

Contributions of Greek Scholars in Geography

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Component-I (B) - Description of Module

Items	Description of Module
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Module Name/Title	Contributions of Greek Scholars in Geography
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Pre-requisites	Contributions of Greek Scholars in Geography
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Contributions of Greek Scholars in Geography

1. Introduction

Geography as a field of knowledge had its roots in the Greek scholarship. This is not surprising as in the ancient times Greek was one of the well flourished civilizations dating back to 500Bc – 200Bc with its centre in Greece and its surrounding areas. Greek period is rightly called as the “Golden period” because all Greeks provided a framework of concept that guided the western thinking for many centuries. It was the most advanced economy in the world. The Greek philosophers of that time have provided the theoretical and scholarly base for the philosophical thinking through models, concepts, and paradigms which guided Western academia for many centuries. A large number of concepts and theories in the geographical philosophy seem to have an inclination towards the Greek tradition.

2. Roots of Greek Scholarship:

The roots of the ancient Greek scholarship are found in the observations, measurements, and generalizations of scholars in Egypt, the cradle of science. The Egyptians had developed ways of measuring land in order to collect taxes. This led to the identification of North-South line. Another major contribution is the art of writing and also manufactured something on which they could write.

The Greeks also borrowed from the Mesopotamians and Sumerians. They borrowed the basic principles of algebra from them. The sexagesimal system was also taken which believed that there are 360 days in a year. The Sumerians divided the year into twelve months; each month with 30 days. Even the idea that a circle has 360 degrees is from this scholarship; they had divided the circle of the zodiac into 360 parts.

The Greeks came to know about explorations and navigation from the Phoenicians, the settlers of modern Lebanon. These people not only expertise as

explorers and merchants; also invented the world's first phonetic alphabets. They even established a port along the shores of the Mediterranean Sea; the most renowned being that in the city of Carthage.

The ideas about the celestial bodies were adopted from the observations made by the Babylonians and Assyrians on the movement and position of the celestial bodies which gave birth to the discipline of astrology.

All these developments along with the determination of Greek scholars to gain more and more logical and useful knowledge about the earth surface as the home of man laid the roots of geographical thinking.

3. Major Greek Philosophers

In the ancient Greek scholarship, two traditions of geographical studies are found, namely, the mathematical tradition and the literary tradition. It is a common belief that **Homer** is regarded as the *Father of Geography*. This is because he introduced the literary tradition through his monumental work 'Odyssey' and 'Illiad'. He described the four winds coming from different directions and named them Boreas (North), Eurus (East), Notus (South) and Zephyrus (West).

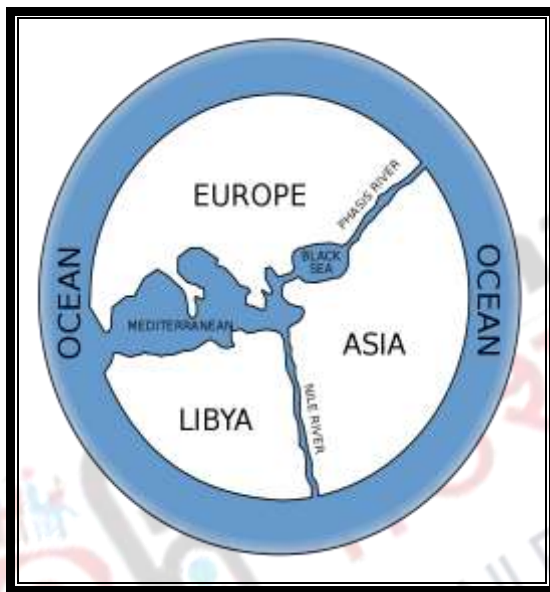
Thales was the first Greek genius, philosopher, and traveler who was concerned with the basic theorems of geometry. He proposed the following six geometric propositions –

- i) The circle is divided into two equal parts by its diameter
- ii) The angles at either end of the base of an isosceles triangle are equal
- iii) When two parallel lines are crossed diagonally by a straight line, the opposite angles are equal
- iv) The angle in a semi-circle is a right angle
- v) The sides of similar triangles are proportional
- vi) Two triangles are congruent if they have two sides and one angle respectively equal (James and Martin, 1972)

He visualized earth as a disc floating on water. He was also the first who started the measurement of the earth and location of things on the face of the earth; thus establishing the mathematical tradition. Not only this he laid the foundations of empirical studies that is an explanation can be checked through ground observations and measures; a critique of the traditional unscientific explanations.

Anaximander is credited with the introduction of a Babylonian instrument known as *Gnomon* into the Greek literary world. Gnomon is a pole set vertically above a flat surface on which the varying position of the sun and other celestial bodies could be measured by the length and direction of the shadow cast by the vertical pole. He is even credited to produce a world map to scale. This map is based on the information gathered from the Sumerians who had an archive of pictorial maps. Interestingly, this map has an ocean encircling the world.

World Map as given by Anaximander



Anaximander's Gnomon



Thales and Anaximander are credited for the initiation of mathematical tradition in geography. The credit for originating the literary tradition goes to **Hecataeus**. He was a Greek scholar of 6th century BC from Miletus (the center of learning in those days). He was a pioneer scholar and one of the earliest writer of Greek prose. He was the first Greek scholar to classify the information about the then known world and brought it to Miletus. His work is known as "*Ges-periodos*" or Description of the Earth. It was the first systematic description of the then known world, that was published by the end of 6th century BC. *Ges-periodos* describes the places in the vicinity of the Mediterranean Sea which was called as perplus means coastal area. Hecataeus divided his book "*Ges-periodos*" into two parts, part 'A' dealing with geographical information about Europe' and part B dealing with Libya. This book is a blend of the literary tradition and the topographical-ecological tradition.

Hecataeus for the first time gave two approaches for the study of geography:

a) Nomothetic or law seeking approach.

b) Idiographic approach (descriptive).

Hecataeus prepared the world map but it was based on the map of Anaximander; he had just modified it. He divided it into two parts by drawing a line passing through Hellespont, the Caspian Sea and Caucasus mountains. The northern part he named as Europa and southern part of Libya that includes Africa and Asia.

Figure 2
The World according to Hecataeus



Herodotus was an outstanding Greek scholar of 5th century BC. There is no exaggeration in the statement to say that Herodotus was the **father of history**. He is credited with the idea that *history must be treated geographically and all geography must be treated historically* (James and Martin, 1981). He is also identified as the **father of ethnography** as he provided a vivid portrayal of cultural traits of people who were unknown to Greeks. His works were based on his own observations during his travels. He contributed both in physical and human geography. Herodotus came up with the concept that Egypt is the gift of the river where he emphasized that silt and mud of river lead to the development of delta. It was he who for the first time gave concept that winds move from cold to hot places. He attempted to measure the age of the earth on the basis of the rate of sedimentation and estimated that one foot of sediment is formed in 880 years. Taking the total sediment strata 158 km thick, Herodotus calculated the age of the earth as 440 million years when the exact age of the earth is 4.6 billion years.

Plato and Aristotle also made valuable contributions in the field of geography. Plato is regarded as the master of deductive reasoning - from the general to the particular. He is considered to be the first scholar who adopted the idea of round earth located in the center of the universe with the other celestial bodies revolving around it in a circular motion.

Aristotle provided the first paradigm within the theoretical framework that existed in Europe at that time. He emphasized that the observations which were made through the senses do not provide explanations; especially the scientific explanations. He formulated laws or fundamental principles of scientific explanation, which became a guiding force for the scholars in future centuries. He agreed with Plato that the earth is spherical in shape and went a step further by seeking an explanation for the spherical shape. He even contributed to the branch of human geography when he put forward the concept of variations in habitability on the surface of the earth on the basis of latitudinal position. He opined that the regions nearer to the Equator were uninhabitable and named it as the Torrid Zone. Similarly, the parts of the earth which was away from the Equator and were permanently frozen were also uninhabitable – the Frigid Zone. The population of the Earth lived in the Temperate zone which existed between the Torrid and the Frigid Zones.

Eratosthenes has been regarded as the '**Father of Geography**'. He is the one who coined the term Geography, deriving from two words '*ge*' meaning '*the earth*' and '*graphy*' meaning '*to describe*'. He is credited to provide the definition of geography as the "***study of earth as the home of man***". His outstanding contribution for which he is known throughout the world is his measurement of the earth's circumference. He has used Thales theorem – When two parallel lines are crossed diagonally by a straight line, the opposite angles are equal - while measuring the earth's circumference (Figure 3). He has also prepared a world map with respect to correct distance (Figure 4). His remarkable contribution was his text "**Geographica**". He also delineated the world into five climatic zones: one Torrid Zone, two temperate zones, and two frigid zones. He also measured different latitudes and longitudes. It is for this reason that Eratosthenes is considered as the *father of "Geodesy"*.

Figure 3
Calculation of the Earth's circumference by Eratosthenes

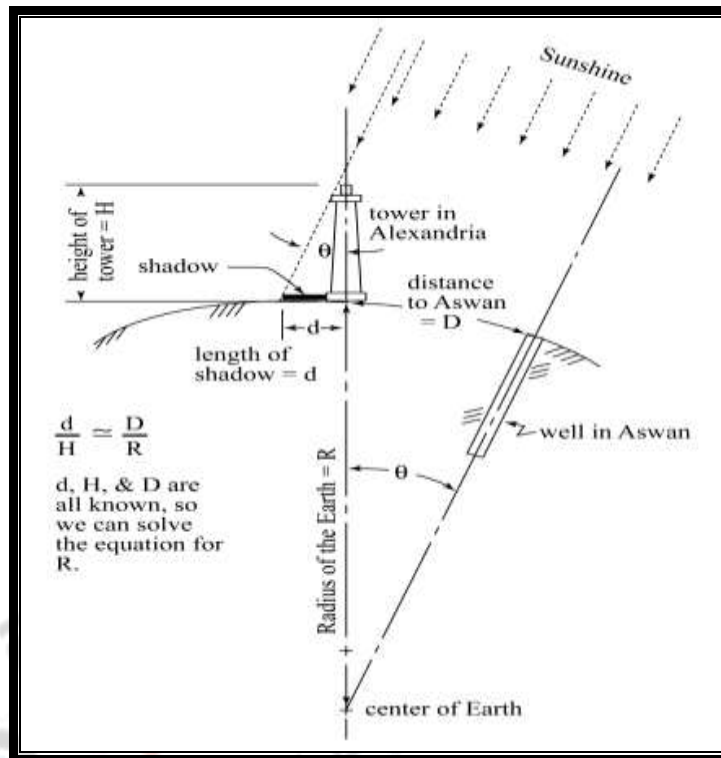
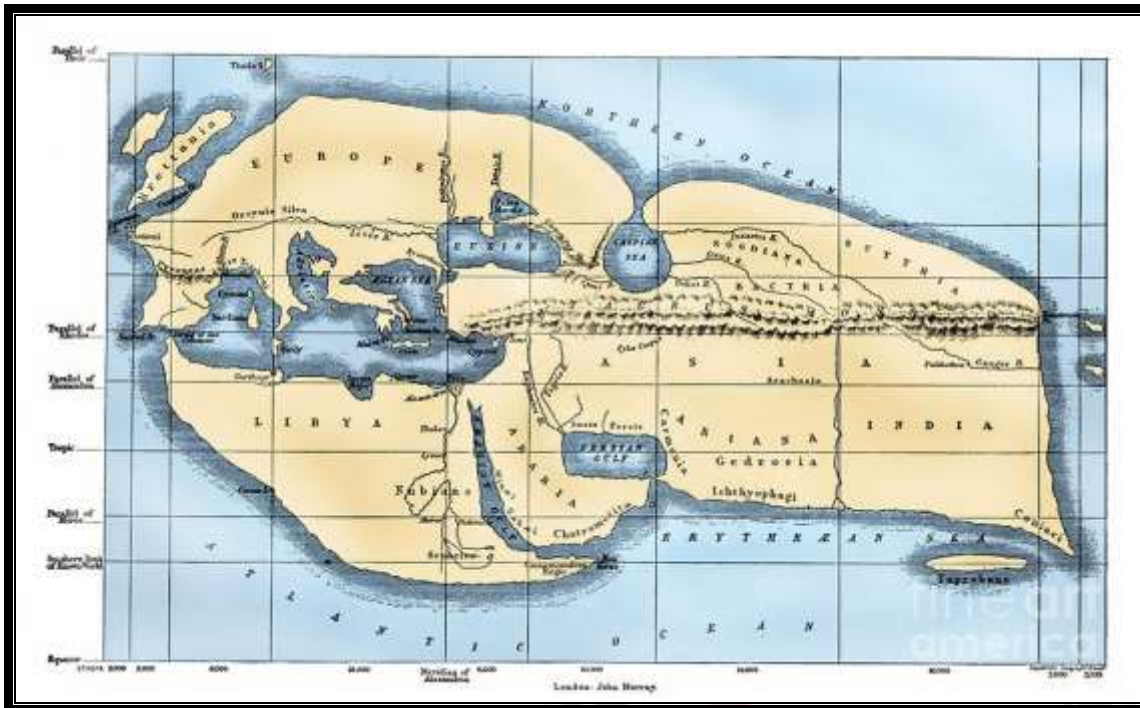


Figure 4
The World Map of Eratosthenes



Hippocrates in his book *On Airs, Waters, Places* explained the man-nature relationship in the context of climatic conditions.

Hipparchus established the concept of locating the exact position of each place on the surface of the earth. On the basis of an Assyrian arithmetic, he divided the circle into 360 degrees. He made an attempt of showing the three-dimensional earth on a flat surface. He is credited with devising two projections to do so; these are the stereographic and the orthographic projections. He even pointed out that these projections have their limitations as they can only represent a hemisphere and not the entire world. Thus supported and flourished the mathematical tradition of geography. Another important contribution of Hipparchus is the invention of *Astrolabe* – an instrument similar to Anaximander's Gnomon but easier to handle. The purpose was to provide accurate measurement of latitude at sea by observing the polestar's angle.

Another important Greek scholar who deserves mentioning is **Posidonius**. He recalculated the earth's circumference and came to a figure much smaller than that of Eratosthenes (approximately 18000 miles).

Strabo, a Greek scholar, and traveller was highly influenced by the historical topographical tradition of former Greek scholars especially Homer, Hecataeus and Aristotle (Adhikari, 2010). He was in acceptance of Aristotle's zones of habitable world – the *Ekumene* (as defined by Eratosthenes). His biggest contribution is his

monumental work '**Geographia**' in 17 volumes; a compilation of writings of his predecessors. Out of these 17 books, eight are in Europe, six on Asia and one of Africa (Egypt and Ethiopia). The first two books were devoted to the historical review of the development of geography from the times of Homer.

4. Roman geographers

The geographical scholarship in the ancient period is incomplete without the advancements made in the Roman Empire. Although Romans did not contribute at such a large scale that it can be compared to the contributions of the Greeks, the writings and the contribution of **Ptolemy** cannot be overlooked. He revived the mathematical tradition of Thales which was long forgotten. For him, geography was a *science of the art of map-making*. This concept was borrowed from the works of earlier Greeks especially Aristotle, Hipparchus, Posidonius and Marinus the Tyre (his teacher). He came up with a monumental work known as "**The Almagest**" – the standard reference for the study of the movement of celestial bodies for a long time. He even accepted Aristotle's view that the earth was spherical in shape, centered in the universe and remained stationary; the celestial bodies revolving around it in a circular motion. Another significant contribution of Ptolemy was in the field of map making. He improved and modified previous maps by adopting a projection for the world map which had a graticule of meridians of longitude and parallels of latitudes (Figure 5).

Figure 5
The World Map of Ptolemy



After the completion of the *Almagest*, he started writing *Guide to Geography*, which consisted of eight volumes. In the first volume, he discusses the map projections. In volumes two to seven, he provides a table of latitudes and longitudes so that every place can be given a precise location in mathematical terms. He accepted the idea that the regions near the Equator were uninhabitable because of higher temperatures.

5. Contributions to various sub-branches of geography

The knowledge about earth has been there through pre-historic times, though in an elementary manner. Greeks were the first to demonstrate the importance and utility of geographical knowledge to the world. They talked of man-environment relationship and stressed that geography as a discipline provides the best understanding of interdependencies between human beings and nature. As already stated they were the ones who developed the concept of geography as the study of earth as the home of man. They laid the foundations of some basic traditions of the discipline – mathematical and literary. Not only this, gave the discipline a scientific inclination, by deliberating on both deductive and inductive reasoning. Greeks developed the framework of descriptive geographical writings which became an essential tool in the coming centuries.

The major contribution of Greeks was in the fields of physical and mathematical geography along with astronomy. Many fundamental concepts have been put forward by them like accurate measurement of the earth's circumference, earth's position in the solar system; the shape of the earth; ekumene, habitable regions of the world and so on. In the field of cartography, they brought the first map of the world on paper with the help of projections. Even the philosophical foundations of human geography have their roots in the Greek and Roman scholarship; worth mentioning are the writings of Strabo. He laid the foundation of chronological paradigm in geography – the regional approach when he concentrates on different parts of the earth in 17 volumes of his book *Geographia*. Similarly, Ptolemy's *Guide to Geography* written in 8 volumes laid the foundation of a comprehensive view of the world.

6. Conclusions:

It would be correctly said that the Greek and Roman scholarship laid the base of scientific geography which left its imprints for centuries to come. The impact is so huge that after the death of Ptolemy it left a vacuum in the history of geographical thinking. As James and Martin (1981) have rightly remarked that after the death of Ptolemy, the geographic horizons that had been widened both physically and intellectually by the Greeks closed in again. It took many centuries before the effort of describing and explaining earth as the home of man got the attention of geographers.

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