ZENITH EDUCATION

Unit 01

Geographic Thought

MPPSC Assistant Professor (Geography) — Master Notes · Madhya Pradesh

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MPPSC Syllabus Coverage and How to Use This Unit

MPPSC syllabus coverage: development of geographical thought in the ancient period; contribution of German and French schools; British and American schools; dualism in geography (physical and human, systematic and regional); determinism and possibilism; paradigm shift; perspectives: positivism, behaviouralism, idealism, humanism and postmodernism.

This unit is built on the reviewed Zenith core (theory, tables, diagrams and maps, fact banks). Topics that the MPPSC syllabus asks for but the core did not cover are added from the MPPSC master notes or written new for this edition. Practise the unit-wise questions in the B-Series MCQ book after each unit.

Nature, Scope and Branches of Geography

Meaning and Definitions

The word **geography** comes from the Greek geo (earth) and graphein (to describe or write). The term geographika was first used as the title of a systematic work by **Eratosthenes** (c. 276–194 BCE). Geography is both a **science of the earth's surface as the home of humankind** and a **synthesising discipline**: it studies the spatial distribution of natural and human phenomena, the causes of the differences between places, and the interaction of people and environment. The three questions that define its viewpoint are: **what is where, why is it there, and why does it matter (so what)?**

Scholar	Definition / view of geography	Emphasis
Eratosthenes (3rd c. BCE)	Description of the Earth (geographika)	Mathematical and descriptive

Scholar	Definition / view of geography	Emphasis
Strabo (c. 64 BCE–24 CE)	Description of the inhabited world (oikoumene) useful to the statesman	Descriptive, regional
Ptolemy (2nd c. CE)	Geography is the representation in map form of the whole known world; chorography is the description of regions	Cartographic
Carl Ritter (1779–1859)	Study of the Earth as the home (educative abode) of humankind	Man–earth relation, regional
Alexander von Humboldt (1769–1859)	Physical description of the cosmos; unity in diversity of nature	Systematic, empirical
F. von Richthofen (1883)	Science of the Earth's surface and of the things and phenomena causally related to it; a chorological science	Chorology
Alfred Hettner (1927)	Chorological science of the Earth's surface according to differences of areas and places; geography is to space what history is to time	Chorology
W. M. Davis (1906)	Study of the relation between an inorganic control and an organic response	Environment–response
H. J. Mackinder (1887)	A bridging subject linking natural science and the humanities	Synthesis
Vidal de la Blache (1913)	The science of places, not of men	Place, region
H. H. Barrows (1923)	Geography as human ecology: the study of mutual relations between humans and natural environment	Human ecology
Richard Hartshorne (1939)	Concerned to provide accurate, orderly and rational description and interpretation of the variable character of the Earth's surface; science of areal differentiation	Areal differentiation
E. Ullman (1950s)	Geography as the study of spatial interaction (complementarity, transferability, intervening opportunity)	Spatial interaction
P. Haggett (1965 onwards)	Study of spatial organisation: movement, networks, nodes, hierarchies, surfaces, diffusion	Spatial analysis

Key definitions of geography (author, view, emphasis)

Nature of Geography

- **Dual character:** physical and human aspects are studied together; geography belongs partly to the natural sciences and partly to the social sciences. This duality is its strength (integration) and its recurrent weakness (fragmentation).
- **Spatial and chorological:** its distinctive viewpoint is spatial (location, distribution, association, interaction, region). Kant had distinguished geography (arrangement in space, chorological) from history (arrangement in time, chronological).
- **Synthetic and integrative:** it studies the assemblage of heterogeneous phenomena (relief, climate, soil, population, economy) that occur together in an area.
- **Idiographic and nomothetic:** it describes unique places and also searches for general laws (see the Hartshorne–Schaefer debate).
- **Dynamic:** places and patterns change through time, so geography has a historical dimension (sequent occupance, Whittlesey 1929).
- **Applied:** resource evaluation, planning, hazard management, geospatial technologies.

Pattison's Four Traditions (1964)

W. D. Pattison, in The Four Traditions of Geography (1964), argued that geography has been held together by four overlapping traditions rather than by one definition.

Tradition	Core question	Typical scholars/ideas
Spatial tradition	Where? How are distributions and movements arranged? Geometry of space	Ptolemy, Haggett, Ullman, Bunge
Area studies (chorological) tradition	What makes an area distinctive? Regional description and synthesis	Strabo, Hettner, Hartshorne, Vidal
Man–land tradition	How do people and environment interact?	Ritter, Ratzel, Semple, Sauer, Barrows
Earth science tradition	How do the physical systems of the Earth operate?	Humboldt, Davis, Penck, Chorley

Pattison's four traditions

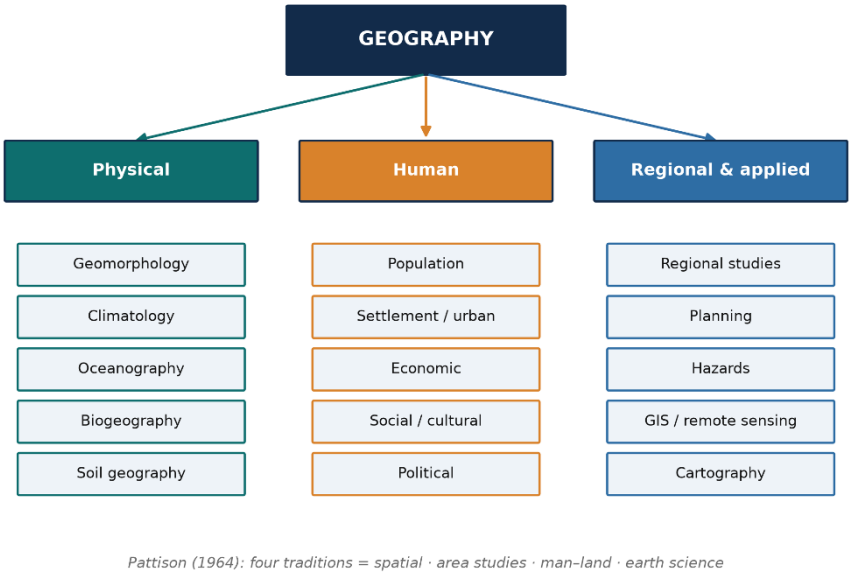


Figure 1.1: Branches of geography and Pattison's four traditions (source: original diagram).

Scope and Branches

The scope of geography extends from the lithosphere, atmosphere, hydrosphere and biosphere to population, settlement and economy. Branches are conventionally grouped as follows.

Group	Branches	Concern
Physical geography	Geomorphology, climatology, oceanography, hydrology, biogeography, soil geography, environmental geography	Earth's natural systems and processes
Human geography	Population, settlement (rural and urban), economic (agriculture, industry, transport, trade), social, cultural, political, historical, behavioural, medical/health, gender geography	Human activities and their spatial organisation
Regional geography	Regional (area) studies, regional planning, regionalisation	Integrated study of areas
Methodological/technical	Cartography, quantitative methods, remote sensing, GIS, GNSS, field survey	Tools of geographic inquiry
Applied geography	Resource and land-use planning, hazard and disaster management, urban and regional planning, geoinformatics, biogeography and conservation	Problem-solving

Branches and scope of geography

Geography and Other Disciplines

Discipline	Relationship
Geology and astronomy	Earth materials and structure; Earth's shape, rotation and revolution; Ptolemy, Eratosthenes and Aryabhata worked at this interface
Biology/ecology	Biogeography, ecosystems; Humboldt, Wallace and Haeckel (ecology) influenced the man–environment tradition
History	**Kant**: geography is the foundation of history ('the stage'); Hettner: geography is to space what history is to time; historical geography and sequent occupance
Economics	Location theories (von Thünen, Weber, Christaller, Lösch), regional science (Isard)
Sociology/anthropology	Cultural and social geography; Le Play, human ecology (Park, Burgess), cultural ecology (Steward)
Political science	Geopolitics, boundaries, electoral geography
Statistics and computer science	Spatial statistics, GIS, remote sensing, geo-AI

Geography and neighbouring disciplines

Exam Tip: Do not confuse Hartshorne's **areal differentiation** (chorology; description of unique areas) with Ullman's or Haggett's **spatial interaction/spatial organisation** (spatial analysis). The first is the 1939 orthodoxy; the second belongs to the quantitative revolution of the 1950s–60s.

The Geographical Method and Haggett's Three Traditions

Geography combines **inductive** inquiry (observation in the field, mapping, description, generalisation from cases) with **deductive** inquiry (theory, hypothesis, testing against data). The classical sequence is: identification of a spatial problem, formulation of a hypothesis, data collection (field survey, census, maps, remote sensing), analysis (cartographic, statistical, modelling), interpretation and communication. Its tools range from the field notebook and topographical sheet to GIS and satellite imagery.

Peter Haggett (1965, 1972) summarised the geographical approach in three complementary traditions, which remain a convenient revision frame:

Tradition	Focus	Typical question	Representative tools
Spatial analysis	Geometry of distributions and movements	Why are settlements spaced as they are? How does interaction decay with distance?	Maps, point-pattern and network analysis, gravity models
Ecological analysis	Man–environment relationships	How do people use and modify an environment, and how does it constrain them?	Systems models, ecosystem and land-use studies, hazards research
Regional complex analysis	Synthesis of the above in areas	How do places differ and why are they as they are?	Regional monographs, regionalisation, composite indices

Haggett's three traditions

Geography as a Discipline of Synthesis

Geography occupies an unusual position between the natural sciences, the social sciences and the humanities. Mackinder (1887) argued that this made it a **bridge**; Hettner and Hartshorne emphasised its **integrating** role in areal studies; Davis emphasised the relation of inorganic control to organic response; the systems tradition made the integration operational. The same position produces tensions: physical geography increasingly shares methods with Earth-system science, while human geography shares theory with sociology, economics and cultural studies. Debates over the **unity of geography** (Chapter 6) are therefore not about a single issue but about how far one discipline can contain such different epistemologies.

Why places differ: the logic of geographical explanation

- **Location and site:** where something is and what its local conditions are (relief, drainage, soil).
- **Situation:** how the place is related to other places (accessibility, connectivity, centrality).

- **Association:** the co-occurrence of phenomena (for example rainfall, soil and crop type) used to infer relationships.
- **Interaction:** flows of people, goods, money, information and diseases between places.
- **Change:** processes through time; geographers study patterns as outcomes of processes, and processes as responses to patterns.

Geography as Science, Art and Social Practice

The 'science or art?' question appears in every generation. Positivists (Schaefer, Bunge, Harvey in 1969) emphasise explanation through laws; idiographic and humanistic scholars (Hartshorne, Tuan) emphasise the uniqueness of places and the interpretation of meaning; radical and feminist scholars emphasise that knowledge is produced from social positions and is never value-free. The standard resolution is that **geography is a plural discipline**: scientific in the study of physical systems and spatial patterns, interpretive in the study of place and culture, and critical in the study of power and inequality.

Geography in the Indian Setting

In India geography is taught at school level as a core subject and at university level as a science or arts subject; the UGC-NET and State PSC examinations test geographical thought as the opening unit because it supplies the vocabulary (regions, models, paradigms) used in every other unit. Indian scholarship on thought and philosophy includes Dikshit's Geographical Thought: A Contextual History of Ideas, Majid Husain's Evolution of Geographical Thought and Hartshorne's and Johnston's classic texts as standard references.

Worked Example: Reading a Definition

A common question asks the examinee to identify the tradition implied by a statement. For example, 'Geography is concerned to provide accurate, orderly and rational description and interpretation of the variable character of the Earth's surface' is **Hartshorne**: it stresses **description and interpretation (idiographic)** of **variable character (areal differentiation)**. 'Geography is the study of spatial distribution and the laws governing it' is the spatial-analysis reading (Schaefer, Bunge, Haggett). 'Geography is the study of the relation between inorganic control and organic response' is **Davis**, an ecological reading. The skill is to link each statement to its tradition, author and decade.

Classifications of Geographical Knowledge

Author	Classification	Basis
Varenius (1650)	General (absolute, relative, comparative) and Special (celestial, terrestrial, human) geography	**Scope**: whole Earth vs particular regions
Kant (1802)	Mathematical, moral, political, mercantile, theological geography; physical geography as foundation	Purpose and content
Humboldt (1845)	Physical description of the cosmos organised by phenomena	Phenomena and their unity
Ritter (1817)	Regional treatment by continents and countries	Areas
Hettner (1927)	General (systematic), regional (Länderkunde) and chorology	Systematic and regional
Hartshorne (1939)	Systematic and regional branches integrated in areal differentiation	Method
Pattison (1964)	**Four traditions**: spatial, area studies, man–land, earth science	Traditions
Haggett (1965)	Spatial, ecological and regional-complex analysis	Analysis type

Classifications of geographical knowledge

Fundamental Concepts in Brief

- **Location and distribution:** where, in what pattern (dispersed, clustered, linear, random).
- **Association and interaction:** how phenomena co-vary and exchange flows.
- **Region:** a classification of areas by homogeneity or nodality.
- **Scale:** local to global; patterns that appear at one scale may disappear at another.

- **Process and change:** time, evolution, equilibrium and thresholds.
- **Human–environment relation:** adaptation, modification, impact.

Ancient and Medieval Geographical Thought

Greek Contributions

Greek geography passed from myth to measurement. It had a **descriptive-regional** strand (Hecataeus, Herodotus, Strabo) and a **mathematical-astronomical** strand (Pythagoreans, Eratosthenes, Hipparchus, Ptolemy).

Scholar	Date	Contribution
Homer	**c.** 8th c. BCE	Earth as a flat disc encircled by the river Oceanus (Iliad, Odyssey)
Thales; Anaximander	6th c. BCE	**Thales of Miletus**: early Ionian rational cosmology. Anaximander: credited with the first map of the known world and with the gnomon
Hecataeus of Miletus	**c.** 550–476 BCE	Periodos Ges (Circuit of the Earth); improved the world map; first prose description of lands
Herodotus	**c.** 484–425 BCE	Histories; described Egypt, Scythia, Libya, Persia; 'Egypt is the gift of the Nile' (deltaic deposition); regional and ethnographic description
Pythagoreans/Parmenides	6th–5th c. BCE	Earth spherical; division of the Earth into climatic zones attributed to Parmenides
Aristotle	384–322 BCE	Proved sphericity (curved shadow in lunar eclipses, change of visible stars with latitude, ships disappearing hull-first); Meteorologica: torrid, temperate and frigid zones
Dicaearchus	**c.** 350–285 BCE	Drew a map with a main parallel through Rhodes and the Pillars of Heracles; measured mountain heights
Eratosthenes	**c.** 276–194 BCE	Coined 'geographika'; measured the Earth's circumference; world map with parallels and meridians; chief librarian at Alexandria
Hipparchus	**c.** 190–120 BCE	Divided the circle into 360°; proposed a latitude–longitude grid; astronomical determination of position; early map projections (stereographic/orthographic)
Posidonius	**c.** 135–51 BCE	Estimated a smaller circumference (about 180,000 stadia), later adopted by Ptolemy; linked tides to the Moon
Crates of Mallus	2nd c. BCE	Constructed an early terrestrial globe at Pergamon

Greek geographers and contributions

Eratosthenes' measurement of the Earth

At Syene (Aswan) the Sun was overhead at noon on the summer solstice (a vertical rod cast no shadow), while at Alexandria, assumed to lie on the same meridian, a rod cast a shadow giving an angle of about **7.2° (1/50 of a circle)**. With the distance Syene–Alexandria taken as **5,000 stadia**, the circumference = 5,000 × 50 = **250,000 stadia** (adjusted to 252,000 stadia). Depending on the length of the stadion used, this equals roughly 39,000–46,000 km; commonly quoted as about 40,000 km, remarkably near the modern 40,008 km (meridional) and 40,075 km (equatorial).

Remember: Formula: **C = (360° / θ) × d**, where θ is the angular difference of the Sun's zenith distance (7.2°) and d the arc distance (5,000 stadia). Assumptions: spherical Earth, Sun's rays parallel, the two places on one meridian.

Roman Contributions

Scholar	Date	Work and significance
Strabo (Greek, under Roman rule)	**c.** 64 BCE–c. 24 CE	Geographica in 17 books: encyclopaedic, regional description of the known world; first two books on principles; geography useful to rulers; emphasised Homer as a geographer
Pomponius Mela	**c.** 43 CE	**De Chorographia**: earliest surviving Latin geography; short regional description
Pliny the Elder	23–79 CE	Naturalis Historia (37 books), including geography; died at the eruption of Vesuvius (79 CE)
Marinus of Tyre	**c.** 70–130 CE	Applied latitude and longitude systematically; equirectangular map; source for Ptolemy
Claudius Ptolemy	**c.** 100–170 CE	Geographike Hyphegesis (Geography, 8 books) with coordinates of about 8,000 places; two conic-type projections; Almagest (astronomy)
Roman road maps	Peutinger Table (copy of a late Roman road map)	Practical itinerary cartography of the Roman road system

Roman-era geography

Ptolemy distinguished **geography** (representation of the whole known world, quantitative and mathematical), **chorography** (description of regions, qualitative) and **topography** (local places). His errors: he adopted Posidonius' small circumference (so Eurasia appeared too wide, encouraging Columbus), showed the Indian Ocean as a closed sea, and exaggerated Taprobane (Sri Lanka). His Geography reached Latin Europe c. 1406 (translation by Jacopo d'Angelo) and shaped Renaissance cartography.

Ancient Indian Geographical Thought

Source/Thinker	Geographical content
Rigveda	Sapta Sindhu (land of seven rivers); Nadistuti Sukta (RV 10.75) lists Ganga, Yamuna, Saraswati, Shutudri, Parushni, Vitasta and others; Himavat; seasons and rain
Atharvaveda	Bhumi (Prithvi) Sukta (12.1): hymn to Mother Earth, the earliest expression of an ethic of the earth as mother
Epics	**Ramayana (Kishkindha Kanda)**: directions and regions searched for Sita; Mahabharata: Bhishma Parva (Bhumi Parva) describes Jambudvipa and the world; tirthayatra descriptions (Vana Parva)
Puranas	**Bhuvankosha**: seven concentric dvipas (Jambu, Plaksha, Shalmali, Kusha, Krauncha, Shaka, Pushkara) separated by seven oceans, Meru at centre; Bharatavarsha defined in Vishnu Purana as the land north of the ocean and south of the snowy mountains; seven kula parvatas (Mahendra, Malaya, Sahya, Suktimat, Riksha, Vindhya, Pariyatra); regional divisions of India (e.g., Markandeya Purana)
Jain and Buddhist texts	Jain cosmography of Jambudvipa; Anguttara Nikaya's list of sixteen Mahajanapadas; Jataka trade-route geography
Kautilya's Arthashastra	Rainfall measurement in storehouses (varsha-mana); four types of forts (audaka, parvata, dhanvana, vana); Chakravartikshetra from the Himalaya to the southern sea; trade routes (Dakshinapatha vs Uttarapatha); classification of land and forests
Aryabhata (b. 476 CE)	**Aryabhatiya (499 CE)**: the Earth is spherical and rotates on its axis, causing the apparent westward motion of stars; Lanka–Ujjayini meridian

Source/Thinker	Geographical content
Varahamihira (505–587 CE)	**Brihat Samhita**: Kurma-vibhaga (regional division of India), rainfall prediction, causes of earthquakes, water divining (dakargala), Panchasiddhantika
Brahmagupta (598–c. 668 CE); Bhaskara II (1114–c. 1185)	Brahmasphutasiddhanta (628 CE) states that the Earth attracts objects; Bhaskara's Siddhanta Shiromani (1150), including Goladhyaya
Kalidasa (c. 4th–5th c. CE)	Meghaduta (route of a monsoon cloud from Ramagiri to Alaka); Raghuvamsha Canto 4 (Digvijaya of Raghu) contain regional geography
Kalhana	**Rajatarangini (1148–49 CE)**: historical chronicle with physical geography of Kashmir

Ancient Indian geographical sources and thinkers

Foreign accounts of India: Megasthenes (Indika, c. 300 BCE, ambassador at the court of Chandragupta Maurya); the anonymous Periplus of the Erythraean Sea (1st c. CE; Indian Ocean monsoon trade; Hippalus is credited with exploiting the monsoon route); Chinese pilgrims Fa-Hien (Faxian, in India c. 399–414 CE), Hiuen Tsang (Xuanzang, 629–645 CE; Si-Yu-Ki) and I-Tsing (Yijing, 671–695 CE). Al-Biruni's Kitab al-Hind (c. 1030 CE) is treated with the Arabs below. Abul Fazl's Ain-i-Akbari (1590s) is a statistical and geographical gazetteer of the Mughal subahs.

Common Trap: The Rigveda's hymn 10.129 is the **Nasadiya Sukta** (creation hymn), not a river hymn; rivers (including the Ganga) appear in the **Nadistuti Sukta (10.75)**. Surya Siddhanta and Aryabhatiya are astronomical works; Brihat Samhita is the one with regional geography.

Chinese Geography

- **Yu Gong** (Tribute of Yu, in the Book of Documents): division of China into nine provinces on the basis of soils, tribute and rivers.
- **Pei Xiu** (224–271 CE): often called the father of Chinese scientific cartography; six principles of map-making (graduated divisions/scale, rectangular grid, pacing distances, high and low, right angles and acute angles, curves and straight lines).
- **Zhang Qian** (2nd c. BCE) opened the routes later called the Silk Road (term coined by Richthofen, 1877). **Zheng He** (1371–1433) led seven treasure-fleet voyages (1405–1433) across the Indian Ocean to East Africa and Arabia.

Arab Geographical Thought

Arab scholars preserved and extended Greek, Indian and Persian learning (House of Wisdom, Baghdad, 9th c.) and added observation, travel and regional description. Their world maps were commonly drawn with **south at the top**. The **iqlim** (climes) classification, derived from Greek klima, divided the habitable world into seven latitudinal zones.

Scholar	Date	Work and contribution
Caliph al-Ma'mun's astronomers	**c.** 830 CE	Measured a degree of the meridian in the Mesopotamian desert; commissioned a world map
Al-Khwarizmi	**c.** 780–850	Surat al-Ard (Image of the Earth): coordinates of about 2,400 places revising Ptolemy
Ibn Khordadbeh	**c.** 820–912	Kitab al-Masalik wa'l-Mamalik (Book of Roads and Kingdoms)
Al-Masudi	**c.** 896–956	Muruj al-Dhahab (Meadows of Gold, 947); called the 'Herodotus of the Arabs'; travelled to India and East Africa; physical and cultural influences
Al-Istakhri; Ibn Hawqal	10th c.	Balkhi school of atlas-maps; Surat al-Ard of Ibn Hawqal
Al-Muqaddasi	**c.** 945–1000	**Ahsan al-Taqasim**: regional geography based on field observation

Scholar	Date	Work and contribution
Al-Biruni	973–1048	Kitab al-Hind (c. 1030) on India; Qanun al-Masudi; measured the Earth's radius using a hill-top horizon method (about 6,340 km); suggested that the Indus–Ganga plain was once a sea basin filled with alluvium
Al-Idrisi	**c.** 1100–1165	Nuzhat al-Mushtaq (Tabula Rogeriana, 1154) made for Roger II of Sicily; world map with silver planisphere
Yaqut al-Hamawi	1179–1229	Mu'jam al-Buldan, a geographical dictionary
Ibn Battuta	1304–1368/69	Rihla (travels 1325–1354, about 117,000 km); in India 1333–1347 under Muhammad bin Tughlaq; dictated to Ibn Juzayy
Ibn Khaldun	1332–1406	**Muqaddimah (1377)**: influence of climate on society, seven climes, theory of asabiyyah (group solidarity), urban and nomadic life
Piri Reis	**c.** 1470–1553	Kitab-i Bahriye (1521), 1513 world map

Arab and Muslim geographers

Medieval European Geography and the Age of Exploration

- **Church cartography:** T-O maps (Isidore of Seville, c. 7th c.) with Jerusalem at centre and east at the top (Asia in the upper half, Europe and Africa below, the T formed by the Don, Nile and Mediterranean); Hereford Mappa Mundi and Ebstorf map (c. 1300). Medieval geography was subordinated to theology.
- **Practical charts:** portolan charts (from the 13th century; Carta Pisana is the oldest surviving) with rhumb-line networks; Catalan Atlas (1375).
- **Scholars:** Bede, Albertus Magnus, Roger Bacon; Pierre d'Ailly's Imago Mundi (c. 1410) influenced Columbus.
- **Travellers:** Marco Polo (1254–1324; travelled 1271–1295; Il Milione, dictated to Rustichello in 1298–99); Norse voyages to Greenland (c. 982) and Vinland (c. 1000).

Event/person	Year	Significance
Prince Henry the Navigator (1394–1460)	15th c.	Patron of Portuguese voyages along West Africa
Bartolomeu Dias	1488	Rounded the Cape of Good Hope
Christopher Columbus	1492	First voyage to the Caribbean (Bahamas); Martin Behaim's globe also 1492
Treaty of Tordesillas	1494	Spanish–Portuguese division of newly found lands
Vasco da Gama	1498	Sea route to India; reached Calicut (20 May 1498)
Balboa; Magellan–Elcano	1513; 1519–22	Sighting of the Pacific; first circumnavigation (Magellan died in 1521; Elcano completed it)
Waldseemüller map	1507	First map to use the name 'America'
Mercator; Ortelius	1569; 1570	Mercator's cylindrical projection; Ortelius' Theatrum Orbis Terrarum, the first modern atlas
James Cook	1768–79	Three Pacific voyages; scientific hydrography

Age of Discovery milestones

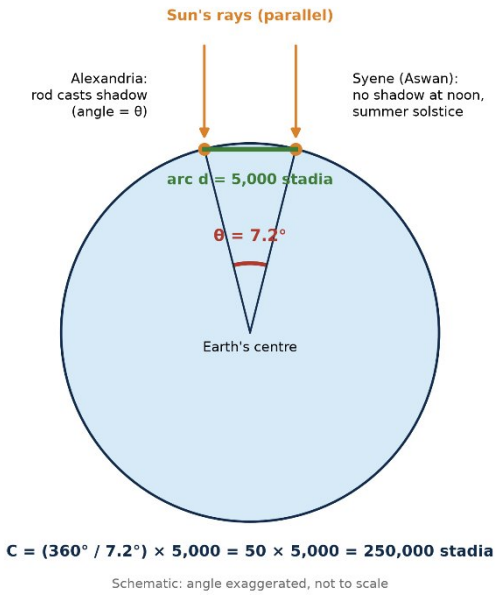


Figure 1.2: Eratosthenes' method of measuring the Earth's circumference (schematic, not to scale).

Worked Examples

Example 1: Eratosthenes' arithmetic

Angle between the Sun's rays at Alexandria and the vertical = 7.2°. Fraction of the circle = 7.2/360 = 1/50. Arc distance (Syene to Alexandria) = 5,000 stadia. Circumference = 5,000 × 50 = **250,000 stadia**. If one stadion is taken as 157.5 m (the 'Egyptian' stadion often used in modern comparison), 250,000 × 157.5 m = 39,375 km, within about 2% of the real value. The result was less certain than it looks because Syene lies about 3° east of Alexandria's meridian and 0.5° north of the Tropic, and the stadion is not exactly known; however, the method (angle and arc) is correct.

Example 2: Al-Biruni's radius method

Al-Biruni measured the height h of a hill near Nandana (Punjab) and the angle of dip θ of the horizon from its summit; the Earth's radius follows from $R = h \cos\theta / (1 - \cos\theta)$. The method needs only one observer, a hill and an astrolabe, and his value of about **6,340 km** differs from the modern mean radius (6,371 km) by roughly half a per cent.

Greek and Roman Concepts that Became Standard Vocabulary

Term	Origin	Meaning
Oikoumene	Greek	The inhabited world; later the ecumene as the permanently settled portion of the globe
Klima/klimata (iqlim)	Greek (Hipparchus' latitude zones); Arabic iqlim	Latitudinal belts defined by length of daylight; seven climes of the Arabs
Chorography	Ptolemy; Pomponius Mela	Qualitative description of regions; basis of chorology (Richthofen, Hettner)
Gnomon	Anaximander, Eratosthenes	Vertical rod used to determine latitude and the solstice
Zones (torrid, temperate, frigid)	Parmenides/Aristotle	Latitudinal belts based on the Sun's rays; five zones of Eratosthenes
Periplus	Greek	Coastal sailing directions (for example the Periplus of the Erythraean Sea)

Vocabulary from classical geography

Environmental Ideas in Classical Antiquity

Greek writers already linked environment and character. **Hippocrates** (Airs, Waters, Places, c. 400 BCE) related the health and temperament of peoples to climate and water; **Aristotle** held that the temperate zone favoured both courage and intelligence, a view repeated by **Strabo**, **Vitruvius** and **Ibn Khaldun** and revived in 19th-century determinism. These are the earliest antecedents of environmental determinism in the discipline's history.