

**ABSTRACT**

Pliny the Elder, Gaius Plinius Secundus (23CE-August 25th, 79CE) was a Naval and Army commander and friend of the emperor Vespasian. Pliny’s last text was the “*Naturalis Historia*” completed in 77CE. It is an encyclopaedia of available knowledge and comprises History, Geography, Botany, Zoology, Astronomy, Geology and Mineralogy.

Unfortunately his sudden and unexpected death whilst endeavouring to rescue persons trapped by the eruptive force of Vesuvius meant that this text was both perhaps his greatest and last.

The geographical fragments included there-in, are from many sources; each is attributed to the original author and traveller as the case may be. These people generally existed just before our common era, but also as far back as Eratosthenes (285-194BCE), and thus provide a marvellous insight into the Geography of that age. It pre-dates the work of Marinus the Tyrian and Claudius Ptolemy, who were active from the end of the first century to the latter part of the second century CE, but, it is contemporaneous with the “Geography” of Strabo. However, it appears that Pliny was not aware of that text.

This text is not a comprehensive analysis of Pliny’s work, but a selective overview to establish the overall extant world view that appertained in the first century of our common era. It is also the pre-cursor of a second text, cgPl2, which investigates the map or maps available to and studied by Pliny.

The text comprises 23 A4 pages and 21 A4 full colour diagrams.

**SYNOPSIS**

Each of the 37 (38) books comprising the “Natural History”<sup>1</sup> have been studied and the more important geographical facts extracted. They are set out in the original text order of Pliny the Elder, and are then sequentially analysed. Where practical cross referencing occurs, but it is in fact sometimes counter-productive as Pliny sub-divides certain data which it would be thought contemporary.

I have referenced my earlier texts where applicable, and there-by reduced the explanations given here-in. Those texts extensively cover all of the subject matter concerning the reference.

This paper does not seek to resolve all of the anomalies found within the text of Pliny the Elder, and is followed by a second text which evaluates the map or maps available to Pliny for his text.

**THE NATURAL HISTORY: BASIC DISCUSSION**

In his text comprising 37 (or 38 Books), Pliny includes a geographical description of the oikoumene in its various parts. The text is set out in a semi logical form. Indeed, after Book 1, Book 2 is entitled, “*An account of the world and the elements*”, to be followed by Books 3, 4, 5 and 6 all entitled, “*An account of the countries, nations, seas, towns, havens, mountains, rivers, distances and peoples who now exist or formerly existed*”.

In Book 2, chapter 112, entitled, “*The dimensions of the Earth*”, Pliny quotes Artemidorus<sup>2</sup> (c100BCE) and Isidorus<sup>3</sup> (c BCE/CE) regarding the length of the oikoumene. These are but two of the sources Pliny uses throughout his text.

Therefore, from before our common era we have distance measures, including those of Eratosthenes<sup>4</sup> (c285-194 BCE and explained in my texts **Es1** and **Es2**). But, the aforementioned Geographers are prior to Strabo<sup>5</sup> (c64BCE-25CE) and the writing of his “Geography” which is based

upon the three books of Eratosthenes. Thus, it is possible that the use of at least two measurements for a Stadion<sup>6</sup>, particularly as Pliny quotes Eratosthenes' measurement of the world, 252000 stadia, are utilized. That I have shown is based upon a Stadion of c157.5 metres. Thus when Pliny calculates that the 252000 stadia are equal to 31500 Roman miles (mpm) he has inadvertently mis-interpreted the Stadion. This fact is borne out by his quotation in Book 2:21 where he confirms the length of the Stadion as 125 Roman paces or 625 Pedes, i.e. 184.896 metres.

At this period a degree of latitude was 75 Roman miles (mpm) and thus the actual figure would be  $360 \times 75 = 27000$ mpm. Pliny states that, "*The attempt (by Eratosthenes) is presumptuous, but it is supported by such subtle arguments that we cannot refuse our assent*". Thus we can assume Pliny was reading the original text of Eratosthenes, where-in no doubt he explains why the circuit of the earth was 252000 stadia. But, obviously, at no time did Eratosthenes quantify the Stadion used. However it is necessary to ask, why did Pliny not recognise the conflicting distance measures?

We can therefore use both Stadion's to analyse the distance measures which are within the text, and thus conclude the measurements of the Earth as actually perceived, as well as its various parts.

There is a wealth of data in the Books, but in Book 6:38, "*The comparative distances of places on the face of the earth*", Pliny states, "*Having now fully described the Earth, both without as well as within, it seems only proper that we should succinctly state the length and breadth of its various parts*".

Thus my comment -semi logical- was used as the major geographical distances for the Earth or Globe and the oikoumene are scattered throughout the whole text and this is really a re-iteration.

Rather than gather the disparate data together, particularly as it is attributed by Pliny to many authors and travellers, it is simpler to follow the text Book by Book and analyse each statement as it appears. Thus any particular cross referencing can be carried out to enable a complete understanding of Pliny's vision of the Earth.

#### HERODOTUS<sup>7</sup> (c485-425BCE); "THE HISTORIES", BOOK 4, 34-42.

To illustrate the knowledge available even prior to Eratosthenes (c275-194BCE), it is worth quoting in full the description of the oikoumene given by Herodotus<sup>7</sup> c446 BCE.

"I cannot help laughing at the absurdity of all the map-makers – there are plenty of them – who show Ocean running like a river round a perfectly circular earth, with Asia and Europe of the same size. Let me spend a few words in giving a proper notion of the size and shape of these two continents. Persian territory extends southward to the Red Sea, as it is called; north of them are the Medes, then the Saspies, then the Colchians, who go as far as the northern sea (Black Sea) where the mouth of the Phasis is. These four nations fill the area between the Black Sea and the Persian Gulf. Thence run westward two great continental promontories, one of which stretches from the Phasis on the north of the Black Sea and the Hellespont to the Mediterranean at Sigeum (Yenicher) in the Troad, and again in the south, along the Mediterranean coast from the Myriandic gulf, near Phoenicia, to Cape Triopium (Krio Isostros). This branch of the continent contains 30 different nations. The other starts from Persia, and embraces successively Persia, Assyria, and Arabia, and ends – or is assumed to end – at the Arabian Gulf (Red Sea), which Darius connected by canal with the Nile. Between Persia and Phoenicia lies a very large area of country; and from Phoenicia the branch I am speaking of runs along the Mediterranean coast through Palestine-Syria to Egypt, where it ends. It contains three nations only. Such is Asia from Persia westward; eastward, beyond Media and the territories of the Saspies and Colchians lies the Red Sea (Indian Ocean) and, at the northern limit, the Caspian Sea and the River Araxes, which flows eastwards. Asia is inhabited as far as India; further east the country is uninhabited, and nobody knows what it is like. Such, then, are the shape and size of Asia. Libya is a part of the second branch I mentioned, for it adjoins Egypt; Egypt itself forms a narrow neck, only about 120 miles across from the Mediterranean Sea to the Red Sea; but it soon broadens out, and what is known as Libya covers a very large area.

In view of what I have said, I cannot but be surprised at the method of mapping Libya, Asia, and Europe which I mentioned a page or two back ( in fact he rambles over the preceding 33 chapters of Book

4 with a generalised description). The three continents do, in fact, differ very greatly in size. Europe is as long as the other two put together, and for breadth is not, in my opinion, even to be compared with them. As for Libya we know that it is washed on all sides by the sea except where it joins Asia, as was first demonstrated, so far as our knowledge goes, by the Egyptian King Neco, who, after calling off the construction of the canal between the Nile and the Arabian Gulf (Red Sea), sent out a fleet manned by a Phoenician crew with orders to sail round and return to Egypt and the Mediterranean Sea by way of the Pillars of Hercules. The Phoenicians sailed from the Red Sea into the southern ocean, and every autumn put in where they were on the Libyan coast, sowed a patch of ground, and waited for next year's harvest. Then, having got in their grain, they put to sea again, and after two full years rounded the Pillars of Hercules in the course of the third, and returned to Egypt. These men made a statement which I do not myself believe, though others may, to the effect that as they sailed on a westerly course round the southern end of Libya, they had the Sun on their right – to northward of them. This is how Libya was first discovered to be surrounded by sea, and the next people to make a similar report were the Carthaginians; for Sataspes, son of Teaspes, the Achaemenian, though sent out for the purpose, took fright at the length and loneliness of the voyage and turned back.”

The text **Cp4** discusses the circumnavigation of Libya/Africa.

I will now commence a general over-view analysis of the text by Pliny the Elder, but would caution all to remember the previous section.

## BOOK 2, CHAPTER 21: “OF THE DIMENSIONS OF THE WORLD”

*“The Stadium is equal to 125 of our paces, or 625 feet.”*

The Roman Pace or Passum is two steps, and thus five feet in length (in fact the Roman Mile is 1000 passum/5000 pedes or feet). The pace is 5 x 11.64706 statute inches or 606.615 statute feet and thus 184.896 metres. The Roman Mile is therefore 0.919118 statute miles or 1.4791 Kilometres. Within this text I use both Roman Mile and/or mpm to denote that one measure.

*“For if the diameter consists of 7 parts, there will be 22 of the same parts in the circumference; as if we could measure the heavens by a plumb line.”*

This confirms that Pliny was aware of the  $\text{PI}^8$  ratio of 22/7, but later in his text chooses to accept  $\text{PI}^8$  as 3 and not  $3 + 1/7$ th.

## BOOK 2, CHAPTER 68: “WHAT PART OF THE EARTH IS INHABITED?” Diagram cgPI11D00

*“In the first place, then, it appears that this should be estimated at half the globe, as if no portion of this half was encroached upon by the ocean”*

*“For the globe is divided into 5 parts, termed zones, and all that portion is subject to severe cold and perpetual frost which is under the two extremities, about each of the poles, the nearer of which is called north, and the opposite the south pole.”*

*“The middle of the earth, over which is the orbit of the sun, is parched and burned by the flame, and is consumed by being so near the heat.”*

*“There are only two of the zones which are temperate ----. It appears, therefore, that the heavens take from us 3 parts of the earth; how much the ocean steals is uncertain”.*

The diagram illustrates the zones. However, a full description of those zones and the persons involved with their definition and number is to be found within “The History of Cartography”<sup>9</sup>, chapters 8, 9 and 10. It is therefore unnecessary to repeat the data.

*“And with respect to the part which is left to us, I do not know whether that is not in greater danger. This same ocean----so near to the inland seas, that the Arabian Gulf is no more than 115mpm from the Egyptian Sea, and the Caspian Sea only 375mpm from the Euxine.”*

The Arabian Gulf or Red Sea is separated from the Egyptian Sea or Mediterranean Sea by the two gulfs, Suez and Aqaba, either side of the Sinai Peninsula. The former is in fact the Suez Canal and the

latter basically the line of the Israeli Border. The former is 135KM or 90mpm and the latter 216Km or 146mpm.

The estimate measured via the Suez Canal is quite accurate, as later diagrams illustrate.

Some of this information was no doubt gleaned from **Herodotus** who states in **Book 2; 155-160,** "The shortest distance from the Mediterranean, or Northern Sea, to the Southern Sea- or Indian Ocean- namely, from Mount Casius between Egypt and Syria to the Arabian Gulf, is just 1000 stadia."

The discrepancy over just what is the Arabian Gulf or Sea continues throughout the text. The distance between the Caspian Sea and the Black Sea or Euxine is along the 42<sup>nd</sup> parallel across Georgia and Dagestan to Derbent, 540Km or 365mpm. This is a very accurate measurement.

## BOOK 2, CHAPTER75: "WHEN AND WHERE THERE ARE NO SHADOWS". Diagrams P11D01 and P11D02

*"It is likewise said, that in the town of Syene, which is 5000 stadia south of Alexandria there is no shadow at noon on the days of the solstice (Summer), and that a well, which was sunk for the purpose of the experiment, is illuminated by the sun in every part"*.

This refers to the basic experiment and distance calculation explained to us by Cleomedes, as carried out by Eratosthenes, to establish the circle of the earth (texts **Es1** and **Es2**). The 5000 stadia would therefore be 625mpm, and this discrepancy is fully discussed in my texts. It is in fact an Eratosthian meridional measure formed from a direct measure of 5300 stadia of 0.1575KM. My diagram **cgP11D01** illustrates the Sun's Path for this latitude and therefore confirms the text of Pliny.

However, in 6:34, Pliny states that this experiment took place on the Red Sea coast at Berenice which is at similar latitude to Syene.

The text is as follows;

*"It is well known, that at Berenice, a city of Troglodytae and 4280 stadia beyond that city, in the same country, at the town of Ptolemais which was built on the Red Sea,----, this same thing takes place for 45 days before the solstice and for an equal length of time after it----- and during those 90 days the shadows are turned to the south."*

At Ptolemais, latitude, c20<sup>0</sup>N, it has a sun path at the solstice which indicates it is 5<sup>0</sup>N of East/West and thus gives a southerly shadow. But, one month earlier, 21<sup>st</sup> May, it is directly overhead. Allowing for a latitudinal reading at Ptolemais, the 45 days before the solstice is quite acceptable and the description given is thus one of fact. Diagram **cgP11D02** indicates the Sun's Path for Ptolemais at c20<sup>0</sup>N.

*"Again, at Meroe an island in the Nile and the metropolis of the Aethiopians, which is 5000 stadia from Syene, there are no shadows at two periods of the year, viz. when the sun is in the 18<sup>th</sup> degree of Taurus and the 14<sup>th</sup> of Leo."*

Those dates are in fact the 8<sup>th</sup> May and the 4<sup>th</sup> August. Meroe is c800KM direct distance south of Syene (Aswan), that is 547mpm or 4377 stadia. The measurement is therefore possibly an itinerary measure crossing the Nubian Desert via Wadi Gabgaba, or it is an Eratosthian Stadion of 0.1575Km, used in the calculation which equates to a measure of c5080 stadia.

It is, as I have opined in text **Es2**, the Stadion of Eratosthenes 0.1575Km, copied unknowingly by Pliny. He is therefore unknowingly using a measure differing from the Roman Stadion he understands.

Diagram **cgP11D02** has the Sun's Path for 16<sup>0</sup>N latitude, and on the 8<sup>th</sup> May it indicates the sun directly overhead at midday. But, it could also be on the 11<sup>th</sup> August. However, the measurement given must be considered excellent and a very creditable observation.

## BOOK 2, CHAPTER 112:" THE DIMENSION OF THE EARTH." Diagrams cgP11D03, cgP11D04, cgP11D05, cgP11D06 & cgP11D07

(The diagrams for this section of text are drawn from West to East. It is rather strange that in most of the ancient geographical texts the description is nearly always from Right to Left, or, East to West. This of course presented the ancient Geographers with a problem, as the eastern edge of the oikoumene

was always a nebulous place. I do not understand the imperative that stopped them from starting their descriptions in the West, at the Sacred Promontory or the Straits of Gades/Hercules and then working towards the unknown or the East. At least then it was a positive to a negative.)

The text commences;

*“Our part of the earth---- stretches out to the greatest extent from east to west, viz. from India to the Pillars ---- being a distance of 8568 miles according to ---- Artemidorus or ---- Isidorus --- 9818 miles. Artemidorus adds to this 491 miles from Gades going round by the Sacred Promontory to the Promontory of Artabrum which is the most projecting part of Spain.”*

From India to the Pillars of Gades (Hercules) and the Capes of Iberia was originally measured by Eratosthenes. He utilized this distance as the length of the oikoumene. He calculated a length of 73800 stadia (of 0.1575KM) and thus we may consider this as being equivalent to 62900 stadia of c184.89 metres, and thus 7858 Roman miles. Thus, the distance measure quoted of 8568 miles is not the same itinerary distance as used by Eratosthenes, but, given the similarity of the numerals it is possibly a scribal error. If the two mpm distances are converted back to Stadion measures the evidence of scribal error is indicated.

**The difference between the Artemidorus distance of 8568 mpm and the Isidorus distance of 9818 can thus be explained; 8568mpm = 68544 stadia and 9818 mpm = 78544 stadia, a single digit.**

It takes very little to cause major upsets in the investigation of ancient measures.

If we progress with the text of Pliny, another explanation is possible;

*“This measurement may be taken in two directions. From the Ganges, at its mouth, where it discharges itself into the Eastern Ocean, passing through India and Parthyene, to Myriandrus, a city of Syria, in the bay of Issus, is a distance of 5215 miles. Thence, going directly by sea, by the island of Cyprus, Patara in Lycia, Rhodes, and Astypalaea Islands in the Carpathian sea, by Taernarum in Laconia, Lilybaeum in Sicily and Calaris in Sardinia, is 2103 miles. Thence to Gades is 1250 miles, making the whole distance from the Eastern Ocean 8568 miles.”*

The route from Issus to Gades given in two parts is a clue to its origin. From Issus to Caralis in Sardinia is 2103 mpm or 16824 stadia of indeterminate length. But, it can be measured and is a geographical distance of c2625km, which is 1775mpm. Therefore the measure would appear to be 16824 stadia x 0.1575Km = 2650 Km.

From Caralis to Gades is 1250mpm or 10000 stadia and is thus also using the Eratosthian Stadion of c157.5 metres. It is also the distance measure utilized later by Marinus the Tyrian (**Mt1 & Mt2**).

But, the next section describes a separate route, possibly to the south of that discussed above;

*“The other way, which is more certain, is chiefly by land. From the Ganges to the Euphrates is 5169 miles; thence to Mazaca, a town in Cappadocia, is 319 miles; thence, through Phrygia and Caria, to Ephesus is 415 miles; from Ephesus, across the Aegean sea to Delos, is 200 miles; to the isthmus is 212 ½ miles; thence, first by land and afterwards by sea of Lechaeum and the Gulf of Corinth, to Patrae in Peloponnesus, 90 miles; to the promontory of Leucate 87 ½ miles; as much more to Corcyra; To the Acroceraunian mountains 132 ½ miles, to Brundisium 87 ½ miles and to Rome 360 miles. To the Alps, at the village of Scingomagum, is 519 miles; through Gaul to Illiberis at the Pyrenees, 927; to the ocean and coast of Spain, 331 miles; across the passage of Gades 7 ½ miles; which distances, according to the estimate of Artemidorus make altogether 8945 miles.”*

This itinerary route across India, although non specific, indicates that a very northerly route was taken through Parthyene. It can be plotted to investigate its veracity and through the distance measures given.

We do however have significant background information which allows us to understand the data available to geographers and historians prior to, and including Pliny. **Herodotus<sup>7</sup>, The Histories; Book 5, 49-52** gives an enormous amount of data regarding the landscape and distances from Persis to the Mediterranean

Sea and actually states it could be taken from a map of Greece and Asia up to at least Persis and Susiana, as follows;

“Here, Aristagorus produced the map he had brought with him. ‘Look’, he continued, pointing to it, ‘next to the Ionians here are the Lydians- theirs is a fine country, rich in money. Then come the Phrygians, farthest east, richest in cattle and crops of all the nations we know. And here, adjoining them are the Cappadocians-Syrians, we Greeks call them; and next to them the Cilicians, with their territory extending to the coast- see, here’s the island of Cyprus- who pay annual tribute to the Persian King of 500 talents. Now, the Armenians- they, too, have cattle in abundance; and next to them, here, the Matieni. Again, farther east, lies Cissia; you can see the Choapses marked, with Susa on its banks, where the Great King lives, and keeps his treasure.”

This is a story which details the distance from the Ionian Sea to Susa, given as a three month travel period. But, here we read how a map was produced by a Greek to convince a Spartan that he should invade another country, Persia. Maps were obviously well known and utilized in the ancient world.

But **Herodotus** now produces confirmation of that travel period in some detail; it is none other than the Persian Royal Road, a route from Ephesus/Sardis in Anatolia to Susa, and is as follows;

“That information I will now supply myself. At intervals all along the road are recognised stations, with excellent inns, and the road itself is safe to travel by, as it never leaves inhabited country. In Lydia and Phrygia, over a distance of  $94\frac{1}{2}$  parasangs – about 330 miles- there are 20 stations. On the far side of Phrygia one comes to the river Halys; there are gates here, which have to be passed before one crosses the river, and a strong guard-post. Once over the river and into Cappadocia, a distance of 104 parasangs, with 28 stations, brings one to the Cilician border, where the road passes through two sets of gates, both guarded. These left behind, the distance through Cilicia is  $15\frac{1}{2}$  parasangs, with 3 stations. Separating Cilicia from Armenia is a river the Euphrates, which has to be crossed in a boat, and the distance across Armenia itself is  $56\frac{1}{2}$  parasangs, with 15 stations or stopping-places. Here, too, there is a guard. Through this part of the country 4 rivers run, all of which have to be crossed by a ferry; the first is the Tigris; the second and third both have the same names- Zabatus- though they are different rivers and flow from distinct sources, one rising in Armenia, and the other in Matiene; the fourth is the Gyndes- the river which Cyrus once split into 360 channels. Leaving Armenia and entering Matiene, one has 137 parasangs to go, with 34 stations, and, passing from thence into Cissia, another  $42\frac{1}{2}$  with 11 stations, which bring one to the river Choapses – another navigable stream- on which the city of Susa stands. Thus the total number of stations, or posthouses, on the road from Sardis to Susa is 111. If the measurement of the Royal Road in parasangs is correct, and if a parasang is equal (as indeed it is) to 30 furlongs, then the distance from Sardis to the Palace of Memnon (450 parasangs) will be 13500 furlongs. Travelling, then, at the rate of 150 furlongs a day, a man will take just 90 days to make the journey. So, one can see that Aristagoras of Miletus was quite right when he told the Spartan Cleomenes that it took 3 months to reach Susa from the Sea. But, if anyone wants still greater accuracy, I would point out that the distance from Ephesus to Sardis should be added to the total, so that one gets, as a final measurement of the distance from the Aegean Sea to Susa- the “City of Memnon”- 14040 furlongs; Ephesus to Sardis being 540 furlongs, which increase the three months’ journey by three days.”

This route has been examined by many researchers and is well documented. It is written this time as a journey from west to east, which we perhaps are more familiar with.

Now travelling from east to west in the text and leaving Asia, we reach Europe, and the simplest of the distances to investigate, those which are in fact Roman Road measures<sup>10</sup>.

From Brindisi to Rome there is one route, the Via Appia, or Appian Way. This route was in fact shortened in later years. The original Via Appia from Rome to Brindisi was 365mpm. But the revised route, the Via Apia Traiana reduced the travel; distance to 337mpm. The later Pilgrim’s route totals 363mpm for the same journey.

Thus the distance given in Pliny's text of 360mpm is in all probability the accepted route mileage.

From Rome to Gades we are fortunate to have a complete itinerary engraved upon a *Poculum*, or drinking cup. The total is given as 1842mpm. The total in Pliny's text is 1777mpm, but his reference point is the Pillars of Hercules, called Gades, and not the city of Gades or Cadiz, which is some mpm further. We may therefore infer that Pliny used actual itinerary measures for the distances set down in his text.

However, the actual total is reasonably correct, but the subdivision at "*Illiberis at the Pyrenees, 927mpm*" is certainly not. This is a conflation of the passage by various scribes in confusing the *Illiberis of Gallia Narbonensis* with the *Illiberis of Baetica, Iberia*.

In the above text and comments and as shown by the diagrams, Pliny has described the length or longitude of the oikoumene.

The following text describes the breadth or latitude;

*"The breadth of the earth from south to north, is commonly supposed to be about one –half only of its length, viz. 4490 miles; hence it is evident how much the heat has stolen from it on one side and the cold on the other; for I do not suppose that the land is actually wanting, or that the earth has not the form of a globe; but that, on each side, the uninhabitable parts have not been discovered. This measure then extends from the coast of the Aethiopian ocean, the most distant part which is habitable, to Meroe, 1000 miles; thence to Alexandria 1250; to Rhodes 562; to Cnidos 87 ½; to Cos 25; to Samos 100; to Chios 94; to Mytilene 65; to Tenedos 44; to the promontory of Sigaeum 12 ½; to the entrance of the Euxine 312 ½; to the promontory of Carambis 350; to the entrance of the Palus Maeotis 312 ½; and to the mouth of the Tanais 275 miles, which distance, if we went by sea, might be shortened 89 miles."*

Note; Following the Greek metaphysical requirements of proportion for the length of the oikoumene, of 2:1, if the length is 8568, the breadth would be 4284, and, if 8945 it would be 4472.5 mpm.

There is then a short paragraph which I find perplexing, in that Pliny does not recognize the error he has calculated or in his terminology;

*"The above is all that I consider worth relating about the length of the Earth. But Eratosthenes, a man who was peculiarly well skilled in all the more subtle parts of learning and in this above everything else, a person whom I perceive to be approved by every one, has stated the whole of this circuit to be 252000 stadia, which, according to the Roman estimate, makes 31500 miles. This attempt is presumptuous, but it is supported by such subtle arguments that we cannot refuse our assent. Hipparchus, whom we must admire, both for the ability with which he controverts Eratosthenes, as well as for his diligence in everything else, has added to the above number not much less than 25000 stadia"*

I have indicated in my texts **Es1 and Es2**, (along with **Cp3**), that the Eratosthian Stadion was 0.1575Km. The Roman world was 75 mpm per degree of latitude, and thus 27000 mpm circumference or 216000 Roman stadia. I find it hard to accept that a man of Pliny's status and learning would not know of the Roman system and its world measurement particularly as he quotes from Agrippa's texts at length.

But, the sentences following the above text illustrate that Pliny was perhaps more interested in quoting the geographers he so lauds in his text rather than analysing the units utilised by them and recognising the contradictions there-in.

The following text is; "*Dionysodorus is certainly less worthy of confidence; -- he was a native of Melos--- he died of old age there.*" Paraphrased now --- relatives found an epistle in his tomb stating he had descended to the lowest part of the earth, "*a distance of 42000 stadia*". "*Hence the estimate has been made that it is 252000 stadia in circumference*".

The calculation is so very simple, but it uses as PI, 3; the very old approximation. Thus we have,

$3 \times 2 \times 42000 = 252000$  stadia. But in Book 2, Chapter 21, “*Of the dimensions of the world*”, Pliny has shown he was aware of the PI ratio,  $22/7$ , and thus I believe he is merely copying and not editing for correctness the texts of others.

Pliny has also clearly stated that Eratosthenes calculated the circle of the earth as 252000 stadia and would surely have calculated a radius using the correct PI ratio, he was an eminent mathematician.

### BOOK 3: “INTRODUCTION”

Here Pliny sets down his description of the whole globe;

*“The whole globe is divided into three parts, Europe, Asia, and Africa. Our description commences where the sun sets and at the Straits of Gades, where the Atlantic Ocean, bursting in, is poured forth into the inland seas. As it makes its entrance from that side, Africa is on the right hand and Europe on the left; Asia lies between them; the boundaries being the rivers Tanais and Nile.”*

Thus we can delimit Europe and Africa. Europe extends from the Straits of Gibraltar to the River Don (Tanais) which flows into the north-eastern corner of the Sea of Azov, the Palus Maeotis of old.

Africa extends from the same Straits to the River Nile.

Asia extends from the River Nile in the South and possibly from the River Don in the North to form its Western limits, then as far as the River Ganges in the East.

The Ganges was the limitation set on the oikoumene by Eratosthenes, although he did add an extra 2000 stadia thus encompassing the capes of India or the delta of the Irrawaddy River at Maudin San (Es1). This ensured he retained the metaphysical ratio of longitude to latitude required by Greek philosophical thought, of 2:1.

### BOOK 3, CHAPTER 1: “THE BOUNDARIES AND GULFS OF EUROPE FIRST SET DOWN IN A GENERAL WAY”

Diagram P11D08

*“I shall first speak of Europe ---- considered it, not as a third part only of the earth, but equal to all the rest, looking upon the whole of our globe as divided into two parts only, by a line drawn from the River Tanais to the Straits of Gades. The Ocean----hollowing out the coast of Europe especially into numerous bays, among which there are four gulfs that are more particularly remarkable. The first of these begins at Calpe, which I have previously mentioned, the most distant mountains of Spain; and bends, describing an immense curve, as far as Locri and the Promontory of Bruttium.”*

The bay referred to is none other than the northern Mediterranean Sea comprising gulfs and Seas. Thus from the Straits of Gibraltar curving along the coast of Spain the first is the Gulf of Valencia, and then the Gulf of Lyon, to the Ligurian Sea, and the Gulf of Genoa. Following along the coast of Italy there are several gulfs before we reach the Toe, Calabria as is, and its southern coastline, and the Promontory of Bruttium.

There is a measurement text later in the books of Pliny.

However, the limits of Europe were set down long before Pliny or Eratosthenes. In his book, “*The Histories*”, Herodotus (c485-425BCE) makes the following statements;

*“With Europe, however, the case is different; for no one has ever determined whether or not there is sea either to the east or to the north of it; all we know is that in length it is equal to Asia and Libya combined. Another thing that puzzles me is why three distinct women’s names should have been given to what is really a single landmass; and why, too, the Nile and the Phasis- or, according to some, the Maeotic Tanais and the Cimmerian Strait- should have been fixed upon for the boundaries. Nor have I been able to learn who it was that first marked the boundaries, or where they got the names from.”*

It would appear that these boundaries having been set in the far distant past have been repeated and although shown to be outdated, adhered too. But the distance measures tell another story.

### BOOK 3, CHAPTER 3: “OF BAETICA”

Throughout his text Pliny relies heavily upon the work of Marcus Agrippa<sup>11</sup> who we are informed was responsible for producing not just a map of the Roman World, or the Empire as a whole, but rather a map of the whole known world, of which the Roman Empire was merely one part. (Text StM1)

Pliny states;

*M Agrippa has also stated the whole length of this province to be 475mpm, and its breadth 257: but this was at a time when its boundaries extended to Carthage, a circumstance which has often caused great errors in calculations; which are generally the result either of changes effected in the limits of provinces, or of the fact that in the reckoning of distances the length of the mpm has been arbitrarily increased or diminished. In some parts too the sea has been long making encroachments upon the land, and in others again the shores have advanced: while the course of rivers in this place has become more serpentine, in that more direct. And then, besides, some writers begin their measurements at one place, and some at another, and so proceed in different directions; and hence the result is, that no two accounts agree.*

That whole paragraph sums up the problem nowadays when even Pliny quotes several geographers and does not inform us of the co-relationship of the various measures quoted. Add to that the fact that there was an inconsistency in the measures, particularly the Stadion and evaluating the data becomes rather a stressful task.

Pliny continues;

*At the present day the length of Baetica, from the town of Castulo, on its frontier, to Gades is 250mpm, and from Murcia, which lies on the sea-coast, 25mpm more. The breadth, measured from the coast of Carteia, is 234mpm.*

*Who is there that can entertain the belief that Agrippa, a man of such extraordinary diligence, and one who bestowed so much care on his subject, when he proposed to place before the eyes of the world a survey of that world, could be guilty of such a mistake as this, and that too when seconded by the late emperor the divine Augustus? For it was that emperor who completed the Portico which had been begun by his sister, and in which the survey was to be kept, in conformity with the plan and descriptions of M Agrippa.*

Thus we can assume that Pliny actually saw and studied the “survey” and his descriptive prose owes a great deal to its portrayal of the “world”.

### BOOK 3, CHAPTER 24:” MOESIA”

#### Diagram P11D04

*“The breadth of Illyricum at its widest part is 325 miles, and its length from the River Arsia to the River Drinius 530; from the Drinius to the Promontory of Acroceraunia Agrippa states to be 175 miles, and he says that the entire circuit of the Italian and Illyrian Gulf is 1700 miles. In this gulf, according to the limits which we have drawn, are two seas, the Ionian in the first part, and the Adriatic, which runs more inland and is called the Upper Sea.”*

Moesia is basically Serbia and part of Bulgaria, with Illyricum being Istria above Dalmatia now in Croatia. The distance from the Arsia to the Drinius and thence to the Acroceraunian promontory, now Kepi I Gjuliezes in Albania, north of Corfu Island, can be measured in any atlas. The whole sea is now known as the Adriatic with the Gulf of Venice and the Gulf of Trieste at its northern extremity. It is possible to confirm some of the distance measures, but it is not practical to try to determine the limits of the gulf for this text.

### BOOK 4, CHAPTER 28:” GERMANIA (A)”

#### Diagram P11D03 and P11D04

### BOOK 4, CHAPTER 30:” BRITANNIA (B)”

#### Diagram P11D09

(A) *“The Greek writers and some of our own countrymen have stated the coast of Germany to be 2500 miles in extent, while Agrippa, comprising Rhaetia and Noricum in his estimate, makes the length to be 686 miles and the breadth 148 (or 248 or 268)*

These distance measures are too nebulous to warrant investigation.

On diagrams **cgPI1D03** and **cgPI1D04** I have added the coast of Germania to illustrate the overall knowledge gained by the Roman conquest of north-west Europe.

*(B) “Opposite to this coast is the island called Britannia, so celebrated in the records of Greece and of our own country. It is situate to the north-west, and, with a large tract of intervening sea, lies opposite to Germany, Gaul, and Spain, by far the greater part of Europe. Its former name was Albion. This island is distant from Gesoriacum, on the coast of the nation of the Morini, at the spot where the passage across is the shortest, fifty miles. Pytheas and Isidorus say that its circumference is 4875 miles. Agrippa believes its length to be 800 miles and its breadth 300; he also thinks that the breadth of Hibernia is the same, but that its length is less by 200 miles.”*

In my text, “*When Rectangle superseded triangle, **Tp1***”; “**Br1**, *When was Britannia a rectangle?*” and “**Br2**, *Between Ptolemy and Bede just where is Ireland?*” I have endeavoured to resolve the various textual descriptions afforded to Britannia.

It must be noted that Agrippa’s knowledge probably came from the “world” survey requested by Julius Caesar which was completed in 18BCE. The resultant of that survey was that first Agrippa, then his sister Vipsanius Polla, and finally the emperor Augustus himself, saw the data transformed into a map which was displayed in Rome c7BCE. This map was seen and used by Pliny as has been pointed out in his text of Book 3:3, Baetica.

The text “**StM1**, *With Michael from Italy to Ireland*” fully explains the survey and its aftermath.

Britannia was given dimensions which were not mere guesses. Although the Romans did not occupy the majority of Britannia until c100CE, from the time of the invasions of 55 & 54 BCE there was continual trade and travel which provided adequate information from the itinerant population.

#### **BOOK 4, CHAPTER 37: “THE GENERAL MEASUREMENT OF EUROPE” Diagrams PI1D04 and PI1D09**

*“Having thus made the circuit of Europe, we must now give the complete measurement of it. Artemidorus and Isidorus have given its length, from Tanais to Gades as 8214 miles. Polybius in his writings has stated the breadth of Europe in a line from Italy to the Ocean to be 1150 miles. But, even in his day, its magnitude was but little known, The distance of Italy, as we have previously stated as far as the alps is 1120 miles, from which, through Lugdunum to the British port of the Morini, the direction which Polybius seems to follow, is 1168 miles. But the better ascertained, through greater length is taken from the Alps through the Camp of the Legions in Germany in a north-westerly direction to the mouth of the Rhine, being 1543 miles.”*

This measurement as written, 8214 miles must be suspect given that the length from the Pillars to the Ganges is either 8568 according to Artemidorus or 9818 according to Isidorus (Book 2 chapter 112).

Thus having set out the itinerary route from Tanais to Gades it measures c4750 Km and is thus 3214 Roman Miles, hence the scribal error is confirmed.

The distances according to Polybius<sup>12</sup> can be analysed as follows; Within the “*Itinerarium Antonini*”<sup>10</sup> various road lengths are listed. The distance of “Italy to the Alps” is three sections, Ad Columnan the toe of Italy to Mediolano/Milan, 956mpm. From Milan to Brigantia on Lake Constance or the Bodensee is 138mpm, a total of 1094mpm. From Brigantia to the Mouth of the Rhine is another route, and from Milan to Lugdunum/Lyon and on to the port, Gesoriacum, another road route. There are alternatives for most routes, but in general the distance measures provided by Polybius are very reasonable, and it serves no purpose trying to identify them individually at this juncture.

#### **BOOK 6, CHAPTER 12: “THE PASSES OF THE CAUCASUS” Diagram PI1D10**

*“After passing the last (Albania/Iberia 6/11), we come to the Gates of the Caucasus, by many persons most erroneously called the Caspian Passes; a vast network of nature, which suddenly wrenched asunder in this place a chain of mountains. At this spot are gates barred up with beams shod with iron,*

while beneath the middle there runs a stream which emits a most fetid odour; on this side of it is a rock, defended by a fortress, the name of which is Cumania, (probably Daryell) erected for the purpose of preventing the passage of the innumerable tribes that lie beyond. Here then we may see the habitable world severed into two by a pair of gates; they are just opposite Harmastis, a town of the Iberi”.

“Some writers have stated that the distance between the Euxine and the Caspian Sea is not more than 375 miles; Cornelius Nepos makes it only 250. Claudius Caesar has informed us that from the Cimmerian Bosphorus to the Caspian Sea is a distance of only 150 miles. It is a well-known fact that the distance from the Gates of Caucasus to the shores of the Euxine is 200 miles.”

The well known fact may be correct if a “Gate” can be identified in the centre of the Caucasus. The distance is correct at 375mpm, and thus all else is speculation. The translator of Pliny’s text states as follows; “There are two chief passes over the chain of the Caucasus, both of which were known to the ancients. The first is between the eastern extremity of its chief north-eastern spur and the Caspian Sea, near the modern Derbend. This was called “Albaniae”, and sometimes, “Caspiae Pylae”, the “Albanian” or “Caspian Gates.” The other, which was nearly in the centre of the Caspian range, was called “Caucasiae” or “Sarmaticae Pylae”, being the same as the modern pass of Daryell, and probably the one here referred to.”

Webster’s Geographical Dictionary<sup>13</sup>, pages 226/315/316 and 326 lists these passes.

## BOOK 6, CHAPTER 15: “THE CASPIAN AND HYRCANIAN SEA” Diagram P11D10

“Eratosthenes gives the measure of it on the south-east, along the coast of Cadusia and Albania as 5400 stadia, to the mouth of the river Zonus he makes 4800 stadia, and thence to the mouth of the Jaxartes 2400; which makes in all a distance of 1575 miles. Artemidorus, however, makes this sum smaller by 25 miles. Agrippa bounds the Caspian Sea and the nations around it including Armenia, on the east coast by the ocean of the Seres, on the west by the chain of the Caucasus, on the south by that of the Taurus, and on the north by the Scythian Ocean; and he states it, so far as its extent is known, to be 480 miles in length and 290 in breadth. There are not wanting, however, some authors who state that its whole circumference, from the Straits is 2500 miles.”

There is within the historical texts confusion between the various Gates to be found throughout Asia. Pliny is well aware of that fact and adds the following information;

“In this place it may be as well to correct an error into which many persons have fallen, even those who lately took part with Corbulo in the Armenian War. The Gates of Iberia which we have mentioned (B6,ch12) as the Caucasian, they have spoken of as being the “Caspian”, and the coloured plans which have been sent from those parts to Rome have that name written upon them. The menaced expedition, too, that was contemplated by the emperor Nero, was said to be designed to extend as far as the Caspian Gates, where-as it was really intended for those which lead through Iberia into the territory of the Sarmatae; there being hardly any possibility of approach to the Caspian Sea, by reason of the close juxtaposition of the mountains there. There-are however other Caspian gates, which join up to the Caspian Tribes; but these can only be distinguished from a perusal of the narrative of those who took part in the expedition of Alexander the Great.”

Not only is there confusion regarding the “Gates”, but also the actual Caspian or Hyrcanian Sea. Agrippa appears to be describing a minor Sea, 480mpm in length and 290mpm in breadth; i.e. 700 x 500 Km. However, the Caspian Sea is in fact approximately 1175 x 500 Km or 800mpm x 340mpm. Text **cgAr1** has a full explanation of this confusion.

Eratosthenes appears to understand its size, but does not mention its near neighbour, the Aral Sea. He gives the mouth of the Zonus or Oxus and the mouth of the Jaxartes distance measures, but, both are in fact discharging into the Aral Sea. This is the Sea between Kazakhstan and Uzbekistan and possibly derives its name from the Kyrgyz or Kazakh word “Aral” meaning Island, as the sea contains (or did) over 1000 islands!

Thus there is a conflation of both Seas into one. A glance at the later work of Marinus/Ptolemy confirms this. In fact it does not appear until after their influence upon maps has waned in the 15thC.

However, yet again we can use the text of Herodotus; Book1, 199-205 to facilitate an explanation; “Like the Gyndes, which Cyrus divided into 360 channels, the river Araxes (Pliny 6:10) rises in the country of the Matieni. It has 40 mouths, all but one issuing into swamp and marshland, ---- by the remaining mouth it flows clear into the Caspian Sea. The Caspian is a sea in itself and has no connexion with the sea elsewhere----. The Caspian, however, is quite separate; in length it is a 15 days’ voyage, using the oars, and it is 8 days’ voyage across its broadest part. Along the west of it stretches the chain of the Caucasus, the longest and loftiest of all mountain ranges, inhabited by many different tribes-----. On the west, then, the Caspian is bounded by the Caucasus; east-wards lies an immense tract of flat country over which the eye wanders till it is lost in the distance.”

Pliny in 6; 10 states the following;

*“The river Cyrus takes its rise in the mountains of the Heniochi, by some writers called the Coraxici; the Araxes rises in the same mountains as the river Euphrates, at a distance from it of 6 miles only; and after being increased by the waters of the Usis, falls itself, as many authors supposed, into the Cyrus, by which it is carried into the Caspian Sea”.*

The river Cyrus, now the river Kura, and the river Araxes, now the Araks, fall into the Caspian Sea south of Baku and the 40<sup>th</sup> parallel. The Aras/Araks/Araxes rises in the mountain area between the two upper reaches of the Euphrates and it passes north of the mountain Agri Dagi, better known as Mount Ararat. If the distance had been nearer 60mpm then the description would have been excellent.

But where is the Aral Sea and how did the conflation occur? A text **cgAr1** discusses this.

**BOOK 6, CHAPTER 16: “ADIABENE (A)”**

**BOOK 6, CHAPTER 17: “MEDIA AND THE CASPIAN GATES (B)”**

*(A) Gazae as its chief city, distant from Artaxata 450 miles and the same from Ecbatana in Media to which country Atropatene belongs.*

*(B) Ecbatana the capital of Media – built – at a distance from Great Seleucia 750 miles and 20 miles from the Caspian Gates. The remaining towns of the Medians are Phazaca, Aganzaga and Apamea, surnamed Rhagiane. After leaving these gates we find the nation of the Caspii---. Turning back from this nation to the River Cyrus, the distance is said to be 220 miles; but if we go from that river as far down as the Caspian gates the distance is 700. In the itineraries of Alexander the Great these gates were made the central or turning point in his expeditions, the distance from the Caspian Gates to the frontier of India being there set down as 15680 stadia; to the city of Bactria commonly called Zariacpa, 3700 and thence to the River Jaxartis 5000 stadia.”*

There is great confusion within the distance measures quoted above. Ecbatana is midway between Seleucia and the Caspian Gates, as the diagrams illustrate. Herodotus states that Ecbatana was built fortified by concentric walls, seven in number, and that the circuit of the outer wall was similar in size to that of Athens itself.

The route taken by Alexander the Great<sup>14</sup> is indicated upon diagram **cgP11D12**. Unfortunately the measurements given above are also inconclusive. The route taken by Alexander the Great is quite circuitous and thus meaningless in terms of a geographical measure. In fact in 6:21 Pliny sets down the inter-distances from the Caspian Gates, which total 1697mpm. The river Jaxartes is the furthest point east (north) that Alexander achieved and the city of Alexander Eschate is situated there. Thus we have insufficient data to determine the geography because of the missing Aral Sea.

**BOOK 6, CHAPTER 21:” THE NATIONS OF INDIA”**

**Diagram P11D07**

*“But we come now to nations as to which there is a more general agreement among writers. Where the chain of Emodus rises, the nations of India begin, which borders not only on the Eastern Sea, but on the Southern as well, which we have already mentioned (6;14) as being called the Indian Ocean. That part which faces the east runs in a straight line a distance of 1875 miles until it comes to a bend, at which the Indian Ocean begins. Here it takes a turn to the south, and continues to run in that direction a distance of 2475 miles, according to Eratosthenes, as far as the river Indus, the boundary of India on the*

west. Many authors haven represented the entire length of the Indian coast as being 40 days' and nights' sail, and as being, from north to south, 2850 miles. Agrippa states its length to be 3300 miles, and its breadth, 2300. Posidonius has given its measurement as lying from north-east to south-east, placing it opposite to Gaul, of which country he has given the measurement as lying from north-west to south-west; making the whole of India to lie due west of Gaul. Hence, as he has shewn by undoubted proofs, India lying opposite to Gaul must be refreshed by the blowing of that wind and derive its salubrity there-from.

The text of Eratosthenes as recorded by Strabo concerning India and its distance measures has been fully covered in text **Es1**. The measurements of India vary wildly in Pliny's text and as we are not given precise points, any meaningful examination here is not possible.

Here Pliny adds yet again a series of distance measures according to the track of Alexander's expedition. They would be better discussed separately but are included as per the original text.

*“However, that we may come to a better understanding relative to the description of these regions, we will follow in the track of Alexander the Great. Diognetus and Baeton, whose duty it was to ascertain the distances and length of his expeditions, have written that from the Caspian gates to Hecatompylon, the city of the Parthians, the distance is the number of miles which we have already stated( 6;17, 133 miles); and that from thence to Alexandria of the Arii, which city was founded by the same King, the distance is 575 miles; from thence to Prophthasia, the city of the Drangae, 199 miles; from thence to the city of the Arachosii, 565; from thence to Ortospanum, 175; and from thence to the city built by Alexander, 50 miles. In some copies, however, the numbers are found differently stated; and we find this last city even placed at the very foot of Mount Caucasus! From this place to the river Cophes and Peucolaitos, a city of India, is 237 miles; from thence to the river Indus and the city of Taxila ,60; from thence to the famous river Hydaspes, 120; and from thence to Hypasis a river no less famous, 290 miles, and 390 paces. This last was the extreme limit of the expedition of Alexander, though he crossed the river and dedicated certain altars on the opposite side. The dispatches written by order of that King fully agree with the distances above stated.”*

*“The remaining distances beyond the above point were ascertained on the expedition of Seleucas Nicator. They are, to the river Sydrus, 168 miles; to the river Jomanes, the same; some copies however , add to this last distance five miles; thence to the Ganges, 112 miles; to Rhodapha, 569 – though according to some writers, this last distance is only 325 miles; to the town of Calinipaxa, 167, according to some 265; thence to the confluence of the river Jomanes and Ganges, 625, most writers, however, add 13 miles to this last distance; thence to the city of Palibothra, 425- and thence to the mouth of the Ganges, 637 ½ miles”.*

The track of Alexander the Great across Asia to India and the furthest most parts has been discussed in a multitude of texts. The individual place names have been identified. The bibliography includes several of these texts to enable an in depth study to be made of Pliny's text.

## BOOK 6, CHAPTER 24: “TAPROBANE”

## Diagram P11D11

*“Eratosthenes has also given the dimensions of this island, as being 7000 stadia in length, and 5000 in breadth; he states also that there are no cities, but villages to the number of 700. It begins in the Eastern Sea and lies extended opposite to India, east –west. This island was in former times supposed to be 20 days' sail from the country of the Prasii, but at later times, whereas the navigation was formerly confined to vessels constructed of papyrus with tackle peculiar to the Nile, the distance has been estimated at not more than 7 days' sail, in reference to the speed which can be attained by vessels of our construction.*

*We learned also that the nearest point of the Indian coast is a promontory known as Coliacum, distant from the island 4 days' sail, and that midway between then lies the island of the Sun.*

*They also informed us that the side of their island which lies opposite to India is 10000 stadia in length, and runs in a south-easterly direction.”*

The island of Taprobane has been the subject of many texts. Undoubtedly it was originally Sumatra, as texts **Es1**, **Es2** and **Cp3** indicate. However in later ancient texts it is moved closer to the

southern cape of India and then becomes Ceylon/Sri Lanka; which island was originally thought of as part of India and formed the southernmost Cape with a large bay either side.

However it is worth recording the following text to be found upon the map of Johannes Ruysch<sup>15</sup>, 1507, where he places Taprobane along the Golden Chersonesus, i.e. as Sumatra is geographically.

The text is;” Taprobana Insula ante Alexandri Magni tempora alter existimata orbis + Elephatis Tygribus Q3 abyndat ad haec Margaritis gemmisQ3 viv etura plesisQ3 supra annV centesimv rex vestitv cvltvm representat liberi patris in longitudine stadiis 3433 + in latitudine 7440 patet ad hanc lvsitani navte navigarvnt anno salutis MDVII de qua plvra Plinius SolinvsQ3 Secvdy antique traditionem.”

Which translates as;” Taprobane island, before the time of Alexander thought to be another \*orbis; it is full of Elephants and Tygers; near it, pearls and gems; quite a few (people there) live past their 100<sup>th</sup> year. The King as dressed for worship, representing Liber Pater. It extends 3433 stadia in longitude and 7440 in latitude. To it Portuguese sailors navigated in the year of our salvation 1507. Pliny and Solinus (say) a lot about it according to old tradition /report.”

My first comment is thanks to Bill Thayer for sorting out the translation, which for me proved a little problematical. It seemed to me a very diverse set of comments for a world map. However, it does confirm that Sumatra was considered to be Taprobane. My texts Cp1 to Cp4 discuss this point.

### BOOK 6, CHAPTER 27: “CARMANIA (A)”

### BOOK 6, CHAPTER 28: “THE PERSIAN AND ARABIAN GULFS (B)” Diagram P11D12

(A) “Nearchus states in his writings that the coast of Carmania extends a distance of 1250 miles. From its frontier to the river Sabis is 100 miles. At this spot begins the cultivation of the vine; which with the tillage of the fields, extends as far as the river Ananis, a distance of 25 miles. This region is known by the name of Armuzia. The cities of Carmania are Zetis and Alexandria.”

(B) “The one which lies to the east is called the Persian Gulf, and is 2500 miles in circumference, according to Eratosthenes. Opposite to it lies Arabia, the length of which is 1500 miles. On the other side again, Arabia is bounded by the Arabian Gulf. The sea as it enters this gulf is called the Azanian Sea. The Persian Gulf at the entrance is only 5 miles wide; some writers make it 4. From the entrance to the very bottom of the gulf, in a straight line, has been ascertained to be nearly 1125 miles; in outline it strongly resembles the human head. Onesicritus and Nearchus have stated in their works that from the river Indus to the Persian Gulf, and from thence to Babylon, situate in the marshes of the Euphrates, is a distance of 1700 miles.”

“After passing the promontory are the Armozei, joining up to the Carmani; some writers however place between them the Arbii, extending along the shore a distance of 412 miles. Here is a place called Portus Macedonum and the Altars of Alexander, situate on a promontory, besides the rivers Saganos, Daras and Salsa.”

“Persis itself, looking towards the west, has a line of coast 550 miles in length”.

The information given above is taken from the texts regarding the conquest and return route of the Army and Navy of Alexander the Great. Therefore previous comments equally apply. The diagram illustrates the campaign trail of Alexander and the voyage of Nearchus<sup>16</sup> along the southern shore-line.

### BOOK 6, CHAPTER 30: “MESOPOTAMIA”

### Diagram P11D13

“From Nearchus and Onesicritus we learn that the distance by water from the Persian Sea to Babylon, up the Euphrates is 412 miles; other authors, however, who have written since their time. Say that the distance to Seleucia is 440 miles; and Juba says that the distance from Babylon to Charax is 175 miles. Some writers state that the Euphrates continues to flow with an undivided channel for a distance of 87 miles beyond Babylon, before its waters are diverted from their channel for the purposes of irrigation; and that the whole length of its course is not less than 1200 miles. The circumstances that so many different authors have treated of this subject accounts for all these variations, seeing that even the Persian writers themselves do not agree as to what is the length of their Schoeni and Parasangae, each assigning to them a different length.”

“Seleucia is distant by way of the Euphrates, from the beginning of Mesopotamia, 1125; from the Red Sea, by way of the Tigris, 220; and from Zeugma, 723 miles. Zeugma is distant from Seleucia in

Syria, on the shores of our sea, 175 miles. Such is the extent of the land that lies in these parts between the two seas. The length of the Kingdom of Parthia is 918 miles.”

A calculation shown on the diagram illustrates that there is a mixture of Stadion lengths used. Pliny in selecting the data he is to give at each point or chapter is inadvertently mixing those lengths.

## BOOK 6, CHAPTER 32: “ARABIA”

## Diagram P11D14

*“As for Arabia itself it is a peninsula running out between the Red and the Persian Seas,”*  
*“Nabataei who have a city called Petra---; it is distant from the city of Gaza on our shores 600 miles and from the Persian Gulf 135.”*

*“Opposite this place, in the main sea lies the island of Ogyris famous for being the burial-place of King Erythras, it is distant from the mainland 120 miles, being 112 in circumference. No less famous is another island called Dioscoridu, lying in the Azanian Sea; it is distant 280 miles from the extreme point of the promontory of Syagrus.”*

*“The circumference of Arabia, measured from Charax to Laeana is said to be 4666 miles, but Juba thinks that it is somewhat less than 4000.”*

The circumference of Arabia is a creditable 4000/4666mpm, i.e. 5900 to 6900 Km, being in the order of 6300 Km. I do wonder however if the constant translation of the original stadia measures to mpm., has not introduced many errors into Pliny’s text.

## THE PERIPLUS OF THE ERYTHRAEAN SEA<sup>17</sup>

This text dates from the middle of the 1<sup>st</sup> century CE. It is Greek text describing the ports to be found whilst trading along the Red Sea, the coast of Northeast Africa and the south coast of Arabia across to the East coast of India. It does not contain distance measures as such but sailing periods which can be assessed. Most of the ports have been identified, but there is still confusion with the final ports on the coast of East Africa. There are numerous scholarly texts available discussing its contents.

## BOOK 6, CHAPTER 34: “TROGLODYTICE”

## Diagram P11D14

*“Beyond this are forests, in which is Ptolemais built by Philadelphus for the chase of the Elephant, and thence called Epitheras situate near Lake Monoleus. This is the same region that has already been mentioned by us in the Second book (2:75), in which during 45 days before the summer solstice and for as many after, there is no shadow at the sixth hour, and during the other hours of the day it falls to the south; while at other times it falls to the north.”*

*“That place (Berenice) is situate at a distance of 602 from Ptolemais which has thus become the subject of a remarkable theory--- for it was at this spot that the extent of the earth was first ascertained, it being fact that Eratosthenes, beginning at this place by accurate calculation of the length of the shadow, was enabled to determine with exactness the dimension of the earth.”*

*“Juba will have it that at the Promontory of Mossylum the Atlantic Sea begins and that with a north-west wind we may sail past his native country, the Mauritanias, and arrive at Gades. We ought not on this occasion to curtail any portion of the opinions expressed by him. He says that after we pass the promontory of the Indians known as Lepteaera, and by others called Drepanum, the distance, in a straight line, beyond the island of Exusta and Malichu, is 1500 miles; thence to a place called Sceneos 225; and from thence to the island of Adanu 150 miles; so that the distance to the open sea is altogether 1875 miles.”*

Much of the above has already been covered in this text, but Juba’s belief can be tested thus; Herodotus Book 4; 34-42, clearly states that “The Phoenicians sailed from the Red Sea into the southern ocean---- and after two full years rounded the Pillars of Hercules”.

## BOOK 6, CHAPTER 35: “ETHIOPIA”

## Diagram P11D14

*“Timosthenes, however, the commander of the fleets of Philadelphus, without giving any other estimate as to the distance says Meroe is 60 days’ journey from Syene; while Eratosthenes states that the distance is 625 miles, and Artemidorus 600. Sebosus says that from the extreme point of Egypt, the distance to Meroe is 1675 miles, while the other writers last mentioned make it 1250. All of these differences, however have since been settled; for the persons sent by Nero for the purposes of discovery have reported that the distance from Syene to Meroe is 871 miles, the following being the items. From Syene to Hiera Sycaminos they make to be 54 miles, from thence to Tama 72, to the country of the Evonymitae, the first region of Aethiopia, 120, to Acina 54, to Pittara 25, and to Tergedus 106. They state also that the island of Gaaudes lies at an equal distance from Syene and Meroe, and that it is at this place that the bird called the parrot was first seen; while at another island called Artacula, the animal known as the sphingium was first discovered by them, and after passing Tergedus the cynocephalus. The distance from thence to Napata is 80 miles---. From thence to the island of Meroe the distance is 360 miles. They reported also that the city of Meroe stands at a distance of 70 miles from the first entrance of the island of Meroe.”*

*“Marcus Agrippa was of opinion that the length of the whole country of the Aethiopians, including the Red Sea was 2170 miles and its breadth including Upper Egypt 1297.”*

*“It is agreed by most authors that the distance altogether from the ocean to Meroe is 625 miles and from Meroe to Syene that which we have already mentioned.”*

The river Nile and its distance measures are explained in text **Es2**. The distances quoted here are mis-copied. Whether this is a translation to mpm of stadia measures is questionable, but the City of Meroe, the ancient capital of the Ethiopian King’s is situated only 45Km or 30 mpm northeast of Shendi and the junction of the Blue Nile and Atbara river, the beginning of the island of Meroe is only 35Km or 24mpm, northeast of Meroe City. The 70 mpm equates to 103Km using the stadion of 0.184KM, but, using a stadion of 0.1575 Km it is 88Km and thus indicates a confusion of the Stadia yet again.

## **BOOK 6, CHAPTER 36: “ISLANDS OF THE AETHIOPIAN SEA”      Diagram P11D15**

*“We learn from Ephorus, as well as Eudoxus and Timosthenes, that there are great numbers of islands scattered all over this sea; Clitarchus says that king Alexander was informed of an island so rich that the inhabitants gave a talent of gold for a horse,-----. Ephorus states that those who sail from the Red Sea into the Aethiopian Ocean cannot get beyond the Columnae there, some little islands so called. Polybius says that Cerne is situate at the extremity of Mauritania, over against Mount Atlas, and at a distance of 8 stadia from the land; while Cornelius Nepo states that it lies very nearly in the same meridian as Carthage, at a distance from the mainland of 10 mpm, and that it is not more than 2 mpm in circumference. It is said also that there is another island situate over against Mount Atlas, being itself known by the name of Atlantis. Five days’ sail beyond it there are deserts, as far as the Aethiopian Hesperiae and the promontory, which we have mentioned called Hesperu Ceras, a point at which the face of the land first takes a turn towards the west and the Atlantic Sea. Facing this promontory are also said to be the islands called the Gorgades, the former abode of the Gorgons, two days’ sail from the mainland, according to Xenophon of Lampsacus. Hanno, a general of the Carthaginians, penetrated as far as these regions, and brought back an account that the bodies of females were covered with hair, but that men, through their swiftness of foot, made their escape;-----. Beyond these even, are said to be two islands of the Hesperides; but so uncertain are all the accounts relative to this subject, that Statius Sebosus says that it is 40 days’ sail, past the coast of the Atlas range, from the islands of the Gorgons to those of the Hesperides, and one days’ sail from theses to the Hesperu Ceras. Nor have we certain information relative to the islands of Mauritania. We only know, as a fact well-ascertained, that some few were discovered by Juba over against the country of the Autololes, upon which he established a manufactory of Gaetulian purple.*

The last named indicates possibly the Purpuriae or Purple Islands of the Madeira group, but, we must be careful, as the Phoenicians developed the purple colour from a mollusc and had islands near Sicily with kilns and production centres. In fact they had many such centres throughout the Mediterranean.

The over-riding sense taken from the foregoing text is that there are two sets of islands in the Atlantic Ocean west of the coast of Libya/Africa. This could account for the problems which are discussed in the following chapter. The diagram illustrates the text of Marinus/Ptolemy and sets out the main geographical data available illustrating the two sets of islands.

## BOOK 6, CHAPTER 37: "THE FORTUNATE ISLANDS"

## Diagram P11D15

*There are some authors who think that beyond these (6,36 Islands of the Aethiopian Sea) are the Fortunate Islands, and some others; the number of which Sebosus gives, as well as the distances, informing us that Junonia is an island 750 miles distant from Gades. He also states that Pluvialia and Capraria are the same distance from Junonia, to the west; and that in Pluvialia the only fresh water to be obtained is rain water. He then states at a distance of 250 miles from these, opposite the left of Mauritania, and situate in the direction of the sun at the eighth hour, are the Fortunate Islands, one of which, from its undulating surface has the name of Invalis, and another that of Planasia, from the peculiarity of its appearance. He states also that the circumference of Invalis is 300 miles, and that trees grow to a height of 114 feet.*

*Relative to the Fortunate Islands, Juba has ascertained the following facts; that they are situate to the south in a nearly westerly direction, and at a distance from the Purple Islands of 625 miles, the sailing being made for 250 miles due west and then 375 towards the east.*

*First Island called Ombrios, has no buildings, but a lake, trees and giant fennel from which water is extracted.*

*Second Island called Junonia has a small temple of stone and a nearby island of the same name.*

*Third Island is Capraria infested by multitudes of huge lizards*

*Fourth Island is Ninguaria, with its perpetual snows and fogs.*

*Fifth Island is Canaria, which contains very large dogs and traces of buildings*

The naming of these Islands has led to an enormous number of texts being written. Generally it is the etymological argument regarding the names attributed to them which leads to confusion. For instance, Ninguaria is from the Latin, ningit, "it is snowing"; but, Capraria is derived from the Latin, caper or capra, meaning Goat, a lizard is lacerta in latin. Others make little sense in Latin. Many researchers use the later names to be found in the texts of Marinus/Ptolemy. But these are some 100 to 150 years after the references given by Pliny. It should also be noted that the actual Canary Islands were populated by a peoples known as the "Guanches", who were, from the historical and archaeological record, civilised and possibly derived from the Berbers of Mauritania, the mainland opposite. Unfortunately the Spanish invaders wiped out this population much the same as in South America.

The diagram sets out the argument for the correct naming and positioning of the Fortunate Islands as The Cape Verde Group as text **Cp4** illustrates.

## BOOK 6, CHAPTER 38: "THE COMPARATIVE DISTANCES OF PLACES ON THE FACE OF THE EARTH"

## Diagrams P11D16 and P11D17

*Having now fully described the earth, both without as well as within, it seems only proper that we should succinctly state the length and breadth of its various seas.*

*Polybius has stated, that in a straight line from the Straits of Gades to the mouth of the Maeotis, it is a distance of 3437 ½, and that, starting from the same point the distance in a straight line to Sicily is 1250 miles, from thence to Crete 375, to Rhodes 187 ½, to the Chelidonian Islands the same distance, to Cyprus 225, and from thence to Seleucia Piera, in Syria, 115 miles: the sum of all which distances amounts to 2340 miles.*

*Agrippa estimates this distance, in a straight line from the Straits of Gades to the Gulf of Issus, at 3340 miles, in computation, however, I am not certain that there is not some error in the figures, seeing that the same author has stated that the distance from the Strait of Sicily to Alexandria is 1350 miles.*

*Taking the whole length of the sea-line throughout the gulfs above mentioned, and beginning at the same point he makes it 10058 miles; to which number Artemidorus has added 756; the same author,*

including in his calculation the shores of the Maeotis, makes the whole distance 17390 miles. Such is the measurement given by men who have penetrated into distant countries, unaided by force of arms, and have, with a boldness that exhibits itself in the times of peace even challenged, as it were Fortune herself.

I shall now proceed to compare the dimensions of the various parts of the earth, however great the difficulties which may arise from the discrepancy of the accounts given by various authors; the most convenient method, however, will be that of adding the breadth to the length.

Following this mode of reckoning the dimensions of Europe will be 8294; of Africa, to adopt a mean between all the various accounts given by authors, the length is 3794 miles, while the breadth, so far as it inhabited, in no part exceeds 250 miles. But as Agrippa, including its deserts, makes it from Cyrenaica, a part of it, to the country of the Garamantes, so far as was then known, a further distance of 910 miles, the entire length, added together, will make a distance of 4608 miles.

The length of Asia is generally admitted to be 6375 miles and the breadth, which ought, properly, to be reckoned from the Aethiopian Sea to Alexandria near the River Nile, so as to run through Meroe and Syene, is 1875. It appears then that Europe is greater than Asia, by a little less than one half Asia, and greater than Africa by as much again of Africa and one Sixth.

If all these sums are added together, it will be clearly seen that Europe is one third, and a little more than one eighth part of one third, Asia one fourth and one fourteenth part of one fourth, and Africa, one fifth and one sixtieth part of one fifth of the whole earth.

**The last sentence is actually mis-leading and should be read as  
1/3 + 1/8 for Europe, then, 1/4 + 1/14 for Asia and 1/5 + 1/60 for Africa.**

The Latin text available is quite clear as follows;

*210; apparet ergo Europam Paulo minus dimidia Asiae parte maiorem esse quam Asiam, eandem altero tanto et sexta parte Africae amplioem quam Africam. Quod si misceantur omnes summae, liquido patebit Europam totius terrae tertiam esse partem et octavam Paulo amplius, Asiam vero quartam et quartam decimam, Africam autem quintam et insuper sexagesimam.*

Thus we have the following parts of the earth, which we can set down as percentages;

Europe; 1/3rd plus a little more than 1/8<sup>th</sup>  
Asia; 1/4 plus 1/14<sup>th</sup>  
Africa; 1/5<sup>th</sup> plus 1/60<sup>th</sup>, and these we are told make the whole earth, and will thus total 1 (unity) or 100%.

But as stated they in fact total;

Europe;	0.3333 + 0.125	= 0.4583	= 45.83%
Asia,	0.25 + 0.0714	= 0.3214	= 32.14%
Africa	0.20 + 0.0167	= 0.2167	= 21.67%
Total		= 0.9964	= 99.64%

Thus the “little more than 1/8<sup>th</sup>” must account for the short fall of 0.0036 in the calculation. But, I have used decimals, a methodology the Romans could only dream of whilst using their cumbersome numerical system.

If we resolve the decimals, the parts, or percentages, as fractions, we have the following;

Europe;	0.3333 + 0.125 + 0.0036	= 0.4619 or 46.19%
Asia;	0.25 + 0.0714	= 0.3214 or 32.14%
Africa;	0.20 + 0.0167	= 0.2167 or 21.67%
Total		= 1.0000 or 100%

and resolving these to simple fractions we have;

46.19%	= 970/21
32.143%	= 675/21
21.667%	= 455/21, and these total 2100/21 or 100%

The diagrams illustrate by comparison of the distance measures the veracity of the above statements. They also indicate that once more we find a mixture of Stadion lengths used for the Mediterranean distances.

The percentage division of the Earth is harder to illustrate. The diagram shows firstly the calculation of the actual land areas from the text. There is one section, Asia for which Pliny gives both length and

breadth. Thus we can use that land area to calculate the area of a single percent and thus multiply out the land areas for Africa and Europe. Then, using the limiting places described in the text the diagram can be drawn. This has then been transferred onto the geographical map to illustrate the differences.

Generally the concept of Pliny for the land areas is upheld by the diagram and map plot, but, it was obviously conceived of on a very different map projection.

### BOOK 6, CHAPTER 39:” DIVISIONS OF THE EARTH INTO PARALLELS AND SHADOWS OF EQUAL LENGTH”. Diagrams P11D18, P11D19, P11D20

*“To the above we shall add even another instance of ingenious discovery by the Greeks, and indeed of the most minute skilfulness; that so nothing may be wanting to our investigation of the geographical divisions of the earth, and the various countries thereof which have been pointed out; that it may be better understood, too, what affinity, or relationship as it were, exists between one region and another, in respect to the length of their days and nights, and in which of them the shadows are of equal length, and the distance from the pole is the same. I shall therefore give these particulars as well, and shall state the divisions of the whole earth in accordance with the various sections of the heavens. The lines or segments which divide the world are many in number; by our people they are known as “circuli” or circles, by the Greeks they are called “paralleli” or parallels.”*

*“The first begins at that part of India which looks towards the south, and extends to Arabia and those who dwell upon the borders of the Red Sea. It embraces Gedrosi, the Carmanii, the Perse, the Elymaei, Parthyene, Aria, Susiane, Mesopotamia, Seleucia surnamed Babylonia, Arabia as far as Petra, Coele Syria, Pelusium, the lower parts of Egypt called Chora of Alexandria, the maritime parts of Africa, all the cities of Cyrenaica, Thapsus, Adrumentum, Clupea, Carthage, Utica, the two Hippo’s, Numidia, the two Mauritanias, the Atlantic Sea, the Pillars of Hercules. Within the meridians this parallel, on the middle day of the equinox, the pin of the dial, usually called the gnomon, if 7 feet in length, throws a shadow at mid-day no more than 4 feet long, the longest day and night are 14 equinoctial hours respectively, the shortest being only 10”.*

*“The next circle or parallel begins with the western parts of India, and runs through the middle of Parthia, through Persepolis, the nearer parts of Persis, the nearer Arabia, Judea, and the people who live near Mount Libanus, and it embraces Babylon, Idumaea, Samaris, Hierosolyma, Ascalon, Joppa, Caesarea in Phoenicia, Ptolemais, Sidon Tyre, Berytus, Botrys, Tripolis, Byblus, Antiochia, Laodicea, Seleucia, the maritime parts of Cilicia, the southern parts of Cyprus, Crete, Lilybaeum in Sicily, and the northern parts of Africa and Numidia. In these regions, at the time of the equinox, a gnomon of 35 feet in length gives only a shadow 24 feet long; and the longest day and night are respectively 14 equinoctial hours, and one fifth of an hour in length.”*

*“The third circle or parallel begins at the part of India which lies in the vicinity of Mount Imaiis, and runs through the Caspian Gates and the nearer parts of Media, Cataonia, Cappadocia, Taurus, Amanus, Issus, the passes of Cilicia, Soli, Tarsus, Cyprus, Pisidia, Side in Pamphylia, Lycaonia, Patara in Lycia, Xanthus, Caunus, Rhodes, Cos, Halicarnassus, Cnidus, Doris, Chios, Delos, the middle of the Cyclades, Gythium, Malea, Argos, Laconia, Elis, Olympia, Messenia in the Peloponnesus, Syracuse, Catina, the middle of Sicily, the northern parts of Sardinia, Carteia and Gades. A gnomon 100 inches in length throws a shadow 77 inches long, the length of the longest day is 14 equinoctial hours and a half, plus one thirtieth of an hour.”*

*“Under the fourth circle or parallel lie those parts of India which are on the other side of the Imaiis, the southern parts of Cappadocia, Galatia, Mysia, Sardis, Smyrna, Sipylus, Mount Timolus, Lydia, Caria, Ionia, Tralles, Colophon, Ephesus, Miletus, Chios, Samos, The Icarian Sea, the northern part of the Cyclades, Athens, Megara, Corinth, Sicyon, Achaia, Patrae, the Isthmus, Epirus, the northern parts of Sicily, the eastern parts of Gallia Narbonensis, the sea-coast of Spain, from New Carthage westward. In these districts a gnomon of 21 feet throws a shadow of 16 feet in length; the longest day contains 14 equinoctial hours and 2/3 hour.” (Caution, see later note)*

*“Under the fifth zone are included, from the entrance to the Caspian Sea, the Bactri, Iberia, Armenia, Mysia, Phrygia, the Hellespont, Troas, Tenedos, Abydos, Scepsis, Ilium, Mount Ida, Cyzicus, Lampsacus, Sinope, Amisus, Heraclea in Pontus, Paphlagonia, Lemnos, Imbros, Thasos, Cassandria, Thessaly, Macedonia, Larissa, Amphipolis, Thessalonica, Pella, Edessa, Bercae, Pharsalia, Carystus, Euboea in Boeotia, Chalcis, Delphi, Acarnanis, Aetolia, Apollonia, Brundisium, Tarentum, Thurii, Locri, Rhegium, the Lucani, Neapolis, Puteoli, the Tuscan Sea, Corsica, The Balearic Islands, and the middle of Spain. A gnomon, 7 feet in length, in those countries gives a shadow of 6 feet and the length of the day is 15 equinoctial hours.”*

*“The sixth division, in which Rome is included, embraces the Caspian nations, Caucasus, the northern parts of Armenia, Apollonia on the Rhyndacus, Nicomedia, Chalcedon, Byzantium, Lysimachia, the Chersonesus, the Gulf of Melas, Abdera, Samothracia, Maronea, Aenus, Bessica, Thracis, Maedica, Paeonia, the Illyrii, Dyrrhachium, Canusium, the extreme parts of Apulia, Campania, Etruria, Pisae, Luna, Luca, Liguria, Antipolis, Massilia, Narbo, Tarraco, the middle parts of Hispania Tarraconensis, and thence through Lusitania. A gnomon of 9 feet here throws a shadow 8 feet long; the greatest length of the day is 15 equinoctial hours plus 1/9<sup>th</sup> part of an hour, or according to Nigidius 1/5<sup>th</sup>.”*

*“The seventh division begins on the other side of the Caspian sea, and the line runs above Callatis, and through the Bosphorus, the Borysthenes, Tomi, the back part of Thrace, the Triballi, the remainder of Illyricum, the Adriatic Sea, Aquileia, Altinum, Venetia, Vicetia, Patavium, Verona, Cremona, Ravenna, Ancona, Picenum, the Marsi, the Peligni, the Sabini, Umbria, Ariminum, Bononia, Placentia, Mediolanum, all the districts at the foot of the Apennine, and, beyond the Alps, Gallia Aquitania, Vienna, the Pyrenean range, the Celtiberia. A gnomon 35 feet in length here throws a shadow of 36 feet, except in some parts of Venetia where the shadow just equals the length of the gnomon; the longest day is 15 3/5ths equinoctial hours.”*

*“Thus far we have set forth the results of observations made by the ancients. The remaining part of the earth has been divided, through the careful researches of those of more recent times, by three additional parallels. The first runs from the Tanais through the Maeotis and the country of Sarmatae, as far as the Borysthenes, and so through the Daci and part of Germany, and the Gallic provinces, as far as the shores of the ocean, the longest day being 16 hours.”*

*“The second parallel runs through the country of the Hypoborei and the Island of Britannia, the longest day being 17 hours in length.*

*The last of all is the Scythian parallel, which runs from the Rhiphaean range to Thule, in which, as we have already stated the year is divided into days and nights alternately for 6 months duration.”*

*“The same authors have also placed before the first parallel which we have given here, two other parallels or circles; the first running through the Island of Meroe and the city of Ptolemais which was built on the Red Sea for the chase of the Elephant; where the longest day is 12 ½ hours in length; and the second passing through Syene in Egypt, in which the longest day is 13 hours. The same authors added ½ hour to each of the parallels until they came to the last.”*

*“Thus far on the Geography of the Earth.”* Thus ends the geographical text of Pliny.

The parallels as described by Pliny and plotted upon a geographical map are rather inter-twined as opposed to the textual inference of horizontal bands across the Earth's surface. The most obvious reason for the curvilinear shapes is that the map projection is wrong.

However it should be noted there is an obvious scribal error in section four where the gnomon is 21 units and the shadow or ombre should read 17 units and not 16 units. i.e. xvii not xvi.

The second problem is one of text place names; there are many more in the second parallel than any other. In fact this parallel encompasses the whole latitude of the eastern Mediterranean Sea from Issus to Ascalon, just above Gaza. Geographically that is a 5 degree spread, some 550Km or 370mpm. Thus we

must look to a map which reduces the latitudinal measure of this part of the Mediterranean Sea and allows the parts to the north to widen and become similar “parallels”. Or, the text has been wrongly copied.

The text **PI2**, which will follow this text upon the web-site, investigates the maps provenance.

If we compare the “parallels” with the “Climates” of one half hour interval, using the Gnomon Ratios given by Pliny, we can begin to establish the *raison d’être* for his statements.

But we must be aware of the possible error between the third and fourth ratios given, as they appear to be a reversal. The obvious answer is that the fourth ratio is in fact meant to be around c39<sup>0</sup>N, a ratio of 21:17 (or 16:13), both reasonably the mid-point of “parallels 3 and 5”, at c39.1 degrees. And, obviously the original 21:16 ratio given is very probably a scribal error and the 21:17 ratio is correct.

Without investigating the map on which these parallels were drawn and with that the veracity of the Poleis or Towns noted as being in that parallel it is impractical to comment further at this stage of the investigation.

The following text **PI2** seeks to answer that point.

## CONCLUSIONS

The first and probably most important conclusion is that Pliny re-defined each measurement, however it was originally written in the various texts he used, as a Roman Mile or mpm.

However, the one fact he did not ascertain was the original distance measures of each text and if it was therefore capable of being divided by eight, the number of Stadia in a Roman Mile. Thus we have distance measures based upon a Stadion of c157.5m or c185m both being divided by eight to produce a Roman Mile measure. That of course produces a variation from 1.26Km to 1.4791Km or 85% to 100% of the actual length of a Roman Stadion.

The second conclusion must be that Pliny merely copied the data he was researching from within other geographers and historians texts, without first verifying or questioning the veracity of that data. He has merely taken their word for the facts there-in.

Thirdly the problem with all such texts, that of scribal copying errors.

Pliny though has bequeathed to us extracts of texts from other geographers and historians which we would perhaps not otherwise have available. The fact that his text uses the work of Eratosthenes, as does Strabo, and contains some extra information, enables us to use both texts to enhance our studies. Had Pliny actually noted each and every author he was quoting in his History, we may have had an even greater insight.

What the text of Pliny does show is that there were dozens of geographers and historians in the Roman and Greek worlds who were trying to increase the overall knowledge of the oikoumene. It also indicates that that overall knowledge was quite awesome and if the texts had survived for our studies then perhaps we would have a slightly different view of the oikoumene.

Also, if only the metaphysical and philosophical arguments could have been obviated and the adherence to a world view of zones re-evaluated, I do not doubt that the ancient geographers would have mapped the whole world.

The “Naturalis Historia” of Pliny the Elder is a work of immense importance even in the 21<sup>st</sup> century.

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