

PG TRB GEOGRAPHY

UNIT I – PHYSICAL GEOGRAPHY

A. GEOMORPHOLOGY

Key Contributors and Theories

- **John Playfair (1802)** – Published “*Theory of the Earth*”; explained **uniformitarianism** and the **work of rivers in shaping valleys**. His interpretations strengthened Hutton’s view that present-day processes explain past landforms.
- **Charles Lyell (1830–1863)** – Authored “*Principles of Geology*” and “*The Geological Evidences of the Antiquity of Man*” (1863). He emphasized **slow, gradual changes** rather than catastrophic ones — laying the foundation for **modern geology**.
- **W.M. Davis (1889–1899)** – Proposed the **Geomorphic Cycle Theory** through “*The Rivers and Valleys of Pennsylvania*” (1889) and “*The Geographical Cycle*” (1899).
 - Landforms evolve through **Youth → Maturity → Old Age → Rejuvenation**.
 - Davis emphasized **time, structure, and process** as the controlling factors.
- **Walter Penck (1924)** – In “*Die Morphologische Analyse*”, he rejected Davis’s cyclic model.
 - Suggested landforms develop through a **simultaneous interaction** between **diastrophic (endogenetic – uplift)** and **denudational (exogenetic – erosion)** forces.
 - Introduced concepts like “*waxing and waning uplift*.”
- **L.C. King (1953)** – Asserted **uniform development of landforms** across varied environments; **climate plays a minor role** in fluvial landform evolution.
 - Major landscapes result from **global rhythmic tectonic events**.
 - Proposed **parallel retreat of slopes**, producing **pediplains**.
- **Alfred Wegener (1912)** – Advanced the **Continental Drift Theory** in “*Die Entstehung der Kontinente und Ozeane*”.

- Suggested all continents once formed **Pangaea**, later drifting apart.
 - **J. Tuzo Wilson (1965)** – First used the term “**plate**” in describing **Plate Tectonics**, integrating continental drift and seafloor-spreading concepts.
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B. CLIMATOLOGY

Thermal Anomalies (Isanomalous Temperature)

- The **difference between observed temperature** of a place and the **mean temperature of its latitude** is termed a **thermal anomaly**.
 - **Positive Anomaly** – Observed temperature > mean latitude temperature.
 - **Negative Anomaly** – Observed temperature < mean latitude temperature.
- Lines joining equal anomalies are **Isonamals** (Isanomalous Isotherms).

Wind Direction and Speed

- **Wind Vane** – Determines wind direction.
- **Wind Roses** – Show prevailing wind directions and speeds on maps.
- **Beaufort Scale (1805)** – Devised by **Sir Francis Beaufort**, classifying wind force into 12 grades (later related to wind velocity).
- **Anemometer** – Measures wind speed; **propeller-type** models also record direction.
- **Meteorograph / Triple Register Instrument** – Records wind speed, direction, sunshine, and precipitation simultaneously.

Humidity Measures

- **Absolute Humidity** – Mass of water vapour per unit volume of air (g/m^3).
Remains constant unless evaporation/condensation occurs.
 - **Specific Humidity** – Mass of water vapour per kg of moist air; represents **actual moisture content**.
 - **Relative Humidity (%)** = (Actual vapour content ÷ Maximum vapour capacity) × 100; expresses **degree of saturation**.
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C. OCEANOGRAPHY

1. Ocean Deposits

(a) Terrigenous Muds

- **Blue Mud** – Derived from **iron sulphide rocks**; bluish-black; $\approx 35\%$ CaCO_3 ; common in Atlantic, Mediterranean, Arctic seas.
- **Red Mud** – Rich in **iron oxide (FeO)**; $\approx 32\%$ CaCO_3 ; found along Brazilian coast and Yellow Sea.
- **Green Mud** – Altered blue mud containing **glauconite and potassium silicates**; found off North America, Japan, Australia, Africa (100–900 fathoms).

(b) Calcareous Oozes

- Found between **1000–2000 fathoms**; high in CaCO_3 .
 - **Pteropod Ooze** – Formed from shells of floating pteropods; $\approx 80\%$ CaCO_3 ; tropical oceans (300–1000 fathoms).
 - **Globigerina Ooze** – From foraminifera (shells of globigerina); $\approx 64\%$ CaCO_3 ; found in Atlantic and Indian Oceans (2000–4000 fathoms).

(c) Siliceous Oozes

- Dominated by **silica-bearing organisms**; found at greater depths.
 - **Radiolarian Ooze** – Formed from radiolaria and sponges; 5–20% CaCO_3 ; common in tropical Pacific (2000–5000 fathoms).
 - **Diatom Ooze** – Microscopic plants with siliceous shells; 3–30% CaCO_3 ; found near Antarctica and N. Pacific (600–2000 fathoms).

(d) Red Clay

- Covers the **largest deep-sea area**; composed of **silicates of alumina ($\approx 85\%$)**, iron oxides, and volcanic residues.
 - Contains **radioactive minerals**; soft, plastic, and greasy in texture.
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2. Tides

- One lunar day = **24 h 52 m**; successive high tides occur about **12 h 26 m** apart.

Major Theories of Tide Origin

1. **Equilibrium Theory – Isaac Newton (1687)**
2. **Dynamical Theory – Laplace (1755)**
3. **Progressive Wave Theory – W. Whewell (1833)**

4. Canal Theory – G. B. Airy (1842)
5. Stationary Wave Theory – R. A. Harris

3. Coral Reefs and Theories of Formation

Theory	Proponent / Year	Core Idea
Subsidence Theory	Charles Darwin (1837–1842)	Reefs form as volcanic islands subside; fringing → barrier → atoll sequence.
Stand-Still Theory	John Murray (1880)	Reefs form on submarine banks without subsidence.
Glacial Control Theory	R.A. Daly (1915)	Coral growth controlled by sea-level rise after Pleistocene glaciation.
Davis's Concept	W.M. Davis (1914–1918)	Supported Darwin's subsidence model; added geomorphic cycles of reef development.

UNIT III – GEOGRAPHICAL THOUGHTS

1. Greek Geographers (700 BC – 200 BC)

Known as the “Golden Age of Geography” — foundation of mathematical and philosophical geography.

Geographer	Period / Work	Major Contributions / Concepts
Homer	1280 - 1180 BC	First to describe known world (Book <i>NEWS</i>); mythical geography.
Thales of Miletus	624 – 546 BC	Predicted solar eclipse (28 May 585 BC); “Everything is full of life – Water.” Father of Natural Philosophy.
Anaximander	610 – 546 BC	Student of Thales; concept of <i>Unity of Opposites</i> ; first to draw a world map.
Hecataeus	550 – 476 BC	Book <i>Ges Periodos</i> (Description of the Earth); Father of Geography.
Herodotus	484 – 425 BC	<i>Father of History</i> ; described “Egypt as the gift of the Nile.”
Plato	428 – 348 BC	Philosophical ideas on ideal states and nature.

Aristotle	384 – 322 BC	Book <i>Meteorologica</i> ; discussed Earth's spherical shape, zones of habitation.
Eratosthenes	276 – 194 BC	Coined term <i>Geography</i> ; first to calculate Earth's circumference (~40,000 km); developed latitude–longitude grid; “Study of Earth as home of man.”
Hipparchus	190 – 120 BC	Divided circle into 360°; invented <i>Astrolabe</i> ; advanced astronomical geography.
Posidonius	135 – 51 BC	Book <i>Ocean</i> ; studied tides and ocean currents.

2. Roman Geographers (100 BC – 400 AD)

Focused on descriptive and regional geography.

Geographer	Major Works / Concepts	Contributions
Strabo	<i>Geographica</i> (17 vol.)	Father of Regional Geography ; introduced <i>Chorology</i> (study of regions).
Pliny the Elder	<i>Historia Naturalis</i>	Encyclopedic natural geography.
Ptolemy	<i>Almagest</i> & <i>Guide to Geography</i>	Mathematical–astronomical geography; refined coordinate system.
Solinas	<i>Collectanea rerum memorabilium</i>	Collection of remarkable facts.
(Dark Age)	—	Decline in scientific geography after Ptolemy's death.

3. Arab Geographers (8th – 15th Century)

Preserved and advanced Greek knowledge; pioneers in climatic, cartographic, and regional studies.

Geographer	Major Works / Concepts	Contributions
Al-Balkhi	<i>Kitab al Ashkal</i>	World's first Climatic Atlas .
Ibn Hauqal	<i>Book of Routes & Realms</i>	Early regional geography and trade routes.

Al-Masudi	<i>Golden Meadows (Muruj al Dahab), Kitab al Awsat, etc.</i>	Discussed monsoons; divided world into 14 regions; combined history and geography.
Al-Biruni	<i>Kitab al Hind, Qanun al Masudi</i>	Comparative study of India; astronomical and cultural geography.
Al-Idrisi	<i>Amusement for Him Who Desires to Travel Around the World</i>	Drew detailed world map for King Roger II of Sicily; Arabic translation of Ptolemy.
Ibn Battuta	<i>Rihlah</i>	Extensive world traveler; appointed Qazi of Delhi by Muhammad bin Tughlaq.
Ibn Khaldun	<i>Muqaddimah</i>	Founded social geography; cyclical theory of civilizations.

4. German Geographers (16th – 20th Century)

Heart of scientific geography — Systematic and Regional Geography developed.

Chronological Table

Period	Geographer	Major Work / Concept	Contribution
Pre-Classical	Peter Apian	Heart-shaped map	Cartography pioneer.
	Sebastian Münster	<i>Cosmographia Universalis</i> (1544)	First modern geography text.
	Philipp Clüverius	—	Universal geography idea.
	Gerardus Mercator	Mercator Projection	Modern mapping system.
	Bernhard Varenius	<i>Geographia Generalis</i> (1650)	Divided geography into <i>General/Systematic & Regional/Chorology</i> ; foundation of modern structure.

Classical Period	Immanuel Kant	<i>Critique of Pure Reason, Anthropology, Gaseous Hypothesis (1796)</i>	Father of <i>Exceptionalism</i> ; philosophical geography.
	Alexander von Humboldt	<i>Kosmos, Asia Centralis</i>	Father of <i>Modern Geography</i> ; <i>Systematic</i> geography; introduced isotherms , <i>Humboldt current</i> , <i>climatology</i> ; inductive method.
	Carl Ritter	<i>Erdkunde</i>	Father of <i>Regional Geography</i> ; anthropocentric and teleological approach; “Unity in Diversity.”
Post-Classical	Oscar Peschel	<i>Das Ausland</i>	First geography professor in Germany.
	Ferdinand von Richthofen	<i>China – Result of Fieldwork</i>	Father of <i>Comparative Geography</i> ; <i>Ria–Fjord</i> concept; coined “Silk Road.”
	Friedrich Ratzel	<i>Anthropogeographie, Politische Geographie</i>	Father of <i>Political & Human Geography</i> ; <i>Lebensraum</i> , <i>Environmental Determinism</i> , <i>Social Darwinism</i> .
	Alfred Hettner	<i>Geography of Europe (1907)</i>	Advocated <i>Idiographic</i> view – geography as a unique science of place.
	Albrecht Penk	<i>The Alps in the Ice Age</i>	Introduced geomorphology in Germany.
	Walther Penk	<i>Morphological System</i>	Alternative to Davis’s cycle; dynamic landform evolution.
	Karl Haushofer	—	Founder of <i>Geopolitik</i> .

	Otto Schlüter	—	Coined <i>Cultural Landscape</i> .
	Karl Troll	—	Landscape ecology.

5. French Geographers (18th – 20th Century)

Birthplace of Human Geography and Possibilism.

Geographer	Major Works	Contributions
Philippe Buache	—	Early physical geography.
Élisée Reclus	<i>La Terre</i> (1866–67)	Physical geographer; disciple of Ritter.
Frédéric Le Play	<i>La Réforme Sociale</i>	Studied <i>Place–Work–Family</i> ; human–environment relations.
Paul Vidal de la Blache	<i>Principles of Human Geography</i> (1923)	Father of <i>Human Geography</i> in France; developed Possibilism ; <i>Pays</i> concept; <i>Terrestrial Unity</i> .
Jean Brunhes	<i>La Géographie Humaine</i> (1910)	Human geographer; <i>Geography of History</i> .
Albert Demangeon	<i>La Picardie</i>	Regional–economic geography.
Emmanuel de Martonne	—	Physical geographer; <i>Carpathian Range Studies</i> ; influenced by Davis.
Blanchard	—	Urban geography.
André Siegfried	—	Political geography.

6. British Geographers (19th – 20th Century)

Developed political, regional, and quantitative approaches.

Geographer	Major Works / Theories	Key Concepts / Contributions
H. J. Mackinder	<i>The Geographical Pivot of History</i> (1904); <i>Democratic Ideals & Reality</i> (1919)	Heartland Theory : “Who rules East Europe commands Heartland...”; Geopolitics.
Hugh Robert Mill	<i>Realm of Nature</i>	Physical geography popularization.
A. J. Herbertson	<i>Man and His Work</i> (1911)	Classified major natural regions; human–climate relations.
G. G. Chisholm	<i>Handbook of Commercial Geography</i>	Economic and trade geography.
Patrick Geddes	<i>Cities in Evolution</i>	Coined Conurbation ; urban sociology; <i>Place–Work–Folk</i> model.
H. J. Fleure	<i>Human Geography in Western Europe</i> (1916)	Regional anthropology; <i>Human Regions</i> .
L. D. Stamp	<i>The Land of Britain</i> (1947)	Agricultural and land-use geography.
S. W. Wooldridge	<i>Spirit and Purpose of Geography</i>	Advocated scientific approach.
Peter Haggett	<i>Locational Analysis in Human Geography</i> ; <i>Models in Geography</i>	Led Quantitative Revolution ; spatial modeling.
W. Bunge	<i>Theoretical Geography</i> ; <i>City of Death / Need / Superfluity</i>	Quantitative & predictive geography.
David Harvey	<i>Explanation in Geography</i> (1969)	Marxist–economic geography; spatial theory.

7. American Geographers (19th – 20th Century)

Introduced Human Ecology, Regional Science, and Applied Geography.

Geographer	Major Works	Key Contributions
G. P. Marsh	<i>Man and Nature</i> (1871)	Environmental conservation; human impact studies.
Arnold Guyot	<i>The Earth and Man</i> (1849)	Teleological interpretation; influence of Ritter.
W. M. Davis	<i>Cycle of Erosion</i>	Father of <i>Geomorphology</i> ; time-based erosion cycle.
Mark Jefferson	—	<i>Primate City Concept</i> ; promoted human geography.
E. C. Semple	<i>Influence of Geographic Environment</i>	Environmental determinism; cultural studies.
Ellsworth Huntington	<i>The Pulse of Asia</i> (1907); <i>Civilization & Climate</i> (1915)	Climatic determinism; civilization–climate relation.
Isaiah Bowman	<i>The Pioneer Fringe</i> ; <i>Political Geography</i>	Political and economic geography; field studies.
Carl O. Sauer	<i>Morphology of Landscape</i> (1928)	Founder of <i>Cultural Geography</i> ; <i>Man's Role in Changing the Face of the Earth</i> .
R. D. Salisbury	<i>Physiography</i>	Landform classification.
H. Hartshorne	<i>Nature of Geography</i> (1939)	<i>Areal Differentiation</i> ; regional synthesis.
Griffith Taylor	<i>Geography of 20th Century</i>	<i>Neo-Determinism</i> (“Stop and Go” theory); Climographs, Hythergraphs.
Barrows	<i>Geography as Human Ecology</i>	Defined human ecology framework.
Freeman	<i>A Hundred Years of Geography</i> (1961)	Historical synthesis of geography.
Nicholas Spykman	—	<i>Rimland Theory</i> ; geopolitical model.

W. Isard	—	<i>Father of Regional Science.</i>
John Friedmann	—	Regional planning; social objectives in spatial order.

Age of Exploration (15th – 17th Century)

Empirical data collection, discovery of new lands; foundation for modern cartography.

Century	Explorer	Nationality	Major Voyages / Discoveries	Contribution / Term / Publication
13th	Marco Polo	Venetian	Travelled to China via Silk Route.	<i>The Travels of Marco Polo</i> ; inspired exploration.
15th	Prince Henry the Navigator	Portuguese	Sponsored Atlantic & African expeditions.	Founded navigation school at Sagres.
15th	Bartholomew Dias	Portuguese	Discovered Cape of Good Hope (1488)	Sea route to Indian Ocean.
15th	Christopher Columbus	Italian (Spain)	Reached America (1492)	Initiated European colonization; “New World.”
15th	Vasco da Gama	Portuguese	Discovered sea route to India (1498)	Linked Europe–Asia by sea.
16th	Amerigo Vespucci	Italian	Explored South America	<i>America</i> named after him.
16th	Ferdinand Magellan	Portuguese	First circumnavigation (1519–22)	Proved Earth’s sphericity.
16th	Sir Francis Drake	English	Circumnavigated Earth (1577–80)	British maritime supremacy.
17th	Abel Tasman	Dutch	Discovered Tasmania & New Zealand.	—

18th	James Cook	British	Explored Pacific, Australia, New Zealand	Improved mapping; used chronometer for longitude.
19th	David Livingstone	British	Explored Africa (Zambezi, Victoria Falls)	Humanitarian & physical geography of Africa.
19th	Henry Morton Stanley	British–American	Explored Congo Basin	“Dr. Livingstone, I presume.”
19th	Robert Peary	American	Reached North Pole (1909)	Polar geography.
20th	Roald Amundsen	Norwegian	First South Pole (1911)	Polar meteorology.

UNIT VI – GEOGRAPHY OF ENVIRONMENT

1. Foundations of Ecological Thought

- **Ethology (1859)** – Term by **Isidore Geoffroy St. Hilaire** for animal behaviour study.
- **Hexicology (1870s)** – Proposed by **St. George J. Mivart** as a study of organism–habitat relations.
- **Ecology (1869)** – Coined by **Ernst Haeckel**, meaning “study of organism in its environment.”
- **Deep Ecology (1972)** – Introduced by **Arne Naess**; emphasized intrinsic value of nature and eco-centric ethics.
- **Ecosystem (1935)** – Term coined by **A.G. Tansley** to describe a functional system of organisms and their environment.

2. International Environmental Policies and Conferences

Event / Agreement	Year & Place	Major Outcomes / Objectives
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UN Conference on Human Environment	Stockholm, 1972	First global environment conference; established UNEP.
Vienna Convention for Ozone Layer Protection	1985	Framework to limit CFC production and protect ozone layer.
Montreal Protocol	1987	Legally binding agreement to phase out ozone-depleting substances.
IPCC (Intergovernmental Panel on Climate Change)	1988	Established by WMO & UNEP to assess climate change science.
UNCED – Earth Summit	Rio de Janeiro, 1992	Promoted Agenda 21, Convention on Biodiversity and Climate Change.
Kyoto Protocol	1997 (under UNFCCC)	Legally binding targets for greenhouse-gas emission reduction.
Paris Climate Agreement (COP-21)	2015	Universal agreement to limit global warming below 2 °C.

3. Global Development Agendas

- **Millennium Development Goals (MDGs)** – 8 goals adopted in 2000 to reduce poverty by 2015.
- **Sustainable Development Goals (SDGs)** – 17 interlinked goals and 169 targets (2015–2030) for inclusive economic, social, and environmental progress.