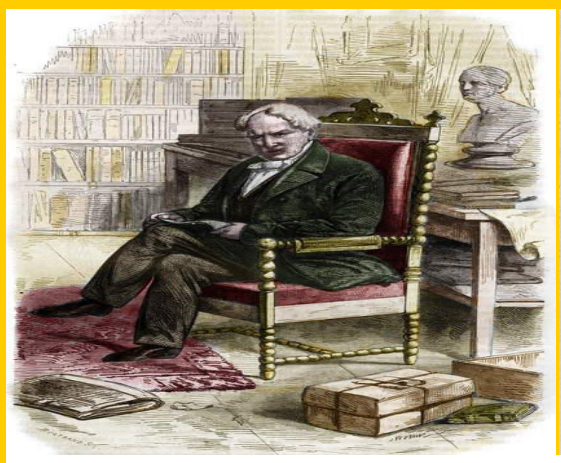
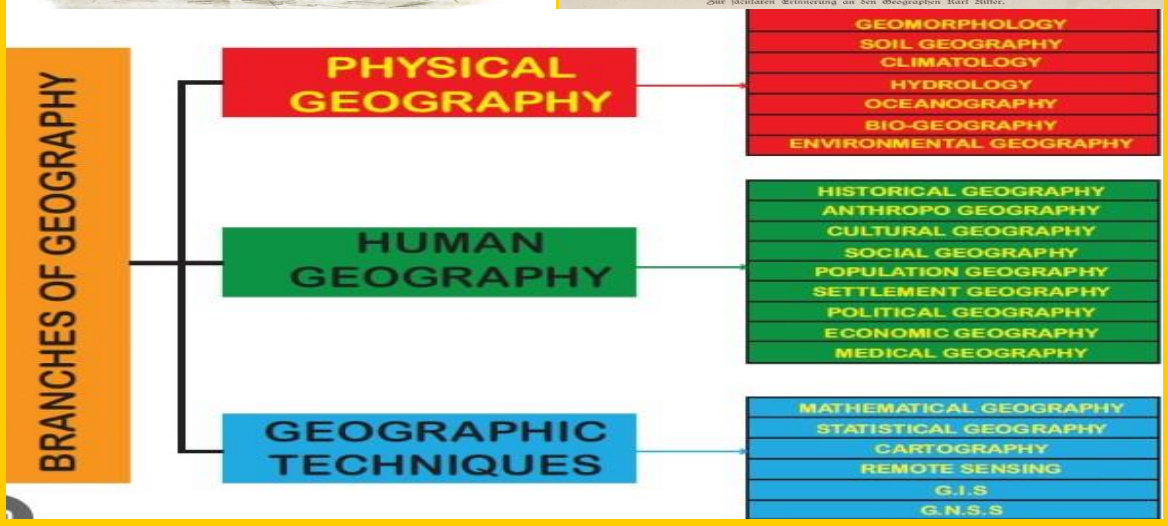
Course Code: GEOG-506

Evolution of Geographical Thought





DEPARTMENT OF GEOGRAPHY AND NATURAL RESOURCE MANAGEMENT

SCHOOL OF EARTH AND ENVIRONMENTAL SCIENCE
UTTARAKHAND OPEN UNIVERSITY

(Teenpani Bypass, Behind Transport Nagar, Haldwani (Nainital), Uttarakhand, India)

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Title	: Evolution of Geographical thought
ISBN	:
Copyright	: Uttarakhand Open University
Edition	: First (2024)

Published By : Uttarakhand Open University, Haldwani, Nainital-263139

Printed By :

CONTENTS

BlOCK: 1 BASIC CONCEPT

UNIT 1 – MEANING, DEFINITION, AIMS AND PURPOSE OF GEOGRAPHY

1.1 LEARNING OUTCOMES

After completing of this unit, the learner should be able to:

- Understand the meaning of geography.
- Understand the definition of Geography.
- Understand the aim and purpose of geography.

1.2 INTRODUCTION

Geography, simply put, is the study of places and the relationships between people and their environments. It seeks to answer questions about where things are, why they are there, and how they got there. Have you ever wondered why some places are hot and others are cold? Or why some countries have lots of mountains, while others are flat as a pancake? Imagine it as a giant puzzle, where each piece represents a different aspect of the Earth, such as landforms, climate, people, and cultures. Geography helps us to understand the whole picture of the earth.

Now, let's talk about why we study geography. The aim of geography is all about helping us become world explorers! When we learn about geography, we become like detectives, trying to solve the inter-relationship of man and nature in the context of location. One of the big aims of geography is to understand how our planet works. We learn about weather and climate, which helps us predict things like storms and sunny days. We also study the Earth's landforms, like mountains and oceans, to learn about how they formed and why they are so important. Another aim is to explore the different cultures and ways of life around the world. Geography helps us appreciate the beauty of diversity, the fact that people in one part of the world might eat different foods, speak different languages, and celebrate different festivals than people in another part.

Now, let's talk about the purpose of geography. One of the most important purposes is to make our world a better place. When we understand how the Earth works and how people live in different places, we can make smart decisions about things like protecting the environment and helping those in need. Geography also helps us with everyday stuff. Have you ever used a map to find your way to a new place? Well, that is geography in action! It helps us navigate and find our way around, whether it is to a friend's house or a far-off vacation spot. Another purpose is to prepare us for the future. When we study

geography, we learn about the challenges our planet faces, like climate change and pollution. By understanding these problems, we can work together to find solutions and take care of our home the Earth.

In this chapter of geographical thought, we will delve into the meaning, definition, aims and purposes of geography, shedding light on why this subject matters and how it shapes our understanding of the Earth.

1.3 MEANING, DEFINITION, AIMS AND PURPOSE OF GEOGRAPHY

1.3.1 Meaning of Geography

Since the time of Eratosthenes, the word "geography" has been in use. It initially covered all topics related to the description of Earth and its components. The word 'geography' consists of two Greek words, 'geo' means the Earth and 'graphein' means to write. The former is more significant and refers to the zone of contact of the solid, liquid, and gaseous masses that make up the planet while the latter refers to the description of these phenomena in regard to "place, localization, and distribution". The term "geography" is used to describe the earth bound phenomena. There are many different phenomena taking place on the surface of the Earth; some are entirely physical phenomena while others are purely human phenomena. Some of these phenomena are mutually inclusive while others are mutually excluding. However, all of these occurrences—physical or human—are relative in the sense that they each have a unique "place of their localization" and "distribution." The 'core' of geography seems to be a blend of both physical and human phenomena, taking place on the surface of the earth as mutually interrelated and interacting.

The role people play in changing the surface of the Earth carries a similar implication. While the face of the Earth refers to that which forms the habitat or environment or space that is entirely dependent on man's selection, changes, and modifications of various sets of earth-bound phenomena are done, play and modifying refer to particular time because people here are identified with a particular set of time with a distinct way of living that is changeable in temporal perspective (place, localization, and distribution understood). In geography, all of these earth-bound phenomena are explained correctly.

Geography endeavors to connect the expanding divide between evolving natural and biological occurrences on one side and evolving human activities on the other. Geography relies on both these aspects, and without it, our understanding of the Earth remains fragmented and inadequate.

1.3.2 Definition of Geography

Since ancient period to modern period, various perspectives from different parts of the world have been developed in geography. So, the definition of geography varies from one perspective to another. Therefore, in this section, you will be learning the definition of geography by different developed perspectives, i.e., 'geography as the study of planet earth', 'geography as the study of location or distribution' and 'geography as the study of man-environment relationships'. A detailed description of definition of geography by different perspectives is presented in the following paragraphs.

Geography as the Study of Planet Earth

In the ancient history of geography, this subject was considered that branch of knowledge which deals with the planet earth, especially in the ancient Greece, in 3rd and 4th century B.C. Eratosthenes was a great Greece geographer, he explained geography as 'the study of the earth as the home of the human beings'. So, in this part, we will understand how the geography is considered as the study of planet Earth and how the various geographers had supported this idea. There were a number of geographers who studied Earth and its features in the past helped in laid the foundation of the subject of geography. Some of them, like Georg Gerland (1833-1919), Ferdinand von Richthofen (1833-1905), Otto Lehmann (1855-1922), Albrecht Penck (1858-1945), and Hartshrone (1959) believed that geography is about studying the whole planet Earth. However, there is a bit of confusion about whether geography only looks at the Earth's surface and the things we can see and feel or if it includes everything about the Earth, even things we cannot easily see.

In 1891, a German geographer and geologist named Georg Gerland wrote an important essay called "The Position of Geography among the Natural Sciences." He asked a big question: Does geography only study the part of the Earth that everyone knows, or does it cover the whole planet? This question was worked as a foundation for geography, and it helped establish the idea that geography is about studying the Earth as a whole system (Hartshrone, 1959). But, most geographers back then only studied things

on the Earth's surface, so geography, in practice, was mostly about the Earth as we usually think of it. The idea of studying the out part of the earth was a limited approach. In 1883, great geographer Richthofen advocated this idea in a speech at Leipzig that geographers should mainly focus on the Earth's outer layer, but this idea did not convince everyone.

Gerland talked about how geography and geophysics are different. He said that geography should look at the Earth like a scientific and objective thing, just one of many similar things in the universe. He thought that we focus on the Earth's surface in geography because we cannot see what is inside the Earth. He also said that the Earth is special because it has things like a narrow temperature range and life, so it is justified to study it as its own science.

Gerland accepted that science is about learning things in the universe, and the Earth is special because people live here. He explained that if we compare Earth to other similar planets, we should look at it like a celestial body in the universe, and we do need little justification to study it as its own science. Gerland concluded it by saying that we should study the Earth because it is the only planet we know where life exists.

Indeed, throughout history, humans have consistently regarded the world they inhabit as a vital component of their existence. Consequently, we now acknowledge that Earth represents not merely a celestial body but also our exclusive abode. The term "earth surface" has taken on essential significance as it precisely delineates the physical scope of our planet's external layer. The word "world" frequently finds usage in expressions such as "worldwide," "world map," and "world tour," all of which pertain to the tangible expanse encompassing Earth's surface. This spatial domain extends deep beneath the Earth's surface and high into the atmosphere but excludes the Earth's core, the moon, and other celestial bodies.

The earth's surface need not be precisely defined in order to understand the physical dimension of geography. The earth's surface need not be precisely defined in order to understand the physical breadth of geography. Geographers research the surface and, if necessary, can delve deeper into a situation. There is no need to draw a line separating the outside world from the interior of the planet. Geographical research is centered on the surface of the earth, which also serves as the center for the disciplines of history, geophysics, meteorology, economics, and geology. The earth's surface is

approached differently by each science. However, academics like Richthofen frequently failed to recognize the distinction between the spatial perspective and systematic sciences addressing the same topics. In 1905, Alfred Hettner emphasized this distinction. The contributions of geographers were constrained by the specialized techniques employed in geophysics, leading to the emergence of geophysics as a distinct field linked with geology and geophysics, as observed by Wagener. There are a number of other eminent geographers who advocated 'geography as the study of planet Earth'. Here are some of their important works:

- **William Morris Davis** (1909), "Geography is the science that studies the physical and cultural features of the earth's surface, and the spatial relationships between them".
- **Richard Hartshorne** (1939), "Geography is the study of the earth as the home of human beings".
- **Carl Sauer** (1956), "Geography is the science of the earth's surface and the study of the relationships between people and their environment".
- **Jean Gottmann** (1973), "Geography is the study of the earth's surface, the human use of it, and the interrelations between the two".
- **D.W. Meinig** (1975), "Geography is the science of the earth and its features, the study of human activity and its relationship with the physical environment, and the synthesis of knowledge about the earth and its inhabitants".
- **Peter Haggett** (1983), "Geography is the study of the Earth's surface and the processes that shape it, including human activities".

The above discussions make it clear that the examination of the Earth's surface holds a vital role in the field of geography. It represents the physical expanse of our planet's outer layer, encompassing the space that extends from deep within the Earth to high into the atmosphere. Notably, it excludes the Earth's core, moon, or other celestial bodies. Geographers are not required to precisely delineate the boundary between the world and the Earth's interior. Instead, the Earth's surface serves as the focal point for all scientific disciplines concerned with our planet, including history, geophysics, meteorology, economics, and geology.

Geography as the Study of Location/Distribution

The term "location or spatial" characterizes a specific type of distribution, one that extends across a surface, as opposed to categorizing objects, as in statistical distributions. Spatial distributions encompass phenomena dispersed across a surface, typically the Earth's surface, sharing similarities with each other. These individual elements in a spatial distribution are arranged in a manner that allows analysis and mapping of their pattern, density (the number of objects per unit area), and dispersion (how far apart the objects are from one another). Geographers can compare different spatial distributions by examining their patterns, densities, and dispersions.

Geography focuses on understanding variations in phenomena across different places, and its significance as an academic discipline lies in its ability to elucidate the connections between various aspects within the same area—what can be termed as interrelated phenomena. The central question in geography is, "Why does this particular condition exist here?" Any phenomena with a discernible "spatial" distribution or that can be mapped hold inherent geographical interest.

Distribution pertains to the manner in which things are dispersed or organized across a geographical area. The notion of distribution finds relevance across a wide spectrum of subjects on our planet, encompassing botanical and zoological species, as well as meteorological occurrences. Geography and geographers have demonstrated that numerous items are found in specific locations but not in others, thereby establishing geography as the science of distributions. At its core, geography, as the science of distribution, is rooted in the belief that everything on Earth holds a spatial context. Geographers delve into the distribution of natural elements like landforms, climate patterns, plant life, and water resources, in addition to societal elements such as population, culture, economic endeavors, and political structures. Through the examination of these patterns, geographers gain valuable insights into the reasons behind the distribution of phenomena, their interplay, and their underlying principles.

Geography, as a science rooted in the study of distribution, finds its origins in the pioneering work of Alexander von Humboldt, a German naturalist who extensively explored South America during the early 19th century. Humboldt's primary focus was on the spatial arrangement of plant and animal species, from which he crafted the foundational concept of the 'geography of plants,' eventually laying the groundwork for

the field of biogeography. Since that time, geography has evolved into a multifaceted discipline encompassing various branches, including physical geography, human geography, and environmental geography. These sub-disciplines share a common emphasis on comprehending the patterns of phenomena across the Earth's surface. For instance, physical geography investigates the spatial distribution of natural elements such as climate, vegetation, and landforms. It seeks to grasp the underlying processes responsible for shaping these distributions, such as plate tectonics, weather systems, and erosion. In contrast, human geography delves into the spatial distribution of human activities, including aspects like population dynamics, migration patterns, and economic endeavors. Its aim is to uncover the social, economic, and political forces influencing these spatial patterns. Similarly, environmental geography explores the intricate interplay between humanity and the environment, examining the distribution of environmental phenomena like pollution, biodiversity, and natural resources. Its goal is to unravel the root causes and consequences of these distributions.

Geography, as a scientific discipline focused on distribution, possesses a notable strength in its capacity to detect and scrutinize spatial arrangements and connections. Take, for instance, the fields of Cartography and Geographic Information Systems (GIS), which empower researchers to chart and evaluate spatial information across various scopes, ranging from the local level to the global stage. Such capabilities enable the identification of regions characterized by either high or low biodiversity, the tracking of trends in land use alteration, and the examination of the distribution of natural hazards like earthquakes and tsunamis.

Geography, rooted in Humboldt's initial concept of the interplay of elements within a geographic space, has evolved over time, marked by significant contributors and varying perspectives. During his extensive exploration of the Orinoco River, Colombia, Cuba, the West Indies, Amazon Basin, and Andes Mountains, Humboldt established that diverse factors such as precipitation, soil, vegetation, flora, fauna, and temperature exhibit variations in distribution. These variations extend to economic activities and population density. Ritter, in his book "Erdkunde," took a teleological approach to investigate the spatial distribution of physical phenomena. Hettner, on the other hand, emphasized "distribution by place" in his studies. He delved into the significance of the Wallace Line, which demarcates the distinct flora and fauna of Australia from South-East Asia and Asia. This separation reflected varying viewpoints within the field.

Hettner, dating back to his earliest methodological discussions in 1895, voiced objections to this concept of geography. He argued that the study of distribution should belong to systematic science rather than geography, as it pertained to the characteristics of objects and the distinctions in faunal equipment in different regions.

This perspective consistently derives from Humboldt's original idea that geography examines elements coexisting in an area, even in Hettner's exploration of cultural phenomena. Despite the broad spectrum of phenomena that geographers analyze, it's essential to recognize that focusing solely on distribution doesn't establish a unifying foundation of interest. While geography encompasses more than the study of distributions, the question of "where" remains intrinsic to the field, particularly in systematic geography. Notably, all systematic sciences studying phenomena on Earth's surface must address the question of "where" in their research.

Nevertheless, geography as the exclusive study of distribution has not gained unanimous acceptance among geographers, as it's just one facet of the discipline. Numerous scholars have contributed to the development of geography as a science of distribution, and some of the renowned figures and their works are detailed below:

- **Jones** (1984), The focus of all geographical enquiries is place. This implies location on the Earth's surface, the relationship between it and other locations, and the processes affecting changes in those relationships.
- **Smith** (1977), Geography offers a broad synoptic view of spatial relationships in human affairs.
- **Yeates** (1968), Geography can be regarded as a science, concerned with the rational development, and testing, of theories that explain and predict the spatial distribution and location of various characteristics on the surface of the earth.
- **Taaffe** (1970), Geography is the study of spatial organization expressed as patterns and processes.
- **Schaefer** (1953), Geography has to be conceived as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the surface of the Earth.
- **Ackerman** et al., (1965), It is the study of spatial distributions and space relations on the Earth's surface.

- **Johann Heinrich von Thunen** (1926): Von Thunen formulated an agricultural land utilization model aimed at elucidating the geographic arrangement of agricultural activities in proximity to urban centers. This model posits that the choice of crops cultivated is contingent upon their proximity to the city, taking into account factors such as perishability and transportation expenses.
- **August Losch** (1930): In his renowned work on Location Theory, he elucidates the process by which businesses and various economic enterprises make decisions regarding their geographic placement, taking into account elements like transportation expenses, the availability of labor, and accessibility to markets. This theory provides insights into the geographical distribution of economic activities and the location of industrial sectors.
- **Walter Christaller** (1933): Christaller's Central Place Theory aimed to explain the arrangement of human settlements and economic practices. According to this theory, human settlements are structured in a hierarchical system, wherein larger settlements offer a wider array of intricate goods and services.

The above discussion advocates geography's role as the scientific study of distribution, with a primary focus on examining the patterns and spatial organization of diverse phenomena across the Earth's surface. Geography delves into comprehending how natural and human phenomena, including landforms, climate, vegetation, population, and economic activities, are distributed. This approach operates under the premise that the distribution of these phenomena is not arbitrary; rather, it's influenced by factors like physical and environmental processes, human actions, and historical events. By studying distribution patterns and processes, geographers can look insights into the interplay and functioning of various aspects of the Earth's surface, enabling them to formulate theories and models for explaining and forecasting their behaviour.

Geography as the Study of Man-Environment Relationships

Geography is often defined as the discipline focused on the interconnectedness between humans and their environment. Its primary purpose is to investigate the dynamic interactions between human societies and the natural world. Geography delves into the ways in which natural phenomena like climate, topography, and available resources mold human behaviors, and conversely, how human activities shape and impact the environment. It aims to comprehend how societies engage with, alter, and adapt to their

surroundings, acknowledging that these interactions can yield both positive and negative outcomes. Through its study of the intricate human-environment connections, geography can offer valuable insights into pressing global challenges, including but not limited to climate change, environmental deterioration, and sustainable development.

Richard Hartshorne, a distinguished geographer, made substantial contributions to the exploration of human-environment interactions. In his 1939 publication, "The Nature of Geography: A Comprehensive Examination of Contemporary Ideas in Historical Context," he underscored the significance of comprehending the intricate interconnection between human communities and their surroundings. Hartshorne maintained that human societies were not merely passive beneficiaries of environmental forces but, rather, active agents capable of modifying and adapting their surroundings to meet their requirements. He acknowledged the profound impact of the environment on human societies, influencing their culture, economy, and way of life. Hartshorne's contributions to the study of human-environment relationships maintain their impact on the field of geography in contemporary times. His emphasis on comprehending the interdependent connection between human societies and their surroundings, along with advocating for a comprehensive approach to explore this relationship, still resonates in current geographic research.

Geography is the study of the intricate and multifaceted relationship between humans and their environment. This field of study delves into how people interact with, adapt to, and influence the natural world around them. Geographers also explore the various ways in which human societies are shaped by their surroundings, and conversely, how they shape and impact the environment. Since the post Darwinism period, various approaches have been developed in geography, i.e., determinism, possiblism and neo determinism. These approaches are offering different perspectives on the relationship between human societies and their environment. Although, these concepts differ in their perspectives on the role of the environment and human but all share a fundamental focus on the study of interaction between humans and their environment as a central theme in geographical analysis.

Nevertheless, geography as the exclusive study of human-environment relationships has gained almost unanimous acceptance among geographers. Several scholars have contributed to the development of geography as the study of human-

environment relationships, and some of the renowned figures and their works are detailed below:

- **Ratzel,** a great German geographer, defined geography as a synthetic study of relationship between human societies and earth's surface.
- **Ellen C. Semple** (1911), an American geographer, defined geography as the study of the changing relationship between the unresting man and the unstable earth.
- **Vidal de la Blache** (1921), a French geographer, defined geography as the study of relationship between living beings and their environment.

Thus, it is clear from the above discussion, the study of human-environment relationship is core fundamental perspective in geography. The study of human-environment relationships in geography explores the intricate interplay between human societies and their surroundings in the context of time and space. Geographers investigate how people influence, adapt to, and are influenced by their environment, considering factors like climate, landforms, and resources.

1.3.3 Aim and Purpose of Geography

Geography is the study of our amazing planet Earth and its inhabitants. Its aim and purpose are like being a detective, but instead of solving mysteries, it helps us explore and understand the world around us. Geography's main goal is to discover and explain all the fascinating things about our planet, from the tallest mountains to the deepest oceans and everything in between.

First, geography helps us understand where things are located. It's like a giant map that helps us find our way and know the different countries, cities, and landmarks. This knowledge is essential for travelers, businesses, and governments to make informed decisions. Second, geography delves into why places are the way they are. It's like a detective story uncovering the reasons behind the diversity of landscapes, climates, and cultures. It helps us learn about the forces of nature, like earthquakes and volcanoes, as well as how people shape their environments through farming, building, and industry.

Furthermore, geography is critical for addressing important global challenges. It guides us in studying climate change, managing resources, and understanding how our actions impact the planet. By knowing more about our world, we can make choices that protect the environment and improve the quality of life for all living creatures.

In simple terms, geography's aim and purpose are to explore, explain, and care for our incredible planet. It's about knowing where things are, why they're there, and how we can be good stewards of the Earth. So, whether you're curious about distant lands or interested in making the world a better place, geography plays a vital role in satisfying that curiosity and creating a brighter future for all of us.

1.4 SUMMARY

In this unit, you have learned the meaning, definition and aim & purpose of geography. Thus, you studied that geography is all about understanding our planet. Geography helps us explore the Earth, from the tallest mountains to the deepest oceans. It helps us learn about places, people, and how they interact with the world around them.

You have studied the definition of geography as per developed different perspectives (i.e., geography as a study of planet earth, geography as a study of distribution and geography as a study of human-environment relationships) over the history. Generally, geography is the study of places and the relationships between people and their environments. It's not just about memorizing maps; it's about understanding why places are the way they are and how they impact our lives.

The main job of geography is to help us know more about our world. It helps us answer questions like "Where?" or "Why?" It's not just about maps; it's about exploring, discovering, and making sense of the world we live in. Geography is like a compass that guides us to understand the Earth better.

1.5 GLOSSARY

Determinism: A geographical theory that suggests that environmental factors overwhelmingly control or determine human activities, behaviors, and societal development. It posits a strong influence of the physical environment on culture and civilization.

Possibilism: A contrasting geographic theory that asserts that while the physical environment does play a role in shaping human activities, it does not determine them. Instead, human societies have the ability to

adapt, innovate, and make choices within the bounds of their environment.

Neo-Determinism: A modified perspective that acknowledges the role of the environment but also takes into account the significance of human and technology in shaping human-environment interactions. Neo-determinism attempts to strike a balance between strict determinism and possibilism.

Spatial Distribution: The arrangement, pattern, or organization of physical or human phenomena across a geographic area. It provides insights into how various elements, such as population, resources, or land use, are spread out or concentrated within a region, allowing geographers to analyze the underlying factors and implications of these patterns.

Human-Environment Interaction: The study of how human activities and behavior influence, and are influenced by, the natural environment, encompassing issues like resource use, pollution, and sustainability.

1.6 ANSWER TO CHECK YOUR PROGRESS

- Geography helps us find places on the Earth. It's like a giant map that shows us where countries, cities, and mountains are.
- Different places have different weather, people, and landscapes. Geography helps us figure out why.
- The definition of geography changed with the emergence of new perspectives and concepts in geography.
- The oldest perspective defines geography as a study of planet earth.
- The middle perspective defines geography as the subject dealing with the spatial distribution of things.

- The newest perspective defines geography as the study of human-environment relationships.
- Determinism, possiblism and neo determinism concepts are the product of human-environment approach of geography.

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1.8 TERMINAL QUESTIONS

(A) Long Questions

Q.1 Give a detailed account of meaning and definition of geography including different purpose of geography.

Q.2 Can you provide a note on how geography is a study of planet earth as a whole?

Q.3 How would you explain that geography is a subject of spatial science?

Q.4 Could you elaborate that geography is the study of man-environment relationships with suitable examples from your day to day life.

(B) Short Questions

Q.1 What is the meaning of geography?

Q.2 What is geography?

Q.3 Explain geography as the study of planet earth.

Q.4 Why geography is often referred to as the "spatial science"?

Q.5 Why geography is considered as the subject of studying man-environment relationships?

Q.6 How does geography help us understand environmental issues?

Q.7 What is the significance of geography?

Q.8 What is the aim and purpose of geography?

(C) Multiple Choice Questions

Q.1 What is geography?

a) The study of ancient civilizations

b) The study of Earth's physical features

c) The study of human behavior

d) The study of mathematics

Q.2 Which statement best describes the purpose of geography?

a) To find the shortest route between two cities

b) To explore the human mind

c) To understand the Earth's natural and human systems

d) To predict the future

Q.3 What is the purpose of a geographic information system (GIS)?

a) To study ancient civilizations

b) To create weather forecasts

c) To analyze and display spatial data

d) To explore the depths of the ocean

Q.4 Which of the following is NOT one of the Five Themes of Geography?

a) Location

b) Psychology

c) Human-environment interaction

d) Region

Q.5 Geography is often defined as the discipline focused on the interconnectedness between _____ and their environment.

a) Humans
b) Animals
c) Plant
d) Countries

Q.6 Richard Hartshorne, a distinguished geographer, made substantial contributions to the exploration of _____.

a) Natural environment
b) Possiblism
c) Determinism
d) Human-environment interactions

Q.7 The central question in geography is, "Why does this particular condition exist here?" This question emphasizes the importance of understanding the _____ distribution of phenomena.

a) Spatial
b) Population
c) Forest
d) Rice

Q.8 Geography, as the science of distribution, finds its origins in the pioneering work of _____.

a) Ratzel
b) Alexander von Humboldt
c) Semple
d) Hartshrone

Q.9 Geography, as a scientific discipline, is rooted in the study of distribution, with a primary focus on the interplay of elements within a geographic space.

a) True

b) False

Q.10 The study of distribution is considered to belong more to systematic science than geography, as it pertains to the characteristics of objects and distinctions in faunal equipment in different regions.

a) True
b) False

Q.11 Geography primarily focuses on the interconnection between humans and their environment.

a) True
b) False

Q.12 Richard Hartshorne emphasized that human societies are passive beneficiaries of environmental forces.

a) True
b) False

Answers: 1-b, 2-c, 3-c, 4-b, 5-a, 6-d, 7-a, 8-b, 9-a, 10-a, 11-a, 12-b.

UNIT 2 – APPROACHES OF GEOGRAPHY

2.1 OBJECTIVES

After reading this unit, the learner should be able to:

- Understand the different approaches of geography.
- Explain the various approaches used in geography.

2.2 INTRODUCTION

Geography, the study of our planet and its diverse features, employs specific approaches that help us understand and interpret the world around us. These approaches, like lenses through which we view the Earth, provide valuable insights about the geography of the world. Geography has clearly established as an interdisciplinary field of study. The specific approaches are used to study any subject. Phenomena on the Earth's surface, whether considered independently or in correlation, are studied through distinct approaches. The primary approaches employed in the study of geography can be broadly categorized as (i) systematic approach and (ii) regional approach.

The systematic geography approach closely aligns with general geography and was founded by the great German geographer Alexander Von Humboldt (1769-1859). It involves the systematic study of specific natural or social phenomena, leading to discernible spatial patterns and structures on the Earth's surface. In this approach, the phenomenon is comprehensively examined on a global scale initially, and subsequently, typologies or spatial patterns are identified. For instance, if the focus is on the study of natural vegetation, the analysis begins at a global level. Typologies such as equatorial rainforests, softwood conical forests, or monsoon forests are then meticulously identified, discussed, and delimited as part of the systematic study approach.

The regional approach was founded by Karl Ritter (1779-1859), a German geographer who was a contemporary of Humboldt. In the regional approach, the globe is divided into various hierarchical levels of regions, and a thorough examination of all geographical phenomena within a specific region is conducted. These regions can be categorized as natural, political, or designated areas. The study of phenomena within a region takes a holistic perspective, aiming to uncover unity amidst diversity.

It's essential to recognize that systematic and regional geography are not opposing but rather complementary. The distinction between the two lies not in the subject matter but in the methodology used to perceive geographical elements. The choice between a systematic and regional approach depends on the study's purpose. If the focus is on a single phenomenon, a systematic approach is suitable. However, for the study of multiple phenomena or complex inter-relationships within a specific region, the regional approach is more appropriate.

2.3 APPROACHES OF GEOGRAPHY

Geography has clearly established as an interdisciplinary field of study. The specific approaches are used to study any subject. Phenomena on the Earth's surface, whether considered independently or in correlation, are studied through distinct approaches. The primary approaches employed in the study of geography can be broadly categorized into two parts. These are:

1. Systematic approach and
2. Regional approach.

Systematic Approach

The systematic geography approach closely aligns with general geography and was founded by the great German geographer ***Alexander Von Humboldt*** (1769-1859). It involves the systematic study of specific natural or social phenomena, leading to discernible spatial patterns and structures on the Earth's surface. In this approach, the phenomenon is comprehensively examined on a global scale initially, and subsequently, typologies or spatial patterns are identified. For instance, if the focus is on the study of natural vegetation, the analysis begins at a global level.

Furthermore, the systematic approach in geography is a methodological perspective that involves the study of the Earth's features and phenomena through the application of systematic principles and concepts. Unlike the regional approach, which focuses on specific areas and their unique characteristics, the systematic approach seeks to understand the general principles that govern spatial patterns and processes on a global scale.

One key aspect of the systematic approach is the emphasis on abstraction and generalization. Geographers employing this approach analyze spatial patterns, landforms, climate systems, vegetation, soil and other geographical elements in a more abstract and generalized manner. By doing so, they aim to identify and understand the universal principles and regularities that underlie the diverse and complex features of the Earth's surface.

The systematic approach also involves the development and application of models and theories to explain spatial phenomena. Geographers create models to represent and simulate real-world processes, allowing them to test hypotheses and make predictions. These models contribute to a deeper understanding of the fundamental principles that govern the organization of the Earth's physical and human landscapes.

In terms of subject matter, the systematic approach encompasses various sub-disciplines within geography. For instance, physical geography under this approach might involve the study of climatology, geomorphology, hydrology, and biogeography. On the human geography side, topics such as population geography, economic geography, and cultural geography may be explored systematically.

The systematic approach is particularly useful for gaining a broad understanding of global patterns and processes. It allows geographers to identify trends, regularities, and causal relationships that transcend specific regions. This approach is often employed when researchers seek to formulate general principles and theories that can be applied across different geographical contexts.

In brief, the systematic approach in geography involves the study of the Earth's features and phenomena through the application of abstract principles, generalizations, and the development of models and theories. It provides a framework for understanding the fundamental principles that govern the spatial organization of the Earth's surface on a global scale.

Regional Approach

This approach was developed by ***Karl Ritter*** (1779-1859), a German geographer who lived during the late 18th and early 19th centuries and was a contemporary of Alexander von Humboldt. In the regional approach, the globe is divided into various

hierarchical levels of regions, and a thorough examination of all geographical phenomena within a specific region is conducted. These regions can be categorized as natural, political, or designated areas. The study of phenomena within a region takes a holistic perspective, aiming to uncover unity amidst diversity.

The regional approach in geography is a method of studying the Earth's surface that focuses on dividing the world into regions and analyzing the unique characteristics, patterns, and processes within those specific geographic areas. In the regional approach, the world is viewed as a complex mosaic of regions, each with its own distinct attributes. These regions can be delineated based on various criteria, such as natural features (physical geography), political boundaries (political geography), or specific designated areas with shared characteristics (cultural geography). The goal of this approach is to understand the diverse elements within a given region and explore the connections between them.

One key aspect of the regional approach is the holistic examination of phenomena within a particular region. Geographers employing this method consider the interrelationships between various elements—be they physical, human, or cultural—in order to grasp the overall unity in diversity within that region. This holistic perspective allows for a more comprehensive understanding of the complexity and dynamics at play in a specific geographic area.

It is crucial to note that the regional and systematic approaches in geography are not mutually exclusive; rather, they are complementary. The distinction lies not in the subject matter but in the methodology used to perceive and analyze geographical phenomena. While systematic geography focuses on the study of individual elements in a broader, systematic manner, the regional approach emphasizes the integration and interdependence of these elements within a specific geographic context.

The regional approach addresses the geographical landscape at different hierarchical levels, from local to global scales. Geographers use various tools and techniques, including mapping, spatial analysis, and field studies, to investigate the characteristics and spatial patterns unique to each region. Through this approach, researchers gain insights into the environmental, cultural, and socioeconomic factors

that shape the identity of a particular area. Ultimately, the choice between a systematic and regional approach depends on the objectives of the study.

Difference between Systematic and Regional Approach

The systematic and regional approaches in geography represent two distinct methodologies for studying the Earth's surface, each offering unique perspectives and insights. Here is a detailed difference between these two approaches:

	Systematic Approach	Regional Approach
1.	Concentrates on studying specific elements or phenomena in particular.	Focuses on the analysis of entire regions and their interconnected features.
2.	Narrow and specialized, often dealing with individual components such as climate, landforms, or population.	Broad and holistic, examining the overall characteristics and interrelationships within a specific geographic area.
3.	Seeks to establish general principles and theories that can be applied universally.	Emphasizes the uniqueness of different regions, looking at specific patterns and characteristics that define them.
4.	Often employs quantitative methods, modeling, and spatial analysis to study patterns and relationships.	Utilizes a variety of qualitative and quantitative methods, including fieldwork, mapping, and case studies.
5.	Findings and theories developed through the systematic approach can be applied across various geographic contexts.	Emphasizes the specificity and context-dependent nature of findings, limiting direct applicability to other regions.
6.	Physical geography studies, like climatology or geomorphology, which focus on specific elements of the Earth's system.	Cultural geography, economic geography, or political geography, which analyzes the characteristics and interactions within a specific region.
7.	No inherent hierarchy; studies can be conducted at various scales without a	Involves hierarchical divisions of space, from local to global levels,

	necessary connection.	emphasizing the significance of place and scale.
8.	Components are often studied in particular to establish general principles.	Encourages the integration of multiple elements to understand the complex interactions within a region.

2.4 SUMMARY

The systematic approach in geography involves the focused study of specific elements or phenomena in isolation. It seeks to establish general principles and theories that can be applied universally. This approach employs quantitative methods, modelling, and spatial analysis to analyze patterns and relationships within the Earth's system. Examples include climatology or geomorphology, which concentrate on individual components of the Earth's environment.

Contrastingly, the regional approach in geography emphasizes the holistic study of entire regions and their interconnected features. It considers the spatial arrangement of elements and the interdependence of phenomena within a given area. This approach recognizes and celebrates the unique characteristics that distinguish one region from another, using a variety of qualitative and quantitative methods, including fieldwork, mapping, and case studies. Examples include cultural geography, economic geography, and political geography, which analyze the characteristics and interactions within specific regions.

It's essential to recognize that systematic and regional geography are not opposing but rather complementary. The distinction between the two lies not in the subject matter but in the methodology used to perceive geographical elements. The choice between a systematic and regional approach depends on the study's purpose. If the focus is on a single phenomenon, a systematic approach is suitable. However, for the study of multiple phenomena or complex inter-relationships within a specific region, the regional approach is more appropriate.

2.5 GLOSSARY

Fieldwork: Direct on-site observation and data collection in a specific geographic area to gain firsthand insights into its characteristics and dynamics.

Modelling: The creation of simplified representations or simulations to understand and predict the behaviour of geographic phenomena.

Qualitative Methods: Research techniques involving non-numerical data, often gathered through observations, interviews, and case studies, to understand the complexities of a specific region.

Quantitative Methods: Research techniques in which numerical data and statistical analysis are employed to study patterns, relationships, and trends in geographical phenomena.

Regional Approach: A method of geographic analysis that focuses on the holistic study of entire regions and their interconnected features.

Spatial Analysis: The examination of spatial patterns and relationships through the use of maps, statistics, and Geographic Information Systems.

Specialization: A focused study on individual elements such as climate, landforms, or population dynamics within the broader field of geography.

Systematic Approach: A method of geographic analysis that involves the detailed study of specific components or phenomena in particular.

2.6 ANSWER TO CHECK YOUR PROGRESS

- In systematic approach, we study specific elements or phenomena in particular.
- The systematic approach seeks to establish general principles that apply universally.
- Quantitative methods, such as statistical analysis, are often used in systematic approach.
- Spatial analysis helps us understand patterns and relationships in systematic approach.
- Systematic approach involves a narrow focus on individual components like climate, landforms etc.
- The systematic approach emphasis is on studying elements independently to develop broader insights.
- Regional approach looks at entire regions and their interconnected features.
- Regional approach considers the spatial arrangement and interdependence of phenomena within a region.
- Qualitative methods, like fieldwork and case studies, are often used in regional approach.
- The regional approach emphasizes the uniqueness of each region.
- Fieldwork involves direct observation and data collection in a specific geographic area.
- Regions can be studied at various hierarchical levels, from local to global scales.

2.7 REFERENCES

- Kausik S.D. (2007): Geographical thought and methodology, Rastogi Publications, Shivaji Road, Meerut, UP.

2.8 TERMINAL QUESTIONS

(A) Long Questions

Q.1 How does the systematic approach in geography differ from the regional approach, and what are the key characteristics that define systematic geography?

Q.2 Compare and contrast the regional approach with the systematic approach in geography, highlighting the fundamental differences in their methodologies and objectives.

(B) Short Questions

Q.1 What does the systematic approach in geography focus on?

Q.2 How does spatial analysis contribute to systematic geography?

Q.3 What is the primary goal of modelling in systematic geography?

Q.4 In which approach are quantitative methods often employed?

Q.5 Give an example of a component studied in the systematic approach.

Q.6 What distinguishes the regional approach in geography?

Q.7 How does regional geography define and study regions?

Q.8 What research techniques are commonly used in regional geography?

Q.9 Provide an example of a field within regional geography.

Q.10 How does the regional approach view the interdependence of phenomena within a given area?

(C) Multiple Choice Questions

Q.1. What does the systematic approach in geography focus on?

A. Entire regions

B. Specific elements or phenomena

C. Cultural interactions

D. Qualitative methods

Answer: B

Q.2. Which method involves the creation of simplified representations or simulations in geography?

A. Spatial analysis

B. Fieldwork

C. Modelling

D. Quantitative methods

Answer: C

Q.3. What kind of analysis is commonly used in systematic geography to study patterns and relationships?

A. Qualitative analysis

B. Quantitative analysis

C. Field analysis

D. Regional analysis

Answer: B

Q.4. In which approach is the emphasis on understanding entire regions and their interconnected features?

A. Systematic approach

B. Cultural geography

C. Regional approach

D. Political geography

Answer: C

Q.5. Which approach considers the spatial arrangement and interdependence of phenomena within a given area?

A. Systematic approach

B. Fieldwork approach

C. Regional approach

D. Cultural approach

Answer: C

Q.6. What type of methods involves non-numerical data and is often used in regional geography?

A. Spatial methods

B. Qualitative methods

C. Quantitative methods

D. Modelling methods

Answer: B

Q.7. Which approach seeks to establish general principles and theories applicable across different geographic contexts?

A. Systematic approach

B. Regional approach

C. Cultural approach

D. Political approach

Answer: A

Q.8. Which of the following is a characteristic of the regional approach?

A. Narrow focus on specific elements

B. Universal application of principles

C. Emphasis on holistic study of regions

D. Modelling techniques

Answer: C

Q.9. What is the primary goal of the systematic approach?

A. To emphasize cultural interactions

B. To establish general principles

C. To study entire regions

D. To conduct fieldwork

Answer: B

Q.10. Which approach uses statistical analysis to study geographic phenomena?

A. Regional approach

B. Systematic approach

C. Cultural geography

D. Political geography

Answer: B

Q.11. What does fieldwork involve in the context of the regional approach?

A. Quantitative data analysis

B. On-site observation and data collection

C. Modelling and simulations

D. Studying specific elements in isolation

Answer: B

Q.12. What distinguishes the spatial arrangement of features in the regional approach?

A. Modelling

B. Interconnectedness

C. Isolation

D. Quantitative analysis

Answer: B

Q. 13. What is the primary focus of systematic geography?

A. Holistic study of regions

B. Cultural landscapes

C. Specific elements or phenomena

D. Spatial arrangement

Answer: C.

BLOCK- 2: EVOLUATION OF GEOGRAPHICAL THOUGHT

UNIT-3: GEOGRAPHY IN CLASSICAL TIMES; GREEK AND ROMAN GEOGRAPHERS, CONTRIBUTIONS OF ARAB GEOGRAPHERS

3.1 OBJECTIVES

(Warp Materials) After reading this unit you should be able to:

- Understand the progress of Geography during the ancient classical period
- Gain knowledge about Greek Geographers
- Gain knowledge about Roman Geographers
- Understanding of the contributions of Arab Geographers

3.2 INTRODUCTION

Geography has a genealogy that can be traced back to ancient times and much before the development of any other sciences. The earliest records of human knowledge contain geographical observations and information regarding the physical world. The history of geographical ideas is the accounts of human efforts to gain more logical and useful information of their habitat and their spread over the surface of the earth. In earlier times, geography developed due to explorations, mapping of unknown areas and speculations about the resources allocated. Archaeological evidences suggest that various civilizations contributed to the development and diffusion of geographical knowledge according to their physical and geographical surroundings. For instance, it is believed that astronomy flourished in Chaldea, Assyria and Babylonia where the skies were mostly clear; geometry developed in the fertile, arable lands of Nile Valley; and physical geography in Greece which was characterised by diverse relief features and indented coastline (Husain 2004, p. 29)

3.3 GEOGRAPHY IN CLASSICAL TIMES; GREEK AND ROMAN GEOGRAPHERS, CONTRIBUTIONS OF ARAB GEOGRAPHERS

Classical antiquity (also called classical era, classical period or classical age) is a broad term for a long period of cultural history centred in various locations around the Mediterranean Sea, comprising the interlocking civilizations of ancient Greece and ancient Rome. It is the period when Greek and Roman society flourished and wielded

great influence throughout Europe, North Africa and South-western Asia. Conventionally, it is believed to begin with the earliest recorded epic Greek poetry of Homer (around 8^{th}-7^{th} century BC) and continues through the emergence of Christianity and the decline of the Roman Empire (5^{th} century AD). It ends with the dissolution of classical culture at the close of Late Antiquity (300-600 AD), blending into the early Middle Ages (600-1000 AD). Such a wide sampling of history and territory covers various cultures and periods.

The history of geographical ideas is the record of humankind's endeavours to acquire increasingly rational and practical knowledge of human habitat and humankind's spread over the planet logic because the explanations of the things observed could be so tested and verified that scholars could have confidence in them; useful because this information could be used to help humans adjust to the diverse natural conditions on Earth, make negative conditions possible, or even gain control over them. Thoughts shape what the observer sees, but thoughts come from generalizing earlier ideas an organized, coherent, and harmonious universe is a notion that has been manifested through the history of ideas since the earliest records. Since the idea of an orderly world was well-established, people naturally thought there was evidence to support it. These do not represent different levels of sophistication, as all of them can be found in the thought of the ancient Greek philosophers.

GREEK GEOGRAPHERS

The Greeks pioneered in many branches of knowledge. The period of unprecedented advancements in various fields of knowledge by Greek scholars is known as “Golden Age of Greece.” Geography as a field of learning in the western world had its beginnings among the scholars of ancient Greece. For many centuries, Greek scholars provided a framework of concepts and a model, or paradigm of scholarly methodology, that guided Western thinking. It appears that some Greek ideas have slowed down Western thinking so much that European geography paradigms were only possible after Plato and Aristotle's influence. Some of the fundamental concepts and paradigms of modern geographical philosophy seem to have a strong inclination towards the tradition of the ancient Greek scholarship.

Greek scientists tried to differentiate between kenos (which means void) and cosmos (which, they believe, refers to the universe as a system of well-connected parts). Although the roots of ancient Greek scholarship in the development of geographical ideas reach back to the 'observations', 'measurements', and 'generalisation of the ancient Egyptians, the Phoenicians, and the Mesopotamians, it was primarily Herodotus, Plato, Aristotle, Eratosthenes, and Strabo who organized it in the form of concepts or paradigms. The two basic traditions of geographic study can be found among the ancient Greek philosophers, almost all of whom made contributions to the field of geography: the mathematical tradition and the literary tradition. Astronomy was developed by the Greeks. Also, teachers wrote topographical descriptions of places in the known world, talking about both natural conditions, the culture, and the way of life of the people living there. People thought that Homer was the father of geography because his great epic poem, The Odyssey, started a literary tradition in Greek geographical thought in contemporary times. However, he did not establish any ideas or paradigms that could be universally accepted.

However, as information and knowledge became more common in modern Greece, the Greek sailors in the eighth century BC were able to distinguish between the four different types of winds and their directions. Boreas were strong north wind, cool, and with clear skies; Eurus was the east wind, which was warm and mild, while notus was the south wind, which was on the front of a storm, which was wet and sometimes violent. However, in the second century of BC, the Athenians built a tower that distinguished eight wind directions and had sculptures showing each weather type. Miletus, a town in Lonia on the eastern side of the Aegean Sea, near the mouth of the Meander River, is where most of the ancient Greek geographical research began.

Although it started as a significant commercial hub and attracted sailors and merchants from various cultural backgrounds, it was soon flooded with information. Between 770 and 570 BC, there was not only a flow of geographical data, but also a group of people who were highly educated and academic who thought about how all this strange information could be combined into arguments and concepts. Miletus also wrote about Sumerian algebra, Egyptian geometry, and Assyrian astronomy. These laid the foundation for Greek mathematical tradition in modern times. Thales, who lived in the seventh and sixth centuries BC, was the first Greek scholars to be concerned about the measurement and location of things on the face of the Earth. He tried to combine his

mathematical and geometrical precepts with the greatest possible scientific accuracy. Thus, he presented a true paradigm, which is still relevant in contemporary mathematical geography and astronomy.

He is credited with six geometric propositions: (1) circle's diameter divides it into ten equal parts (2) in an isosceles triangle, the angles at either end of its base are equal (3) whim astraight-line crosses two parallel lines diagonally, and their opposite angles are equal (4) the angle in a semi-circle is a right angle (5) two triangles are congruent if they have two angles and a side respectively equal (Sarton, 1964, 171). Thales's most significant insight was that the solution of practical measurement problems was less of an intellectual accomplishment than the rational generalization of the specific solutions. He believed water, in strange shapes, was the primary significant substance from which all observable features of the Earth were made. He thought the Earth was like a disc floating in water. Thales developed an explanation that could be verified by new observations and measurements, and it sharply contrasted with the unscientific modern traditional explanations. Anaximander was another great scholar who lived in Miletus and seemed to be a younger contemporary of Thales. Although Anaximander was a contemporary of Thales, the paradigm that Thales established did not influence his research. Instead, he brought a Babylonian instrument called the gnomon to the modern Greek world, which enabled him to make several observations about the relative positions of the celestial bodies in relation to the seasonal shifts in the noon shadow. This made it possible to determine the solstice and equinox time. Anaximander drew a world map to scale based on pictorial maps drawn by the Sumerians of some of their cities as early as 2700 BC. According to Anaximander's world map, Greece was in the centre with the known Eurasian regions around it. The world was surrounded by an ocean.

The contemporary scholars of Miletus were puzzled by the question: how could the Sun go under the water? Anaximander seemed to have explained the Thalesian tradition that saw the Earth as a disc floating in water. He claimed that the Sun returned to the east via a very high and big mountain to the north□these mountains' shadow would account for the night. He provided an ontological explanation of the universe's prime substance. This created the Earth's observable objects. This explanation contrasts with the Thalesian tradition, which maintains that water is the prime substance or material. It appeared that the ontological explanation of Anaximander laid the groundwork for idealism and abstraction in the geographical paradigms of the twentieth century. He

invented the term apeiron to represent the prime substance, which could not be felt with the senses, but rather became a concept—a particular mental image that could become a real substance through the process of deduction. Nevertheless, Thales and Anaximander offered different explanations as to whether water or apeiron should be considered the prime substance or vice-versa, which ultimately resulted in an obvious disagreement in Greek thought today. Hecataeus, who died around 475 BC, inherited the conflicting explanatory legacies of his predecessors. He was born around the time of the deaths of Thales and Anaximander. He seemed to have been the initiator of the literary tradition in ancient Greek studies. He gave a topographical explanation of the information that was brought to Miletus from both the known world of the Greeks and the dark world beyond the Greek horizon. His main creative endeavor was the Gesperiodos, or Description of the Earth, where he combined his literary talent with the topographical-ecological tradition, creating a new geography that has been in place for about two millennia. Hecataeus divided his work into two parts, each of which addressed one of the regions of the Earth.One book focuses on Europe, and the other on Asia and Libya.

He preferred to organize all the available information and knowledge about the known world in a usable form, which set forth a different approach to contemporary geographical scholarship. More than twenty-four centuries ago, these scholars of Miletus had different approaches. This shows the clear division between those who try to describe things and those who try to make generalisations. These two perspectives are referred to in modern geographical philosophy as "law seeking" and idiographic, which means descriptive of specific things. Since Hecataeus, scholars have maintained that one or the other approach is necessary for geographical study.

Thales, Anaximander, and Hecataus developed various methods that dominated ancient Greek scholarship for a century until a new approach in geographical studies emerged. He preferred a historical or traditional approach. He examined history from a genuine geographical perspective. He was recognized for the very old notion that every history should be treated geographically and every geography should be treated historically. He thought geography was the physical environment, the stage, through which historical events were understood. Sir Halford J. Mackinder, a prominent British geographer from the twentieth century, was strongly influenced by Herodotus' paradigm of historical geography, which included the recreation of past geographies and the teaching of geographical change over time. Mackinder's thesis on the Eurasian land

power in relation to the struggle between the Asiatic tribes and the European natives clearly reflected the historical tradition of Herodotus. Herodotus' personal observations from many years of travel were the basis for his contributions to geography.

Herodotus thought that the observational statements were the only ones that made direct reference to real-life phenomena Herodotus probably travelled across the Black Sea, the Russian steppes, and the Persian Empire for a long time, meeting people with a variety of cultural characteristics that the Greeks had never seen before. He observed those people's lifestyles and conveyed their cultural characteristics. He came to the conclusions based on indirect observation, and in a way, he was trying to merge his ideas with the most accurate understanding of the cultural context. Herodotus identified and criticized earlier geographical sources and incorporated them. He imparted earlier theories and description that would otherwise have been forgotten. He proved using historical geography that the delta was built by the Nile mud that fell in the Mediterranean. He restored the old shoreline and demonstrated that many former seaports were now far inland.

He also highlighted the physical process of delta-building, which was seen in many places. He not only mentioned the frequency of the Nile summer floods, but he also tried to explain them. Herodotus, like all the Greek scholars, agreed on the basic idea that the world should be arranged symmetrically. He accepted the Homeric conception of the Earth as a flat disc over which the Sen moved from east to west in an arc. Herodotus was the first scientist to draw a meridian on the map of the world. The meridian stretched from Egypt to the peninsula of Sinope, the mouth of Ister, and Cilicia, which is on the south coast of Turkey.

He didn't care about mathematical and astronomical issues, but later it became related to measuring the Earth's circumference and determining places' exact locations. Once the idea of an orderly universe was firmly established, it was natural to expect evidence to support it. It was during the time of Herodotus that an account of an orderly universe required the recognition of cause-and-effect sequences that occurred in accordance with some law. Plato (428–348 BC), who contributed significantly to the development of geographical concepts, provided a different perspective on the cause-and-effect sequences. He thought the world was absolutely perfect, but it is now deteriorating. He invented the deductive procedures and maintained that what we see on Earth were

nothing more than imperfect duplicates of ideas or perfect predicates from which things had degenerated or were in the process of degeneration. When compared to geographical paradigms that emerged in the mid-nineteenth century and persisted in the present century, Plato's deductive procedures seemed to have played a major role in the development of the natural sciences.

Aristotle is credited with the idea that the Earth can be habitable in different latitudes. He thought that habitability was a function of the distance from the equator. He thought that the areas of the Earth near the equator (the dry zone) were uninhabitable; that the regions of the Earth far away from the equator (the frigid zone) were always frozen and, therefore, unhabitable; and the temperate area between was the habitable area of Earth. He thought of a south temperate area that could not be reached from Greece due to the extreme heat in the torrid region (Glacken, 1956). Aristotle presented a model of the ideal or perfect state in politics. He spoke in terms of the "approximation" of the ideal state because he fully understood the theoretical limitations involved in this. Many important concepts in political geography were developed during his time. These include ideas about ideal population and area sizes for political viability and how they are related to technology changes; Population distribution patterns; the capital city's location and morphological issues, including strategic and economic considerations; boundaries versus frontiers as national space limits; and more. Aristotle's paradigm for scientific explanation focused on the use of logic to formulate and support theory, not on the verification of premises or controlled experiments. It has been rightly pointed out that Aristotle's abandonment precluded modern science. Aristotle's inductive methods, which favored the formulation of concepts as generalisations of empirically observed facts, had a significant influence on Alexander the Great. Alexander the Great saw the areal expression of various spatial phenomena in various nations he crossed in the east beyond the Greek zone of influence during his world conquest.

He was just a short distance from the east boundary of the habitable area/ekumene, His achievements revived Greek knowledge of the earth up to the Indus Valley. Consequently, he returned to the Greek world with a great deal of new observations about what it was like beyond the Greek horizon and how far and where to go to get to these strange places. In his book On Airs, Water, Places that Climate, Hippocrates (460-376 BCE) explained the physical and mental differences between people. He paid particular attention to the intermediary role of human occupation in

strengthening the correspondence between the physical environment and national character. Hippocrates probably made the first medical geography in the world. Pytheas's journeys to the north-west of the Greek world in western and northern Europe, sometimes between 330 and 300 BC, were significant because he was very close to the northern limit of the ekumene, or the habitable world. He brought with him a lot of new things to see about the people's customs and food habits in Great Britain, the use of barns to thresh grain in wet weather, and how agriculture in Britain from south to north changed. He most likely sailed along the eastern shore of the North Sea to Denmark today and mentioned the existence of a place called Thule, He says that at Thule, the sun stayed above the horizon during the whole of the longest day, which would put this place to the north in Norway or maybe Iceland. Before going on the journey, Pytheas must have observed the angle of the sun's shadow on a gnomon and from this measurement, the latitude was almost accurate.

Contemporary scholars believe that many of his observations and reports were correct, even though Greek scholars of his time dismissed them as pure fantasy. Because he was the first person to coin the term "geography" and put a stamp on the study of the Earth as the home of humankind, Eratosthenes (276-194 B.C.) is rightly called the "father of geography." He achieved remarkable precision in calculating the Earth's circumference. He is considered the first scientific geographer to maintain the mathematical geographical tradition, which was introduced by Thales much earlier in the seventh and sixth centuries BC.

Eratosthenes made two distinct observations of the position of the Sun at the summer solstice with the help of an indigenous apparatus called gnomon, which was introduced to the Greek world by Anaximander. There was one observation near Syene (Aswan).At this location, there was a deep well. At the summer solstice, the sun's image was reflected in the water at the bottom of the well. In the past, this strange event drew many visitors. This indicates that on that date the Sun was directly above the sky.Alexandria's outside museum was the second place to see a tall obelisk. Eratosthenes took the famous theorem of Thales, "When a diagonal line crosses two parallel lines, the opposite angles are equal," with these two distinct observations of the Sun's positions during the summer solstice in mind. The sun's parallel rays formed the parallel lines. At Syene, the sun's vertical rays could reach the Earth's core.

The Alexandrian vertical obelisk could also be extended to the centre of the Earth. The angle between the sun's rays and the Alexandria's vertical obelisk must then be the same as the opposite angle at the Earth's center. The following question was: How much of a circle's total circumference is subtended by the angle at the earth's center? He calculated this as one fifty percent of the total circumference. After that, the only thing to do was to add the distance between Syene and Alexandria, which was approximately 500 miles or 5000 stadia, and then multiply it by 50.Thus, Eratosthenes discovered that the entire Earth had a circumference of about 25,000 miles (actually, its circumference measured through the poles is 24,860 miles).

Eratosthenes mentioned that Alexandria was due north of Syene, but it is about 3°W of Syene. According to Egyptian calculations, the road between Syene and Alexandria is 453 miles long, and Syene is at 24°5′N, a little north of the cancer tropic. However, all these mistakes were removed, so the resulting calculation was surprisingly close to the correct figure (Thomson, 1965, 159-61).Eratosthenes also tried to figure out how far the Sun and Moon were from Earth. He found that the Moon was 780,000 stadia (78,000 miles) away from the Sun and the Sun was 40,00,000 stadia (4,00,000 miles) away. He wrote a book on the habitable part of the Earth, or the ekumene, and he heavily relied on the assumptions and accounts of Aristotle and Pytheas respectively when he was preparing it.

He approved the massive split of Europe, Asia, and Libya.He established mathematical boundaries for the five primary climatic zones: a dry zone, two temperate zones, and two frigid zones. The entire circumference of 48 degrees was the torrid zone; the tropics were located 24 degrees north and south. Each pole extended 24 degrees to the frigid zones The temperate region was located between the tropic and polar circles. His ekumene stretched from Thule, which is near the Arctic Circle, in the north, to Taprobane (Ceylon), which is in the Indian Ocean, in the south, and from the Atlantic Ocean to the Bay of Bengal, which he thought was the eastern boundary of the habitable region. Eratosthenes created a world map using a frame of north-south and east-west lines, but these lines were not spaced consistently. He used the Alexandrian meridian, which extends south through Syene and north through Rhodes and Byzantium, as the prime meridian. Additionally, he used the latitude of the Hercules' Pillars, which he believed to have crossed through Rhodes (Sarton, 1964, 106-08).Based on this frame of the north-south and east-west lines, he made his world map. His development of global coordinates

systems, including latitude and longitude, which he used to locate places and measure distances, was of equal importance. Traditional location measurements have been replaced by geographic order. At the museum in Alexandria, Eratosthenes's drawings were later developed by his students and successors.

Hipparchus is credited for creating the projection and illustrating how the Earth's surface is curved on a flat surface. Two types of projection, orthographic and stereographic, were introduced to the Greek world by him. He demonstrated how to create an orthographic projection by projecting the latitude and longitude lines from a point of infinity, and how to create a stereographic projection by putting a flat parchment at a tangent to the Earth and extending the lines from a position opposite the point of tangency. Additionally, he made it apparent that the center would appear excessively large on the orthographic map and too small on the stereographic map with respect to the peripheral. Hipparchus countered that neither projection would depict the entire globe, simply one hemisphere. Upholding the mathematical legacy of geography, Hipparchus noted that by charting locations in a theoretical grid and improving the usefulness of the instrument he devised for its exact results, geography might become more relevant and precise. He mentioned that one might compare the local times of an eclipse's beginning at several locations to find the longitude by calculating the time disparities. However, thousands of years after his time, no attempt was made to create a system of coordinated observations. During his time, geography became increasingly mathematical and technical, with astronomy emerging as the field's central concept.

The contributions of Posidonius would remain unacknowledged throughout the history of ancient Greek scholarship. Posidonius was a man who lived just before Christ. He was the one who redrew the Earth's circumference calculations and came up with a significantly smaller estimate than Eratosthenes. He measured Canopus's (a first-magnitude star) height above the horizon at Rhodes and Alexandria, which he believed to be on the same meridian. Then, using the average ship's sailing duration, he calculated their distance from one another. His calculation for the Earth's circumference came to 18,000 miles. The distance between the westernmost point of Europe and the easternmost point of the Ekumene was grossly exaggerated by him. Posidonius believed that the temperate zone near the tropics had the greatest temperatures and the driest deserts, whereas the temperatures near the equator were significantly lower. In doing so, he disproved Aristotle's earlier assertion that the heat rendered the equatorial portion of the

torrid zone uninhabitable. Nevertheless, as Posidonius lacked access to reliable accounts from individuals who had successfully crossed the Sahara, his conclusion regarding the habitability of the equatorial portion of the torrid zone was entirely based on his imagination. The Sun is overhead for a substantially shorter period at the equator and stops longest close to the tropics.

ROMAN GEOGRAPHERS

The geographical traditions of the Greeks were mostly adopted by the ancient Roman academic community. There was hardly much new geography developed by the Romans. A man named Marcus Terentius Varro wrote a geography compendium long before the time of Christ. It included a notion of civilization stages that was virtually uncontested until the nineteenth century. Man's culture, according to Varro, follows a set path. Man originally obtained his meals from the things that the unspoiled Earth simultaneously generated. From this first condition of nomadism, man progressed through stages of agriculture, pastoral nomadism, and finally, modern culture.

Greek scholar and traveler Strabo (63 BC–24 AD), writing during the height of the Roman Empire, was greatly influenced by Homer, Hecateaus, and possibly Aristotle's historical topographical tradition. It's commonly believed that Strabo was the one who ultimately summarized the historical legacy that the Greek scholars had introduced to geographical studies. According to his claim about the geographer, "the geographer must in the same way take his point of departure from the man who has measured the Earth as a whole, having confidence in him and in those in whom he, in turn, had confidence," just as the astronomer and the physicist provide the geographer with their principles.

Secondly, he needs to appropriately address the various regions of the world that are inhabited, both on land and at sea, mentioning in passing any instances where our forebears, who we consider to be the most knowledgeable on the subject, have handled the subject insufficiently (Strabo, trans. Jones, 1917, 429-31). Strabo acknowledges that Eratosthenes' definition of Aristotle's zones of ekumene is accurate. He then asserts that latitude 12"–30' N is the limit of human life that can exist towards the equator, although he does not provide evidence to support this claim. Additionally, he sets the cold as the limiting factor 400 miles north of the Black Sea as the northern limit of the habitable Earth. Strabo acknowledges Posidonius's roughly 100 BC calculation of the Earth's

circumference. He correctly explains the Nile floods by linking them to Ethiopia's intense summer rainfall (James and Martin, 1981, 36). Strabo draws the conclusion that a geographer needs a strong mathematical foundation to accurately describe the components of the ekurnene, drawing on the works of Hipparchus and Posidonius.

Geographia is a 17-volume treatise written by Strabo. This was essentially an encyclopaedic account of the known world, whose main contribution to history was the preservation of numerous writings that he mentioned and annotated for future generations. Geographia also contained explanations of local customs, governance systems, and cultural diversity. Many locations were brought up while discussing the importance of matural conditions for cultural development, particularly when describing Italy (Holt Jenson, 1981, 11). Strabo's first two books offer a historical account of the development of geography starting with Homer, who is regarded as the father of all geographic knowledge. He also goes into great length about the contributions made by Posidonius, Hipparchus, and Eratosthenes. He writes eight books on Europe, six about Asia, and one about Africa, mostly about Ethiopia and Egypt. Political geography is the area in which Strabo made the most contributions, continuing the Aristotelian tradition. He investigates the conditions necessary for the effective operation of larger political units in his Geographia and concludes that a potent central government and a single head of state are necessary components of success. It is not unexpected, considering the political climate of the day, that Italy, the center of the Roman Empire, was best prepared to play this role given its location in the then-known Mediterranean region.

Its "perfect" weather regime, and its balance of varied resources. Once more, these conclusions can be explained by ethnocentrism combined with inherited deterministic ideas about environmental political interactions. Following Strabo's monumental work Geographia, a wealth of sailing materials was compiled for ship captains' guidance during this period. These materials described ports and coastlines with great accuracy and detail, such as the Periplus of Arrian for the shores of the Euxine (Black Sea) and the Periplus of Scylax for the shores of the Mediterranean. The most comprehensive work of this type was an anonymous one that provided traders and navigators with a guide covering the Red Sea, the northern side of the Indian Ocean up to the southern end of the Malabar coast in India, and the east coast of Africa as far south as Zanzibar (more than 6 degrees south of the equator). Bunbury dates the famous Periplus of the Erythraean Sea to a period approximately ten years following Pliny's demise in 79

AD. Without access to the writings of Aristotle, Posidonius, or Strabo, the merchants, and sailors of the first century after Christ were thankfully unaware of the terrible fate that would await those who ventured within 120 degrees of the equator or the impossibility of sustaining life in this central region of the torrid zone. The great achievement of Ptolemy (Claudius Ptolemaus, AD 90–168) effectively ends the mathematical tradition in ancient geographical scholarship, a legacy that the Greek scholars continued into the succeeding ages of academic breakthroughs since Thales.

A large portion of his geography, which he describes as a study of the art of mapping, appears to have been taken from earlier writings by Posidonius, Hipparchus, Aristotle, and Marinus of Tyre, his teacher. Ptolemy tried to organize the ancient Greek concepts of geography and astronomy into categories and prepare them for scientific study. His outstanding contribution to classical astronomy, the Almagest, which for a long time stood as the accepted reference work on celestial body movements, illustrates his debt to Posidonius, Hipparchus, and Aristotle.

Aristotle's tradition—which held that the Earth was a sphere with a stationary center and the celestial bodies around it in circular motions—is reflected in Ptolemy's conception of the universe. Up until the seventeenth century, when Copernicus arrived on the scene, this was the widely held belief. Based on the split of the circle into 360 pieces, Hipparchus created a grid of latitude and longitude lines, which he embraced. Therefore, it would be possible to pinpoint the exact location of every place using mathematics.

His greatest error was underestimating the size of the Earth; he rejected Eratosthenes' nearly accurate estimate in favor of Posidonius, who revised the Earth's circumference. In addition to advocating a lower estimate of the Earth's diameter, Ptolemy also mistakenly increased the land area's eastward extension. His otherwise accurate map of the then world had too many degrees of longitude because longitude calculations had to be based on somewhat erratic travel distances. The map included the interior of China and stretched from a prime meridian in the Canary Islands to a 180-degree meridian. (Jenson, Holt- 1981, 11). Following Marinus, Ptolemy adopted his prime meridian as a north-south line. Ptolemy's modification and refinement of earlier maps, achieved by adopting a projection for the world map that displayed the graticule of latitudes and longitudes, was his greatest contribution to the art of map building.

He was much ahead of his contemporaries in terms of the mathematical formulation of projections. He depicted the meridians as straight lines that cut the equator at right angles and converge at a point (pole) that is located outside the bounds of the map, and the equator and latitudes as parallel curves. To make the meridians more closely match reality, he then reduced them to a curved form as well.

Ptolemy disregarded the theories of Strabo, Hecateaus, and Herodotus, who all thought that Asia was surrounded by an ocean. It was Strabo who noted that Agisyamba was the most southerly point in Asia, whereas Sera and Sine (in China) were only the easternmost. Additionally, he added a notation to his map—likely taken from Hipparchus—that land to the south closed off the Indian Ocean. Ptolemy did, however, acknowledge Aristotle's theory that heat rendered the regions of the Earth close to the equator inhospitable. It's noteworthy to note that Ptolemy acknowledged Posidonius' inaccurate calculation of the Earth's circumference, but he disregarded Posidonius' accurate assessment of the equatorial region's habitability.

As James and Martin correctly point out, "The geographical horizons that the Greeks had expanded both physically and cognitively closed in again with Ptolemy's death. It took several centuries before intellectuals' attention was once again drawn to the endeavor of characterizing and explaining the Earth's surface as the home of humans.

ARAB GEOGRAPHERS

In the Middle Ages, Arab geographers prioritized formulating their ideas as generalisations of empirically observed facts and stressed the importance of direct observation. They made significant contributions to geographical knowledge unlike their counterparts in the Christian world. Some Arab scholars made logical deductions from existing theories and their conclusions were close to realities. They would be remembered for a long time for some of their concepts, models, and paradigms that still govern the teaching of geography. It would be appropriate to give a summary of the factors that seemed to have broadened and enriched the Arab geographic horizon from 800 to 1400.The geographical writings of that time used a much wider range of sources than those of Christian scholars. The medieval spread of the Arabs was a significant event that expanded and broadened the scope of Islam's religion. Because it often united the Arabic-speaking people of Arabia who had no feeling of unity, Islam became the 'raison d'être' of

the Arab world. The Islamic community set out to conquer the world outside of Arabia. They took over Egypt in 642 after subduing Persia in 641.

They crossed the Sahara and occupied the Great Desert by 732. They marched into France across the Iberian Peninsula. The majority of the Iberian Peninsula had been under Arab dominion for about nine centuries. Additionally, India and later several of the islands in Southeast Asia came under Arab dominion. Military missions into the Russian Steppes across the Black Sea were organised by the Arabs. They were able to unravel the ancient Greek heritage in geographical research preserved at the museum in Alexandria, as well as gain fascinating knowledge about the area and people they conquered, through a series of military campaigns across Europe, North Africa, and Asia. Baghdad, which the Arabs constructed in 762 next to the remains of Babylon, was the epicentre of the intellectual world for more than a century and was the epicentre of Arab geography. Baghdad can be likened to Miletus, the Greek intellectual hub that persisted as a hub for scholarly advancements from 770 to 570 BC. The endeavour of translating the writings of Greek philosophers and intellectuals into Arabic was initiated under the patronage of Caliph Harun al-Rashid. All accessible sources were consulted for materials related to geographical Concepts and translators were compensated with gold equivalent to the weight of their volumes (Ahmed, 1947, 5). Thus, a plethora of novel concepts from many origins started to disperse over the Arab world from Baghdad. Latin translations of the Arabic texts eventually brought the advances to Christian Europe.

Among other advances, the Hindus introduced the decimal system of mathematics to Baghdad, having learned it from the Chinese. It is also noteworthy that Arab academics and geographers demonstrated a sincere interest in Greek customs and ideas as opposed to Roman ancestry.

They thought that the Earth was at the centre of the world and that the heavenly bodies revolved around it in circles, adopting Greek ideas about the size and shape of the planet. The scholars of the Baitul-Hukma (Academy) tried to recalculate the Earth's circumference under the guidance of Al-Mamum. They employed the identical technique that Eratosthenes had developed some 10 centuries earlier. They drew a north-south line on the level Euphrates plain and used star observations to determine the latitude at each end. After calculating the separation between the fixed sites, they determined that a degree was 56-2/3 Arabic miles long. Despite trying a few different metrics, the researchers came to nearly identical conclusions. These results were significantly too low because of linear measurement mistakes. Thus, it was discovered that the Earth's

circumference was 20,160 miles, a significant difference from Eratosthenes' original calculation. The Arabs believed that Sila (Japan) formed the eastern boundary of the known ekumene, while the Mediterranean Sea established its western boundary.

In addition to Greek translations, Arab visitors' reports and accounts were available to them in mediaeval Arabia. Compared to their counterparts, they therefore possessed far more precise understanding of the world. Ibn-Haukal was among the first Arab explorers, having passed through some of the most inaccessible parts of Asia and Africa. He travelled to a location around 20° south of the equator by sailing down the coast of east Africa. He was shocked to discover that a sizable population resided in those latitudes. He rejected the Greek theory that the equatorial regions were uninhabitable because of this discovery. Despite Ibn-Haukal's finding, the Greek notion of the habitable zone endured for a longer time and manifested itself in various ways. Early mediaeval Arab scientists made significant contributions to the fields of climatology and physical geography, and some of their ideas are still relevant today.

They observed significant changes in climate and the forces that shaped landforms. Al-Balkhi gathered meteorological data in 921 by examining the reports of several Arab explorers who took firsthand observations throughout their travels and excursions. Al-Balkhi created the first climate atlas in history, Kitab al-Ashkal, based on the climatic data he collected. Al-Masudi Born in Baghdad around the end of the ninth century and dying in 956, Al-Masudi travelled as far south as Mozambique, which is south of the equator, and wrote an excellent account of the monsoon. It appeared that his theory about the monsoon was developed as a generalisation of factual observations of the weather he saw while travelling the east African coast. He explained the process by which moisture evaporates from water surfaces and condenses into clouds.

He thought that the Earth's surface had to be curved because of his understanding of the planet's sphericity. He expressed a viewpoint on environmental determinism and described how the environment affects people's views and ways of living (Husain, 1988, 91). Al-Maqdisi produced a revised global climate map in 985 that included 14 climatic zones, outlining improvements over Al-Balkhi's map. Al-Maqdisi believed that the position of east and west also affected the climate, in addition to latitude. He also proposed that most of the world's land area was in the northern hemisphere and that the southern hemisphere was essentially open.

Al-Biruni and Ibn-Sina would be well-known for their contributions to geomorphology but Al-Balkhi, Al-Masudi, and Al-Maqdisi could be recognised for their

work in climatology. Al-Biruni, who visited India in Mahmud Ghaznavi's era, wrote his magnificent geography of India, "Kitab-al-Hind," in 1030. The processes that shape land formations under typical circumstances are covered in the book. The spherical stones he saw in the alluvial deposits south of the Himalayas had a purpose, which he determined. As the stones tumbled in the raging mountain streams, they grew more rounded. Additionally, he noticed finer alluvial materials located further away from the mountain and coarser alluvial materials closer to the mountain. A fascinating remark that he likely gathered from the narratives of explorers who may have been as far south as possible before the eleventh century is "the south pole night ceases to exist." The concept of landscape erosion is attributed to Avicenna or Ibn Sina. In the mountains of central Asia, he had the chance to watch as mountain streams carved out their valleys. Based on this discovery, he hypothesised that streams were continually eroding mountains, with the highest peaks occurring in areas where the rocks were more resistant to erosion. After being elevated, mountains are subjected to this gradual deterioration process, which proceeds gradually.

Ibn Sina also noted the existence of fossils in the rocks of high mountains, which he explained as instances of nature's failed attempts to produce living plants or animals. James Hutton put up similar theories about the erosion process eight centuries later. He was illiterate in Arabic and most likely had never heard of Ibn Sina. For the first time, the errors of the Roman geographer Ptolemy were extensively corrected by Al-Idrisi, also known as Edrisi. Al-Idrisi believed that there were questions about how mountains, rivers, and coasts were arranged. He was able to develop a new geography based on a wealth of new facts.

In his book Amusement for Him Who Desires to Travel Around the global, published in 1154, he refutes two of Ptolemy's claims: that the Indian Ocean is confined, and that the Caspian Sea is a gulf of the global ocean. In addition, he corrects the alignment of numerous significant mountain ranges and the courses of various rivers, including the Danube and the Niger. He had demonstrated the inaccuracy of the Greek classification of the world into five climatic zones and proposed a more complex global climate system (Holt-Jenson, 1981, 11).

Abdullah Muhammad, often known as Ibn-Batuta, was a renowned Arab traveller of the Middle Ages. Born in Tangier in 1304, he made the customary pilgrimage to Mecca in 1325 at the age of 21, proposing to finish his studies in modern Arab law there. However, he was primarily interested in the countries and people of Egypt and North

Africa, which he travelled through on his way to Mecca. His fascination with the natural world led him to abandon his legal studies and focus instead on exploring the then-Arab region.

He took great care to avoid taking the same path twice. He travelled to several hitherto unexplored regions of Africa. After sailing through the Red Sea, he stopped in Ethiopia before continuing south down the East African coast to Kilwa, which is approximately 10°S of the equator. It was then that he discovered an Arab trading centre called Sofala in Mozambique, which is located more than 20° south of the equator and south of the present-day port of Beira. His trip to the southern equator verified what Ibn-Haukal had hinted at back in the tenth century: that the East African torrid zone was not actually arid but rather home to a sizable aboriginal population, which supported Sofala's very existence. Ibn-Batuta set off once more from Mozambique for Mecca, where he stopped briefly before continuing to Baghdad, Persia, and the region surrounding the Black Sea. He crossed the Russian steppes on his way to Bukhara and Samarkand. He entered India after passing via Afghanistan and over the Asiatic Mountains. He spent several years in the Mongol emperor's court in Delhi and had the chance to see a lot of India.

He was sent to China as an ambassador by the emperor, but he did not get there in time for several reasons. Ibn-Batuta did, however, first go to the Maldives, Ceylon, and Sumatra before arriving in China, where he spent a shorter amount of time. When he eventually left India, he went back to Morocco's capital, Fez, in 1350. He visited Spain in 1351 and returned to Fez once more. Ibn-Batuta crossed the Sahara in 1351–1353 and arrived at Timbuktu on the Niger River.

While there, he collected valuable information about the cultural characteristics of the Arab Negro tribes residing in that region of Africa. He eventually made his home in Fez in 1353, following the Sultan's orders.

Writing a detailed narrative of his travels was Ibn-Batuta's primary focus (Ibn-Batuta, 1358). He travelled a linear distance of roughly 75,000 miles over the course of thirty years, setting a global record for the fourteenth century. Unfortunately, because no attempt was made to translate his Arabic text into Latin, it had little influence on the Christian world.

Ibn-Khaldun, who lived from 1382 until 1405, was the last truly outstanding Islamic geographer of the Middle Ages. Through the analysis of empires' rise and collapse in his books, he laid the groundwork for political geography. He was born on the

northwest African Mediterranean coast, just as Ibn-Batuta. The most of his life was spent in the towns of what are now Algeria and Tunisia; he also briefly resided in the Arab region of Spain.

At the age of forty-five, in 1377, he finished writing the extensive Introduction to History, or Muqaddimah, to his world history. It represents, among other things, the politico-geographical ideas of the Arab world in the late fourteenth century and is the most comprehensive autobiography known in the history of the Middle East. The book starts off by talking about the physical environment of humanity and how it affects them. It then identifies the aspects of humanity that are more closely linked to their culture or way of life than to their surroundings. Ibn-Khaldun focused on the tribe and the city, which represented the conflict between sedentary and nomadic nations and were the most potent entities in the political structure of his own day.

It was believed that Bedouins, who were nomadic or barbaric, and urban, sedentary peoples were linked and 'natural' tribes. He provided a deterministic explanation of these disparities by pointing out that although industry and commerce require an urban setting, agriculture and animal husbandry require a desert lifestyle. On the evolutionary scale, however, both groups were considered linked, with the Bedouins of the desert coming before the people of the cities. The latter were the offspring of nomad immigrants who had advanced to the point where decay settles in their towns, having attained the pinnacle of civilization.

Ibn-Khaldun also talked about how the group operated in space, and it is in this context that the nature of territoriality and environmental-political relations are relevant. He suggested that while the sedentary people represented fixed concentrations of money, a lack of courage, loyalty, common heritage, and tribal cohesion, the Bedouins exhibited traits of courage, alertness, and loyalty in plenty. Where the two types of socio-political organisations were adjacent, there was a functional relationship between them that was dominated by the sedentary state both politically and economically. This meant that the sedentary states had to create new and complex systems of political organisation to protect themselves from attacks and to exercise self-government.

According to Ibn-Khaldun, warlike nomads frequently established vast nations; however, with time, the nomads were assimilated by their permanently settled subjects as peasants and town people, the kings lost their will to fight, and ultimately their kingdoms fell. He was alive when the Islamic state he was living in collapsed, and he also made the prediction. He did, in fact, meet the conqueror and devastation-causing Tamerlane at the

fall of Damascus in 1400 (Holt- Jenson, 1981, 11–12). The initial theory of the life cycles of the state, which is still somewhat applicable in tribal Africa and Asia, is attributed to Ibn-Khaldun.

While his conclusions about the ekumene and other facets of climatic determinism seems to have been drawn from previous Greek ideas, his generalisations about the Bedouin and sedentary states/political organisation were grounded in observed facts. He agreed with the conventional theory of the seven climatic zones that run parallel to the equator. He reiterated the Aristotelian theory—which he took from the Norsemen—that "there existed an uninhabitable zone along the equator because of intense heat, and an inhabitable polar zone because of cold." Ibn-Khaldun agreed with Albertus Magnus when he observed that black individuals eventually turned white or had white offspring when they relocated to a temperate region, whereas black people who stayed too near to the sun turned black."While it is true that Ibn-Khaldun may have discovered the true nature and scope of geographic inquiry, his ideas about the influence of the environment are not highly sophisticated, and his knowledge of the physical Earth is largely based on Greek theory" (Kimble, 1938, 180).

3.4 SUMMARY

The cornerstone of scientific geography was unquestionably formed by the erudition of the ancient Greeks, while significant paradigms based on factual observations were established throughout later times of academic innovation. The approaches we refer to as scientific procedures were devised by the Greeks. If general principles and observed facts diverge, the principles need to be updated. The science of astronomy was developed by the Greeks. Throughout the entire history of geographical concepts, this was a huge advancement. The earlier maps were much more inaccurate and less precise than those created by the Romans, particularly Ptolemy.

Within Greek geographical studies, there appears to have been a division between proponents of the mathematical tradition and those who favored the literary-historical tradition. The opposing methods of those who attempted to define distinct objects and those who attempted to create generalization regions also contributed to the emergence of dualism in modern geographical concepts.

3.5 GLOSSARY

Ancient-	Belonging to a period of history that is thousands of years in the past.
Observations-	The act of watching carefully to learn something.
Archaeological evidences-	Physical artefacts left behind by people who lived in the past.
Civilizations-	A society which has its own highly developed culture and way of life.
Astronomy-	The scientific study of the Sun, Moon, Stars.
Antiquity-	The ancient past
Pioneered-	A person who is one of the first to develop an area of human knowledge, culture.
Angle-	The space between two lines or surfaces that meet, measured in degrees.

3.6 ANSWER TO CHECK YOUR PROGRESS

- The period of unprecedented advancements in various fields of knowledge by Greek scholars is known as "Golden Age of Greece."
- Astronomy was developed by the Greeks.
- Homer was credited with being the father of Geography by Greek Geographers.
- Homer was the composer of the epic poem-Iliad, which describes episodes of the Trojan war sometimes between 1280 and 1180 BC.
- A second great epic poem: the Odyssey was written by Homer.
- The Greek sailors in the 8th century BC referred to the winds and associated weather types to identify directions to sea.
- They distinguished four directions: Boreas was the north wind -strong, cool with clear skies; Eurus was the east wind- warm and gentle; Notus was the south wind on the front of an advancing storm-wet and sometimes violent; Zephyrus was the west wind- balmy but with gale force.
- Thales was the first one to be concerned about the measurement and location of things on the surface of the earth.

- Thales on a trip to Egypt, observed the priests at work measuring angles and base lines and computing areas.
- Thales said that the universe is made of water in various forms and visualised the earth as a disc floating in water.
- Anaximander was a younger contemporary of Thales in Miletus.
- Anaximander is believed to be the scholar who introduced a Babylonian instrument called gnomon into the Greek society.
- Anaximander's map had Greece in the centre and the other known parts of Europe and Asia were plotted around it.
- Anaximander map was circular and surrounded by ocean in all directions.
- Hecataeus was the first Greek writer of prose.
- Ptolemy authored the great work on classical astronomy "the Almagest."
- After completing Almagest, Ptolemy undertook the preparation of a Guide to Geography.
- Al-Masuadi was a geographer, a historian, a world traveller, and a profit writer.
- Al-Masuadi travelled extensively and prepared a good description of the monsoon.
- Al- Biruni wrote kitab-al-hind.
- Al- Biruni wrote on cartography, geodesy and surveying.
- Al-Idrisi contributions lies in medicinal plants.
- Al-Idrisi wrote Kitab-Al-Jamili-Sifat-Ashtata al Nabatat.
- Arabs made outstanding contributions in the field of Mathematics, physical and regional Geography.

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3.8 TERMINAL QUESTIONS

Q.1. What were the major advancements in geographical studies during classical period?

Q.2. What were the effects of various geographical studies conducted by Greek and Roman scholars on the development of the discipline?

Q.3. Give the facts which encourage Arabic scholar to develop the geography?

Q.4. Name important scholars who contributed Muslim geography?

Q.5. What were the major contributions of various Greek scholars in the field of geography?

Q.6. What were the major contributions of Roman scholars in the field of geography?

UNIT-4 RENAISSANCE, EIGHTEENTH CENTURY GEOGRAPHY, CLASSICAL PERIOD OF GEOGRAPHY

4.1 OBJECTIVES

After reading this unit, you will be able to:

- Understanding the impact of voyages and discoveries.
- Learn about geography in the eighteenth century.
- Gain knowledge about Classical period of modern geography.

4.2 INTRODUCTION

One of the key developments of the Renaissance period was the rediscovery and reinterpretation of classical texts, including the works of ancient Greek and Roman geographers such as Ptolemy and Strabo. Scholars during the Renaissance revisited these foundational texts, leading to a renewed interest in the geographic knowledge of antiquity. This revival of classical learning laid the groundwork for a more systematic and intellectually rigorous approach to geography.

The Renaissance also witnessed significant advancements in cartography. Innovations such as the use of perspective in maps and the creation of more accurate representations of geographical features contributed to a more sophisticated understanding of the Earth's surface. Pioneering cartographers, including Gerardus Mercator and Martin Waldseemüller, produced maps that reflected both a deepening knowledge of geography and an appreciation for aesthetic design.

Moreover, the Renaissance period saw the emergence of polymaths who made substantial contributions to geography. Notable figures like Leonardo da Vinci and Gerhard Mercator excelled not only in cartography but also in diverse fields such as anatomy, engineering, and mathematics. Their interdisciplinary approach to knowledge significantly influenced the holistic understanding of geography as a discipline that encompassed both the physical and human dimensions of the world.

The eighteenth century marked a significant period of evolution for the field of geography, as intellectual currents from the Enlightenment and increased global exploration fuelled a more systematic and scientific approach to geographical inquiry. During this era, the Enlightenment ideals of reason, empiricism, and a commitment to understanding the natural world through observation and analysis had a profound impact on geography. Enlightenment thinkers, including philosophers like Voltaire and

Montesquieu, emphasized the importance of empirical evidence and the scientific method, influencing the way geographers approached the study of the Earth.

Geography in the eighteenth century experienced a shift towards a more scientific and systematic methodology. The rise of scientific societies and academies provided a platform for the exchange of ideas and the publication of research findings. Geographers increasingly utilized empirical observations, surveys, and measurements to contribute to a more accurate and detailed understanding of the Earth's surface. The era witnessed advancements in mapping techniques, as cartographers endeavored to produce more precise and comprehensive maps reflecting both physical and human geography.

Global exploration and colonial expansion during the eighteenth century also played a pivotal role in shaping geographical knowledge. Voyages of discovery, such as Captain James Cook's expeditions, brought back detailed information about previously unknown lands, flora, and fauna, enriching the geographical understanding of the time. The increased availability of travel narratives and accounts further stimulated public interest in the diverse cultures and environments across the globe.

The eighteenth century laid the groundwork for the emergence of modern geography as a distinct academic discipline. Geographers increasingly sought to understand the interconnections between physical and human geography, exploring themes such as environmental determinism and the impact of human activities on landscapes. This era set the stage for the nineteenth-century developments in geography, including the rise of regional geography and the formalization of the discipline within educational institutions.

4.3 IMPACT OF VOYAGES AND DISCOVERIES

The impact of voyages and discoveries on geography has been profound, shaping the discipline's evolution and expanding humanity's understanding of the world. From the Age of Exploration in the 15th century to subsequent maritime expeditions, these journeys have contributed immeasurably to geographic knowledge, cartography, and our perception of the Earth's diverse landscapes and cultures. Notable explorers, such as Christopher Columbus, Ferdinand Magellan, and James Cook, navigated

uncharted waters, unveiling new continents, oceans, and territories. Their discoveries not only filled blank spaces on maps but fundamentally altered the way people perceived the global environment.

Geographic discoveries profoundly influenced trade, commerce, and the establishment of colonial empires. The opening of maritime routes facilitated the exchange of goods, ideas, and cultures between different parts of the world. This interconnectedness laid the foundation for globalization, shaping economic systems and cultural interactions on a global scale. The Columbian Exchange, for instance, had far-reaching consequences, introducing new crops, animals, and technologies to different continents.

While the impact of voyages and discoveries on geography has been overwhelmingly positive in terms of expanding knowledge and connectivity, it is essential to recognize that it also had negative consequences, including the exploitation and colonization of indigenous peoples and the distortion of cultural narratives. Nevertheless, the legacy of these journeys endures, as they remain pivotal in shaping our contemporary understanding of the interconnectedness and diversity of the planet. The impact of voyages and discoveries continues to resonate in the ongoing exploration of Earth and the pursuit of knowledge about our dynamic and interconnected world.

Marco Polo introductory life, voyages and contribution in geography

Marco Polo, born in Venice, Italy, in 1254, was a Venetian merchant, explorer, and one of the most influential figures in the history of geographical exploration. At the age of 17, he embarked on an epic journey with his father Niccolò and uncle Maffeo Polo, venturing along the Silk Road to the distant lands of the East. Marco Polo's voyages, spanning from 1271 to 1295, constitute one of the most remarkable journeys in the annals of exploration. The expedition began in Venice, where Polo, along with his father Niccolò and uncle Maffeo, set out for the East at the behest of Kublai Khan, the Mongol ruler of China. Their travels took them across a vast expanse of Asia, navigating through treacherous terrains and encountering diverse cultures. The Polos traversed the Persian Empire, crossed the Pamir Mountains, and ventured through Central Asia, reaching the court of Kublai Khan in Shangdu (present-day Shangdu in Inner Mongolia, China). Polo's detailed accounts shed light on the opulence of the

Khan's court, the advanced technologies employed in China, and the economic prosperity of the Mongol Empire.

Polo's stay in China was extensive, and he served Kublai Khan in various capacities, undertaking diplomatic missions and administrative roles. His experiences allowed him to witness firsthand the cultural richness, economic activities, and societal structures of the far East. Polo extensively explored China, visiting regions like Yunnan, Tibet, and coastal provinces, before embarking on maritime ventures to Southeast Asia. His voyages encompassed an extraordinary range, from the bustling markets of Hangzhou to the intricate canal systems of Suzhou.

The return journey to Venice was no less adventurous, with the Polos opting for a southern route that took them through the Malay Archipelago, Persia, and overland to the Black Sea. The trio encountered diverse landscapes, encountered indigenous peoples, and navigated political complexities. The wealth of information accumulated during these voyages, along with Polo's observations of trade routes, cultural practices, and geographic features, culminated in the composition of "Il Milione" or "The Travels of Marco Polo." While the accuracy of some details in Polo's account has been debated, his voyages undeniably had a profound impact on European understanding of the East. Polo's descriptions of the riches of the Orient, including silk, spices, and precious gems, ignited European interest in trade routes to Asia and contributed to the broader geographical knowledge of the medieval world. The voyages of Marco Polo remain a testament to the spirit of exploration and cross-cultural exchange during the Middle Ages.

Prince Henry

Prince Henry the Navigator, born on March 4, 1394, in Porto, Portugal, was a key figure in the Age of Discovery during the 15th century. The third son of King John I of Portugal and Queen Philippa of Lancaster, Henry played a pivotal role in shaping Portugal's maritime exploration efforts. Despite never undertaking extensive sea voyages himself, Prince Henry earned the epithet "the Navigator" due to his instrumental role in advancing navigation and exploration. His early life was marked by exposure to the courtly traditions of chivalry and education in navigation, mapmaking, and astronomy. Following the capture of Ceuta in North Africa in 1415, Henry became

increasingly fascinated with maritime activities, envisioning a route to Asia that bypassed the overland trade routes controlled by the Ottomans.

As governor of the Order of Christ, a position he assumed in 1420, Henry spearheaded Portugal's maritime expansion efforts. Establishing a navigation school in Sagres, he brought together scholars, navigators, and cartographers to advance the understanding of navigation techniques, ship design, and mapmaking.

Christopher Columbus

Christopher Columbus, born between August 25 and October 31, 1451, in Genoa, Italy, was an Italian explorer and navigator who played a pivotal role in the Age of Exploration. Little is known about his early life, but Columbus gained maritime experience in his youth, likely working as a sailor and trader. Inspired by a vision of finding a westward sea route to Asia, Columbus sought support for his ambitious plan from various European courts, including Portugal and Spain. After facing initial rejections, Columbus found patronage from King Ferdinand II of Aragon and Queen Isabella I of Castile. In 1492, with a fleet of three ships—the Santa Maria, Pinta, and Niña—Columbus set sail from Palos de la Frontera, Spain.

Christopher Columbus embarked on a series of four voyages across the Atlantic Ocean, each with its own set of challenges, discoveries, and historical significance. His first expedition, sponsored by King Ferdinand II of Aragon and Queen Isabella I of Castile, set sail from Palos de la Frontera, Spain, on August 3, 1492. The fleet consisted of three ships—the Santa Maria, Pinta, and Niña. On October 12, 1492, Columbus made landfall in the Americas, specifically on an island in the present-day Bahamas. Although he initially believed he had reached the outer islands of Asia, this moment marked the first recorded European contact with the New World.

Columbus continued his exploration, visiting various Caribbean islands, including Cuba and Hispaniola. The first voyage was characterized by encounters with indigenous peoples, establishing relations, and a mixture of hope and disappointment as Columbus searched for the anticipated riches of Asia. After the Santa Maria was wrecked on Hispaniola, Columbus left a small settlement and returned to Spain with the Niña and Pinta in 1493. The second voyage, commencing in September 1493, aimed to establish permanent settlements and explore further. Columbus explored more

Caribbean islands, including Puerto Rico, and encountered the Taíno people. The expedition marked the beginning of Spanish colonization in the Americas. In 1498, Columbus embarked on his third voyage, navigating farther south and reaching the coast of South America. He explored the Orinoco River and parts of present-day Venezuela, contributing to the understanding of the continent's geography.

The fourth and final expedition began in 1502, as Columbus sought a westward route to Asia. Facing challenges such as shipwrecks and deteriorating health, the voyage resulted in explorations along the Central American coast. Columbus's governance during this period faced criticism, leading to his arrest and eventual return to Spain in 1504. While Columbus's voyages opened the door to European exploration and colonization of the Americas, it is essential to acknowledge the complex and often detrimental impact on indigenous populations. The Columbian Exchange, initiated by these voyages, brought about a transformative exchange of plants, animals, and cultures between the Old World and the New World, shaping the course of global history.

Vasco- da- Gama

Vasco da Gama, born around 1460 in Sines, Portugal, was a pioneering Portuguese explorer and navigator who played a crucial role in opening a direct sea route to the East. Little is known about his early life, but his family had a maritime background. Vasco da Gama came to prominence during the Age of Discovery when Portugal was determined to establish a maritime route to reach the valuable spice markets of Asia, thus bypassing the overland routes controlled by the Ottoman Empire.

In 1497, King Manuel I of Portugal entrusted Vasco da Gama with the leadership of an expedition aimed at reaching the East by sea. Vasco da Gama's voyages were historic maritime expeditions that aimed to establish direct sea routes from Europe to the valuable spice markets of the East, particularly in India. His first and most renowned voyage took place from 1497 to 1499. Appointed by King Manuel I of Portugal, Vasco da Gama led a fleet of four ships—São Gabriel, São Rafael, Berrio, and an unnamed storage ship. Departing from Lisbon on July 8, 1497, Gama faced the daunting challenge of navigating around the treacherous Cape of Good Hope at the southern tip of Africa, a route never successfully completed by Europeans before.

Enduring storms, navigational challenges, and the loss of crew members, Gama's fleet successfully rounded the Cape in November 1497. Sailing along the eastern coast of Africa, the expedition reached the trading post of Calicut (Kozhikode) on the Malabar Coast of India in May 1498. This achievement marked a pivotal moment in maritime history as Gama demonstrated the feasibility of reaching the East by sea. In Calicut, he engaged in diplomatic negotiations and established trade agreements to secure valuable spices, particularly pepper.

The return journey to Portugal in 1499 was equally challenging, but Vasco da Gama's successful circumnavigation of the Cape of Good Hope showcased the potential of establishing direct maritime connections with the East. His triumphant return to Lisbon in September 1499 marked the culmination of the first voyage and solidified Portugal's dominance in the Indian Ocean trade.

Vasco da Gama embarked on a second expedition in 1502, known as the Fourth Armadas, with an expanded fleet and a mission to assert Portuguese influence in the Indian Ocean. This voyage included military actions, diplomatic efforts, and the establishment of trading posts along the East African coast. Gama returned to Portugal in 1503, having further strengthened Portuguese control over key trade routes.

In 1524, Vasco da Gama undertook his third and final voyage, this time as Viceroy of India. His tenure aimed to consolidate Portuguese power in the region. However, his leadership faced challenges, and Vasco da Gama passed away in Kochi, India, on December 24, 1524.

Vasco da Gama's voyages marked a turning point in global exploration, demonstrating the feasibility of direct sea routes to the East and establishing Portugal as a major player in the lucrative spice trade. His achievements paved the way for further European maritime expansion and the establishment of colonial empires in Asia.

Ferdinand Magellan

Ferdinand Magellan, born around 1480 in Sabrosa, Portugal, was a Portuguese explorer and navigator whose ambitious expedition ultimately led to the first successful circumnavigation of the globe. Little is known about Magellan's early life, but he likely belonged to a noble Portuguese family and served in the Portuguese fleet under various commanders. Seeking royal patronage, Magellan approached King Manuel I of

Portugal, but after unsuccessful negotiations, he turned to the service of King Charles I of Spain (known as Charles V of the Holy Roman Empire) in 1518.

Ferdinand Magellan's historic voyages, occurring between 1519 and 1522, aimed to discover a westward route to the Spice Islands and resulted in the first successful circumnavigation of the globe. Magellan, under the sponsorship of King Charles I of Spain, led an expedition of five ships—the Trinidad, San Antonio, Concepción, Santiago, and Victoria. Departing from Seville, Spain, in 1519, the fleet crossed the Atlantic Ocean and entered the dangerous waters of South America. Magellan's navigational prowess became evident when he discovered the passage, now known as the Strait of Magellan, allowing the expedition to access the Pacific Ocean in 1520.

The Pacific crossing was arduous, marked by severe hardships such as scurvy, food shortages, and mutiny. Magellan faced the challenges with determination, and the fleet reached the Philippines in 1521. Tragically, during an encounter with local forces on the island of Mactan in April 1521, Magellan was killed in action. Despite his death, the expedition, now under the command of Juan Sebastián Elcano, pressed on. The surviving ship, the Victoria, continued the journey across the Indian Ocean, rounded the Cape of Good Hope, and eventually returned to Spain in September 1522. Although only one ship and a fraction of the original crew completed the circumnavigation, the achievement was groundbreaking. Magellan's voyages demonstrated the vastness of the Earth, disproved the notion of a flat world, and showcased the potential for global exploration.

The circumnavigation highlighted the interconnectedness of oceans and continents and opened new possibilities for international trade and navigation. Ferdinand Magellan's expeditions left an indelible mark on the Age of Exploration, contributing to the expansion of geographical knowledge and reshaping perceptions of the world.

Captain James Cook

Captain James Cook, born on October 27, 1728, in Marton, Yorkshire, England, was a British explorer, navigator, and cartographer who played a crucial role in the Age of Enlightenment's maritime exploration. Coming from a modest background, Cook

began his maritime career at a young age, initially serving on merchant ships before joining the Royal Navy in 1755. Known for his meticulous charting and navigational skills, Cook quickly rose through the ranks.

Captain James Cook's voyages, conducted in the latter half of the 18th century, stand as some of the most significant and influential in the history of maritime exploration. His three major voyages were characterized by their scientific objectives, including the observation of natural phenomena, mapping uncharted territories, and discovering new lands. Cook's first expedition (1768-1771) aboard the HMS Endeavour had a primary mission to observe the transit of Venus, but it expanded into a comprehensive exploration of the Pacific. Cook meticulously charted the coasts of New Zealand and the eastern coast of Australia, making the first recorded European contact with the eastern shores of the continent. His mapping and precise observations greatly contributed to the understanding of Pacific geography.

The second voyage (1772-1775) focused on searching for the elusive southern continent, believed to exist in the South Pacific. Although the quest did not yield the discovery of a southern landmass, Cook's expedition significantly advanced knowledge of the Antarctic and the South Pacific. The journey included the circumnavigation of Antarctica and the detailed mapping of numerous islands. Cook's third and final voyage (1776-1779) was multifaceted. It aimed to explore the Pacific Northwest, search for a northwest passage between the Pacific and Atlantic Oceans, and investigate the existence of a navigable route through the Bering Strait. The expedition took Cook to the Hawaiian Islands, where he met his tragic end in 1779 during a violent confrontation with the local inhabitants.

Cook's third and final voyage (1776-1779) was multifaceted. It aimed to explore the Pacific Northwest, search for a northwest passage between the Pacific and Atlantic Oceans, and investigate the existence of a navigable route through the Bering Strait. The expedition took Cook to the Hawaiian Islands, where he met his tragic end in 1779 during a violent confrontation with the local inhabitants. These voyages collectively enhanced European understanding of global geography, cultural diversity, and natural history. Cook's precise cartography and documentation laid the foundation for subsequent exploration and colonization, influencing the course of history and science in the Age of Enlightenment. The legacy of Captain James Cook endures as a testament

to his navigational skill, scientific curiosity, and contributions to the expanding body of knowledge about the world.

Varenius

Bernhardus Varenius, commonly known as Bernhard Varen or Varenius, was a German geographer and physician born on January 1, 1622, in Hitzacker, Electorate of Hanover. He is best known for his influential work in geography, particularly his magnum opus, "Geographia Generalis" ("General Geography"), published in 1650. Varenius's early education in philosophy and medicine laid the groundwork for his interdisciplinary approach to geographical studies. He studied at the University of Leiden, where he was exposed to the ideas of prominent thinkers such as René Descartes and Baruch Spinoza.

Varenius's "Geographia Generalis" was a groundbreaking work that systematized the principles of geography based on mathematical and scientific methods. He emphasized the importance of empirical observation and measurement in the study of geography, advocating for a systematic and comprehensive approach to the discipline. Varenius introduced the concept of "geographical physics," which aimed to explain the natural laws governing the Earth's surface and its various phenomena. His work laid the foundation for the quantitative and scientific study of geography, setting a precedent for future developments in the field. Varenius's contributions extended beyond theoretical geography. He made significant strides in the understanding of climatology and meteorology, linking geographical features to climatic patterns. His work had a lasting impact on the evolution of geographical thought, influencing scholars such as Immanuel Kant and Alexander von Humboldt.

Although Varenius's life was relatively short—he died on May 15, 1650, at the age of 28—his intellectual legacy endured through the widespread adoption of his systematic and scientific approach to geography. His contributions marked a crucial transition from the descriptive and speculative geography of the past to a more rigorous and analytical discipline, shaping the trajectory of geographical studies for centuries to come.

Immanual kant

Immanuel Kant, a German philosopher, was born on April 22, 1724, in Königsberg, Prussia (now Kaliningrad, Russia). Widely regarded as one of the most influential figures in Western philosophy, Kant's intellectual contributions extended to various fields, including geography. Raised in a Pietist household, Kant received a strict education that emphasized moral and religious values. He later attended the University of Königsberg, where he studied mathematics, physics, and philosophy. Kant's groundbreaking work, "Critique of Pure Reason" (1781), transformed the landscape of philosophy by addressing questions about the nature of human knowledge and the limits of reason. In the realm of geography, Kant's influence is evident in his essay "Physical Geography" (1755), where he applied his philosophical ideas to the study of the Earth's surface. In this essay, Kant proposed a systematic approach to physical geography, emphasizing the role of empirical observation and scientific method. He introduced the concept of "earth-sculpture," positing that natural forces shaped the Earth's surface over time.

Kant's contributions to geography extended beyond the physical realm. In "Perpetual Peace: A Philosophical Sketch" (1795), he explored political geography and the possibility of international cooperation, anticipating ideas related to geopolitics and global governance. Kant's philosophical inquiries laid the groundwork for the development of critical approaches in geography, influencing subsequent generations of geographers.

Immanuel Kant's life came to an end on February 12, 1804, in Königsberg. His enduring legacy in philosophy and geography continues to shape intellectual discourse and inquiry. Kant's emphasis on reason, empirical observation, and systematic analysis left an indelible mark on the development of geography as a scientific discipline.

4.4 GEOGRAPHY IN THE EIGHTEENTH CENTURY

The eighteenth century was a transformative period for the field of geography, witnessing significant shifts in both theoretical frameworks and methodological approaches. During this era, geography began to evolve from a descriptive and speculative discipline into a more systematic and scientific field of study. Enlightenment ideals, marked by an emphasis on reason, empirical observation, and systematic inquiry, permeated geographical thought. Philosophers such as Immanuel

Kant and Jean-Jacques Rousseau contributed to the conceptualization of space and place, laying the groundwork for a more critical and analytical approach to geography.

Geographical exploration and mapping flourished during the eighteenth century, driven by a growing interest in understanding the Earth's surface in a systematic manner. Expeditions, often sponsored by European colonial powers, ventured into uncharted territories, leading to the mapping of coastlines, rivers, and mountain ranges. The availability of more accurate and sophisticated instruments, such as the sextant and chronometer, facilitated more precise measurements and improved navigational techniques.

The increasing availability of printed maps and atlases contributed to the dissemination of geographical knowledge to a broader audience. Notable cartographers and mapmakers, including Jean-Baptiste Bourguignon d'Anville and Thomas Jefferys, produced detailed and accurate maps that reflected the expanding geographical awareness of the time. These maps played a crucial role in shaping perceptions of the world and supporting the planning and execution of exploration and trade routes.

Johann Reinhold Forster (1729–1798) and his son Johann Georg Adam Forster (1754–1794) were a father-son duo of German naturalists and scientists who made significant contributions to the field of geography during the late 18th century. Johann Reinhold Forster, a pastor and naturalist, accompanied Captain James Cook on his second voyage (1772–1775) around the world. Forster's meticulous observations during the expedition, especially in the South Pacific, contributed greatly to the understanding of the region's geography, flora, and fauna. His work laid the groundwork for the scientific exploration of the Pacific.

Johann Georg Adam Forster, often known as Georg Forster, inherited his father's passion for natural history and accompanied him on the second voyage of Captain Cook. Georg's account of the expedition, "A Voyage Round the World" (1777), provided detailed descriptions of the lands visited, including Tahiti, New Zealand, and Australia. His contributions went beyond geography to encompass ethnography, as he documented the cultures and societies encountered during the voyage. Apart from their work with Cook, both Forsters were involved in scholarly pursuits in Europe. Johann Reinhold Forster's interests spanned various disciplines, including botany, linguistics, and ethnography. Georg Forster, after his father's death, continued his exploration of the

natural world and human societies. His later works, such as "Observations Made during a Voyage Round the World" (1778) and "Florulae Insularum Australium Prodromus" (1786), further enriched geographical knowledge, particularly regarding the Pacific region.

The Forsters' contributions to geography encompassed not only the collection of empirical data but also the synthesis and dissemination of knowledge about distant lands. Their writings and observations played a crucial role in shaping European perceptions of the Pacific and its inhabitants, influencing subsequent generations of naturalists and geographers. The Forsters' legacy endures as a testament to their pioneering contributions to the exploration and understanding of the world during the Age of Enlightenment. **"Reine" or "Pure" geography**, a concept that gained prominence in the 19th and early 20th centuries, represents a scientific and systematic approach to the study of the Earth's surface. This paradigm shift emerged as geography evolved from a primarily descriptive discipline to one that aimed at establishing empirical laws and theories. The term "pure" emphasized a focus on objective observation and analysis, detached from extraneous considerations such as economic, political, or cultural factors. Scholars engaged in pure geography sought to develop general principles that could explain spatial patterns, physical landscapes, and the interplay between nature and human activities. Key figures associated with this movement include Friedrich Ratzel and Élisée Reclus. Ratzel's work emphasized the relationship between environments and the development of cultures, while Reclus explored the interconnectedness of physical and human geography. While the term "pure geography" has waned in contemporary usage, its historical significance lies in shaping the discipline's trajectory toward a more scientific and analytical framework.

The principles and methods developed during this era continue to influence modern geographic research and understanding.

4.5 CLASSICAL PERIOD OF MODERN GEOGRAPHY

The classical period of modern geography, spanning the late 18th to early 20th centuries, was a transformative era that witnessed the evolution of geography into a systematic and scientific discipline. This period was marked by a departure from purely descriptive accounts to a more analytical and empirical approach. Influenced by

Enlightenment ideals, geographers sought to apply reason and systematic observation to understand the Earth's surface comprehensively. Alexander von Humboldt's contributions were central to this shift, emphasizing the interconnectedness of natural phenomena and human societies. His holistic approach to geography, as seen in works like "Kosmos," laid the foundation for physical geography. Concurrently, Carl Ritter advocated for a systematic study of the Earth, promoting a regional approach that considered both physical and human aspects. Technological advancements played a crucial role in exploration and mapping during this period. Captain James Cook's voyages around the Pacific, equipped with improved navigational tools, led to meticulous mapping and detailed observations. The classical period also saw the emergence of regional geography as a distinct sub-discipline. Friedrich Ratzel's work on political geography and Élisée Reclus's comprehensive studies exemplified the growing interest in understanding the spatial organization of human societies.

This period witnessed a profound expansion of geographical knowledge through exploration, mapping, and the development of conceptual frameworks. The legacies of Humboldt, Ritter, Cook, and others from this era laid the groundwork for modern geography, influencing subsequent generations and shaping the discipline into what it is today. If the geographers of the late eighteenth century developed the greater part of the theoretical concepts of the new science of geography, the transformation of their 'ideas, demands and wishes into facts was largely the work of Alexander Von Humboldt (1769-1859) and Carl Ritter (1779 1859).

It is an extraordinary fact that modern geography in all lands should owe so much to these two men living at the same time in the same country for over 30 years in the same city. (Many writers refer to Humboldt and Ritter as the founders of modern geography. But there are also good reasons for thinking of them as bringing the period of classical geography to an end).Using the large volume of new information resulting from the voyages of exploration, Humboldt and Ritter, each in his own way, produced massive syntheses. Although these syntheses made use of the new concepts, and methods of study developed during the preceding two centuries, they, nevertheless, sought to present universal knowledge, just as Strabo had done and as had been attempted during the Age of Exploration by Munster, Varenius, Busching and others.

Both the founders of the classical modern geography depended in large part on their predecessors whom they had in common. Kant gave geography a philosophical foundation and the Forsters demonstrated method of research and a literary style, but Humboldt and Ritter developed the subject as an independent branch of knowledge. Both of them had many views in common and were united in their criticism of the causal and unsystematic treatment of geographical data by other predecessors. The similarity of their opinion was not accidental Ritter regarded himself as a student of Humboldt and Humboldt described Ritter as 'his old friend". They differed markedly, however, in temperament and character.

The geography which Humboldt and Ritter demonstrated was defined as classical' by Hartshorne (1976), because it dominated the foundation period of the subject and because its methods were uniform and simple. Both believed that science must be founded on the objective descriptions of observed facts rather than on logical propositions like those proposed by Kant and others; geographers should collect empirical data and must shape order and association from this material in order to arrive at an inductive explanation. They both died in 1859, the year of the publication of Charles Darwin's Origin of Species. Their ideas and purposes, although formulated before the great impact of evolutionary thought, and before the enormous extension of exploration and mapping in the latter half of the century, have continued to serve as guide posts in the field of geography.

ALEXANDER VON HUMBOLDT (1769-1859)

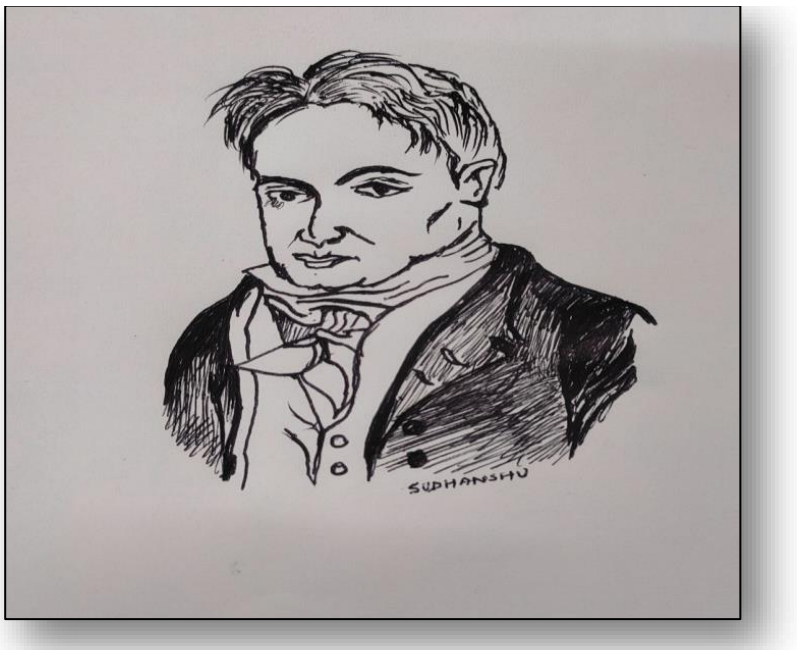
Humboldt was the last of the great polymaths. He mastered a number of disciplines and putall his energy into travel and research in order to understand the whole complex system of the universe. He contributed to so many branches of science that his work is almost as difficult to summarise as Carl Ritter's. At various times, he did research in botany, geology, physics, chemistry, anatomy, physiology, history and all aspects of geography. On several occasions Humboldt had to defend himself against the charge of being too versatile.

The unity of human races, an idea which Humboldt pioneered in the latter part of his academic career, seems to have been developed on account of his frequent meetings (arranged by his mathematics tutor) with the Jewish philosopher, Moses

Mendelssohn. With him and others, Humboldt discussed matters relating to the contemporary social inequities of an aristocratic society and drew up plans to do something about these things. He also attended the lectures on scientific subjects, delivered by the noted physician, Marcus Herz, who was a disciple of Immanuel Kant. These lectures had a profound impact on the thinking of Humboldt. He also witnessed the demonstration of scientific experiments which Marcus performed.

Alexander von Humboldt, born on September 14, 1769, in Berlin, Prussia (now Germany), led a life characterized by intellectual curiosity, scientific exploration, and groundbreaking contributions to multiple disciplines. Coming from a privileged background, Humboldt received an extensive education and demonstrated early interests in natural sciences. At the age of 18, Humboldt entered the University of Frankfurt, but there he stayed for six months only. In 1789, he entered the University of Gottingen, where he had the opportunity to meet George Forster who had lately returned from his voyage around the world with Captain Cook. Before Humboldt came into contact with George Forster, he was very fascinated by geology, and this fascination led him to organise a short scientific tour, in the autumn of 1789, to the Rhineland Basaltic region. He published a short monograph and several articles pot the Rhineland Basalt and attempted to uphold the current.

Fig. 4.1 **Alexander von Humboldt**



Source: Prepared by the Author

His most significant expedition took place from 1799 to 1804, when he explored South America extensively, covering regions from Venezuela to Mexico. During this transformative journey, Humboldt meticulously studied and documented the

geography, geology, biology, and cultures of the regions he visited, pioneering a holistic and interdisciplinary approach to scientific inquiry. His observations and measurements were methodically recorded and later synthesized into his major work, "Kosmos," an ambitious attempt to present a unified understanding of the physical world.

Humboldt's travels weren't confined to South America; he explored Europe, Asia, and Russia, contributing significantly to global scientific knowledge. His approach to geography went beyond the mere collection of data; he sought to understand the interconnectedness of the Earth's various phenomena. Humboldt introduced isotherms to explain climatic variations and developed innovative cartographic techniques. His influence extended into numerous scientific fields, including climatology, biogeography, and oceanography. Beyond his scientific endeavors, Humboldt was a prolific writer, producing numerous essays, letters, and publications. His works, rich with insights into the relationships between nature and culture, influenced the likes of Charles Darwin, Henry David Thoreau, and other luminaries. Humboldt was also an advocate for social and political causes, including abolitionism and environmental conservation.

Expeditions to America

Alexander von Humboldt's expeditions to America, spanning from 1799 to 1804, represent a landmark chapter in the history of scientific exploration. Embarking on this transformative journey, Humboldt sought to unravel the mysteries of the natural world by meticulously studying and documenting the diverse landscapes, flora, fauna, and cultures of the American continent. The expedition covered extensive territories, including Venezuela, Colombia, Ecuador, Peru, and Mexico. One of the most notable aspects of Humboldt's approach was his commitment to a comprehensive and interdisciplinary methodology. He collected an immense amount of data through careful observations, measurements, and experiments, setting new standards for scientific inquiry.

In South America, Humboldt scaled the Andes Mountains, explored the Amazon rainforest, and conducted groundbreaking research on the relationship between climate and vegetation. His travels also took him to the Galápagos Islands, where he made ecological observations that would later influence Charles Darwin's theory of evolution. Humboldt's expeditions were characterized by a holistic vision, wherein he

recognized the interconnectedness of various natural phenomena and their impact on human societies.

Alexander von Humboldt meticulously documented the results of his American expeditions in a series of publications that not only revolutionized the scientific understanding of the natural world but also influenced the broader intellectual landscape of the 19th century. The culmination of his explorations and research was presented in his magnum opus, "Voyage aux régions équinoxiales du Nouveau Continent" (Travels to the Equinoctial Regions of the New Continent), commonly known as the "Personal Narrative." Published in multiple volumes between 1805 and 1834, this monumental work provided a detailed and comprehensive account of his South American journey. In this narrative, Humboldt covered a vast array of subjects, including geography, geology, climatology, botany, and anthropology.

Following the "Personal Narrative," Humboldt continued to disseminate his findings through various publications. His work on isotherms and the distribution of plants at different altitudes, outlined in "Tableaux de la distribution géographique des plantes," significantly contributed to the development of biogeography. Humboldt's research on the ocean currents and their impact on climate was presented in "Essai sur la géographie des plantes" (Essay on the Geography of Plants). One of Humboldt's most ambitious projects was the creation of the "Kosmos," a multi-volume work intended to provide a holistic view of the natural world. Unfortunately, Humboldt was unable to complete the entire series, but the volumes he published, such as "Kosmos: Entwurf einer physischen Weltbeschreibung" (Cosmos: Sketch of a Physical Description of the Universe), demonstrated his vision for a unified science that incorporated astronomy, physics, and the Earth sciences.

Russian Expedition and Generalizations

Alexander von Humboldt's Russian Expedition, undertaken between 1829 and 1833, marked another significant chapter in his illustrious scientific career. While not as extensively documented as his earlier South American journeys, this expedition focused on exploring and understanding the vast territories of the Russian Empire. Humboldt's primary aim was to study and generalize his scientific theories by applying them to the diverse landscapes and environments of Russia. During the expedition, Humboldt traveled through various regions, including the Ural Mountains, Siberia, and the Caspian Sea. One of the key aspects of Humboldt's Russian Expedition was his

exploration of the Ural Mountains, where he conducted geological studies and examined mineral deposits. Humboldt's scientific curiosity extended to Siberia, where he investigated the permafrost phenomenon and its effects on the landscape. His observations on the natural features of the Russian landscape contributed to the development of his broader theories on physical geography and the interconnectedness of Earth's systems.

Geographical Concept

Geography, according to Humboldt, was the means comprehending the the harmonious unity of the of cosmos as a living whole, 'a unity of multiplicity. Insight into the cosmic organism creates a spiritual enjoyment and an inner freedom which even under fate's hard blows cannot be destroyed by external power (Hartshorne, 1976, 65).

Humboldt's concept of geography was basically the same as of Ritter's. In an early work (Flora Fribergenis), he briefly touched upon the limits of the various sciences and distinguished between 'Physiographia (the systematic natural sciences), 'Naturgeschichte (natural history) where the emphasis was on the development of things in time, and 'Geognosie' or 'Weltbeschreibung', which discussed spatial distribution. The science of spatial distribution thus established was not limited to the Earth's surface, it was not a description of the Earth but of the world, i.e. a science of the cosmos (Tatham, 1967, 51-52).

Humboldt points out: 'the uncommon but definite expression of the science of the Cosmos recalls to the mind of the inhabitant of the Earth that we are treating of a more widely extended horizon; of the assemblage of all things with which space is filled. From the remotest nebulae to the climatic distribution of those delicate tissues of vegetable matter which spreads a variegated covering over the surface of our rocks if scientific terms had not long been diverted from their signification, the present work ought rather to have borne the title Cosmography divided into Uranography and Geography (Humboldt, 1845, 53). The Humboldtian geography seems to reflex the Kantian concept of geography, but there no evidence of Kant being quoted by Humboldt. However, the question normally arises: to what extent is his thought derived from Kant Humboldt's Flora Fribergenis was published nine years before Kant's lectures on geography, but Humboldt was so acquainted with Kant philosophy and scientific opinions from the age of sixteen onwards that it is highly probable that he had some

notion of Kant's concept of geography before he wrote the Flora. Whatever the actual facts, it was the Kantian concept of geography that Humboldt held and which he expounded in Cosmos (Tatham, 1967, 52-53). He was also influenced by the philosophical approach of Rousseau which dealt with the descriptions of the harmonies of nature', and which had profound effect on Humboldt's philosophical foundation.

Alexander von Humboldt's geographical concept was pioneering and transformative, representing a departure from traditional geographical approaches and laying the groundwork for modern physical geography. At the core of Humboldt's concept was the idea of unity in diversity, reflecting his belief that the Earth's physical features, climate, and living organisms were interconnected components of a dynamic and harmonious system.

Humboldt's geographical thought was characterized by several key principles: Alexander von Humboldt's geographical concept was pioneering and transformative, representing a departure from traditional geographical approaches and laying the groundwork for modern physical geography. At the core of Humboldt's concept was the idea of unity in diversity, reflecting his belief that the Earth's physical features, climate, and living organisms were interconnected components of a dynamic and harmonious system. Humboldt's geographical thought was characterized by several key principles:

Interconnectedness of Nature: Humboldt emphasized the interconnectedness of natural phenomena, rejecting the compartmentalization of scientific disciplines. He believed that the study of geography should consider the relationships between different elements of the Earth's system, from the distribution of plants and animals to the influence of climate and topography.

Empirical Observation and Measurement: Humboldt placed a strong emphasis on empirical observation and precise measurement. During his extensive travels, he collected vast amounts of data, meticulously documenting the physical and biological characteristics of the regions he explored. This commitment to empirical research became a hallmark of his geographical methodology.

Isotherms and Climate Zones: Humboldt's exploration of climatic variations led to the development of the concept of isotherms, lines connecting points of equal temperature on maps. His studies of the relationship between latitude and climate contributed to the understanding of climate zones, demonstrating the systematic organization of environmental patterns.

Cultural and Historical Geography: Unlike many of his contemporaries, Humboldt recognized the importance of considering cultural and historical factors in geographical studies. He understood that landscapes were not only shaped by physical processes but also by the cultural practices and histories of human societies.

Holistic Vision in "Kosmos": Humboldt's magnum opus, "Kosmos: Entwurf einer physischen Weltbeschreibung" (Cosmos: Sketch of a Physical Description of the Universe), sought to present a unified view of the physical and cultural universe.

In "Kosmos," he integrated knowledge from various scientific disciplines, creating a synthesis that embraced both the natural and cultural dimensions of geography. Humboldt's geographical concept had a profound and lasting impact on the field, influencing subsequent generations of geographers, scientists, and thinkers. His ideas laid the foundation for the development of modern physical geography, environmental science, and the interdisciplinary nature of contemporary geographical inquiry.

The Cosmos

Alexander von humboldt's "kosmos: entwurf einer physischen weltbeschreibung" (cosmos: sketch of a physical description of the universe) is a monumental and influential work that reflects his holistic and interdisciplinary approach to the study of the natural world. Published in several volumes from 1845 to 1862, "kosmos" aimed to provide a unified view of the physical and cultural universe, synthesizing knowledge from various scientific disciplines.

Interdisciplinary Synthesis: "Kosmos" represents Humboldt's attempt to integrate knowledge from astronomy, physics, chemistry, biology, and geography into a comprehensive and interconnected framework. Humboldt sought to present a unified vision of the cosmos, emphasizing the interrelatedness of all natural phenomena.

Unity in Diversity: Central to Humboldt's concept in "Kosmos" was the idea of unity in diversity. He believed that the study of nature should consider the relationships between different elements of the Earth's system, illustrating the interconnectedness of the Earth's physical features, climate, and living organisms.

Global Perspective: Humboldt's global perspective in "Kosmos" was groundbreaking.

He explored the spatial distribution of plants and animals, climate zones, and geological formations across the continents. This global approach set the stage for the development of modern physical geography and environmental science.

Cultural and Historical Considerations: Unlike many scientific works of his time, "Kosmos" also considered cultural and historical factors. Humboldt recognized the impact of human societies on landscapes and ecosystems, acknowledging the symbiotic relationship between nature and culture.

Educational Intent: "Kosmos" was intended to be accessible to a wide audience, and Humboldt aimed to educate the general public about the wonders of the natural world. The work's popularity transcended disciplinary boundaries, influencing not only scientists but also artists, writers, and philosophers.

CARL RITTER (1779-1859)

Carl Ritter (1779–1859) was a German geographer often regarded as one of the founders of modern geographical science. Born in Quedlinburg, Germany, Ritter's life was characterized by scholarly dedication and a commitment to advancing geographical knowledge. He received his education at the University of Halle, where he studied theology, philology, and geography. However, it was his fascination with geography that would define his career. In 1805, Ritter published his seminal work, "Erdkunde," which marked the beginning of his influential contributions to the field. He was appointed as a professor at the University of Berlin in 1810, where he continued his research and teaching.

Ritter's approach to geography was distinctive for its emphasis on a systematic and comprehensive study of the Earth's surface. He advocated for a methodical examination of geographical features, including climate, topography, and human societies, aiming to create a holistic understanding of regional differences. Ritter's influence extended beyond academia; he played a crucial role in shaping the structure and content of geographical education. His commitment to interdisciplinary collaboration laid the groundwork for the development of modern geography, emphasizing connections between physical and human geography.

The work of Ritter

Ritter's initial geographical works included two volumes on Europe which appeared in 1804 and 1807. These were supplemented in 1806 by a series of six maps of the continent. One of these books provided a brief study of the systematic geography of Europe which was reviewed in France. In 1810, Ritter prepared a more complete systematic geography of the world, a' Handbuch der Physischen Geographie, but it was never published probably because of the criticism offered by Von Buch. Fig. 4.2

Fig. 4.2 **Carl Ritter**

Source: Prepared by the Author

In 1814, he went to the University of Gottings after the death of one of his pupils of the Hollweg family. At that University between 1814 and 1816, Ritter studied geography, history, pedagogy physics, chemistry, mineralogy and botany. The Erdkunde. It was at the University of Gottingen that Ritter published the first volume of the Endkunde in 1817. This dealt with Africa and Volume II on Asia appeared in 1818. The publication of these two volumes in 1817 and 1818 made a tremendous impression in the contemporary academic world and he was recognised as the reformer of geograp geography, as the master who first brought the field of geography into science. His approach in the Erdkunde, Ritter said, had entirely changed, and he claimed that its

distinctive theme was a comparative one which aimed at showing the connection between history and nature, both organic and inorganic.

Humboldt is believed to have described Ritter's Erdkunde as the most inspired work of this kind comparative geography) and further commented: 'our country has yielded: it is the first work in which is presented the influence which the surface-view has had on the peoples and their fates." Humboldt also admired Ritter's work on Asia and added that such an important work had not appeared in thirty years. In 1822, Ritter published a second edition of volume I and in 1832 a second edition of volume II.

He realised the magnitude of the work he had begun. He appeared to have given up many of his positions which he had held, such as his engagement with the Prussian Military School and his association with the scientific commission on geography and history. Geography, according to Ritter, deals with local condition (Lokalverhaltnisse) and embraces the attributes of a place with respect to topical, formal and material characteristics. (1) The first attribute was topographical, i.e. it dealt with natural divisions of the Earth's surface and was intended for the searching presentation according to the principles of Pestalozzi. (2) The second included the distribution and movements of water, sea and atmosphere the bases of human life. (3) The material conditions were described as the geographical aspect of natural history, this covered the distribution of minerals, plants and animals. The central principle of geography is the relation of all the phenomena and forms of nature to the human race, examined and organised within the framework of the unique geographical association of land and man on the Earth's surface (Dickinson, 1969, 35-36). It is in the Erdkunde that Ritter provides the above explanatory definition of geography and makes his geography humankind-oriented or anthropocentric.

Geographical Ideas and Methods

Carl Ritter is believed to have stated that he was teaching a new scientific geography in commus to the traditional lifeless summary of facts about countries and cities, mingled with all sorts of scientific incongruities'. His scientific geograpiy was based on the concept of terrestrial or sparial unity (Raumbegriff). To him, the concept of spatial unity presumed a causal interrelation of all the individual features in nature. The phenome of nature had to be studied in order to establish the coherence and unity

Ritter also pioneered the use of regional geography, which focused on detailed descriptions and analyses of specific geographic regions. Rather than approaching geography as a purely theoretical or abstract discipline, Ritter emphasized the importance of empirical observation and fieldwork in understanding the unique characteristics of different regions. This approach laid the foundation for modern regional geography, which continues to be a fundamental aspect of geographical research and education today.

In addition to his emphasis on regional geography, Ritter also made significant contributions to the study of environmental determinism. He argued that physical geography, including factors such as climate, topography, and soil composition, played a crucial role in shaping human societies and cultures. Ritter's ideas helped to establish the field of environmental geography, which explores the complex interactions between humans and their natural environments. Ritter's methods also included the use of comparative analysis, which involved comparing different regions to identify similarities and differences in their geographical characteristics. By examining patterns and trends across multiple regions, Ritter sought to develop general principles and laws that could help explain the underlying processes shaping the Earth's surface.

Geographical Concept of Carl Ritter

Carl Ritter, a prominent German geographer of the 19th century, introduced several influential geographical concepts that significantly impacted the field. One of his central ideas was the concept of "chorology," which emphasized the holistic study of regions as interconnected wholes. Ritter believed that understanding the complex relationships between various elements within a region, such as its physical features, climate, vegetation, and human activities, was essential for comprehending its geographical character. Ritter's concept of chorology marked a departure from earlier approaches that focused on isolated phenomena or individual aspects of geography. Instead, he advocated for a comprehensive analysis that considered the interplay between different factors to reveal the underlying unity and coherence of a region. By studying regions in this integrated manner, Ritter aimed to uncover the fundamental principles governing their organization and development.

Another significant concept associated with Carl Ritter is the idea of "regional geography." Ritter emphasized the importance of detailed descriptions and analyses of specific geographic regions, viewing them as distinct units of study. He believed that by delving deeply into the unique characteristics of each region, geographers could gain insights into the complex processes shaping the Earth's surface. Ritter's regional approach laid the groundwork for modern regional geography, which remains a fundamental subfield of the discipline. Furthermore, Ritter's work contributed to the development of environmental determinism, the theory that the physical environment exerts a significant influence on human societies and cultures. He argued that factors such as climate, topography, and soil composition played crucial roles in shaping human behaviour, settlement patterns, and economic activities. Ritter's environmental determinism reflected his belief in the intimate connection between humans and their natural surroundings, an idea that continues to be explored in contemporary environmental geography.

Teleological Concept

Carl Ritter's teleological thinking in geography refers to his belief in the existence of a divine plan or purpose guiding the development of the Earth's surface and its inhabitants. Ritter's teleological perspective was influenced by his religious convictions and shaped his interpretation of geographical phenomena. Ritter viewed geography not only as a scientific discipline but also as a means of understanding God's design in the world. He saw the Earth's physical features, such as mountains, rivers, and climates, as evidence of a deliberate plan, with each element serving a specific purpose in the grand scheme of creation. In Ritter's teleological framework, geographical processes and patterns were seen as manifestations of divine providence rather than random or chaotic occurrences. He believed that by studying geography, humans could gain insights into the underlying order and purposefulness of the natural world, thereby deepening their understanding of God's plan.

He saw the distribution of human populations, cultures, and civilizations as part of a broader teleological narrative, shaped by divine providence. Ritter believed that geography could reveal the ways in which human societies fulfilled their roles within this overarching plan, whether through exploration, migration, or the development of civilizations. While Ritter's teleological perspective was deeply rooted in his religious

worldview, it also had implications for his approach to scientific inquiry. Critics have argued that Ritter's teleological thinking may have influenced his interpretations of geographical phenomena, potentially leading him to seek evidence that supported his preconceived beliefs about divine purpose rather than objectively analyzing empirical data. Despite these criticisms, Ritter's teleological thinking played a significant role in shaping the early development of geographical thought. It reflected the broader intellectual context of the 19th century, characterized by a synthesis of scientific inquiry and religious belief.

While contemporary geography has largely moved away from teleological explanations, Ritter's influence on the field is still evident in the emphasis on understanding the underlying processes and patterns that shape the Earth's surface and human societies.

4.6 SUMMARY

The Renaissance period, spanning from the 14th to the 17th century, marked a pivotal resurgence in European intellectual and cultural inquiry. In the realm of geography, this era witnessed a profound revival of interest in classical Greek and Roman texts, particularly the works of Ptolemy, Strabo, and other ancient geographers. Scholars during the Renaissance were captivated by the wealth of geographical knowledge contained within these ancient manuscripts, and their efforts to translate and disseminate these texts ignited a fervent pursuit of understanding the world. This renewed enthusiasm for exploration and discovery led to significant advancements in cartography, navigation, and geographical knowledge. The voyages of exploration undertaken during this period, such as those led by Christopher Columbus and Vasco da Gama, expanded European understanding of global geography and initiated the era of colonialism and global trade.

The eighteenth century emerged as an era of enlightenment and scientific inquiry, characterized by a burgeoning interest in empirical observation and systematic study. Geographers during this time made remarkable strides in mapmaking, refining techniques for accurately representing geographical features on charts and atlases. Exploration and colonization continued to play a central role in expanding geographical knowledge, as expeditions to distant corners of the globe added new lands to the map

and deepened understanding of their physical and cultural landscapes. Concurrently, there was a growing emphasis on the study of human geography, with scholars investigating topics such as population distribution, economic activities, and political organization. Figures like Alexander von Humboldt exemplified the spirit of exploration and scientific inquiry, conducting extensive explorations in South America and making groundbreaking contributions to the understanding of physical geography. Alexander von Humboldt and Carl Ritter, two towering figures in the history of geography, made indelible contributions that shaped the discipline in profound ways. Humboldt, with his pioneering explorations in South America and Asia, revolutionized the study of physical geography by emphasizing the interconnectedness of natural phenomena and the importance of understanding ecosystems as holistic systems. His meticulous observations and interdisciplinary approach laid the groundwork for modern environmental science. Meanwhile, Carl Ritter, through his monumental work "Die Erdkunde" (The Geography), provided a comprehensive synthesis of geographical knowledge, weaving together insights from diverse fields to present a holistic understanding of the Earth's physical and human landscapes. Ritter's emphasis on regional studies and his recognition of the interplay between physical and human geography influenced generations of scholars and established the foundation for the systematic study of regions. Together, Humboldt and Ritter exemplified the spirit of scientific inquiry and exploration, leaving an enduring legacy that continues to inspire geographers and scientists to this day.

4.7 GLOSSARY

Rediscovery: The process of reexamining and reviving classical Greek and Roman geographical texts and knowledge during the Renaissance.

Cartography: The science and art of mapmaking, which saw significant advancements during the Renaissance period.

Exploration: The era of maritime exploration and discovery, including voyages by explorers such as Christopher Columbus and Vasco da Gama, which expanded European knowledge of global geography.

Classical Texts: Refers to ancient geographical works, particularly those by Ptolemy and Strabo, which were studied and translated during the Renaissance.

Enlightenment: A philosophical movement characterized by an emphasis on reason, science, and empirical observation, which influenced geographical thought during the eighteenth century.

Colonialism: The expansion of European powers into other regions of the world, which contributed to the exploration and mapping of new territories.

Human Geography: The study of the spatial organization and distribution of human activities, which became increasingly important during the eighteenth century.

Scientific Expeditions: Voyages undertaken for the purpose of scientific exploration and discovery, such as those led by Alexander von Humboldt, which contributed to the advancement of geographical knowledge.

Interdisciplinary Approach: Humboldt and Ritter's method of integrating knowledge from various fields, such as geology, biology, and anthropology, to gain a comprehensive understanding of geographic phenomena.

Physical Geography: The study of the Earth's natural processes and features, which Humboldt revolutionized through his explorations and holistic approach.

Regional Geography: Ritter's emphasis on studying regions as interconnected systems, considering both physical and human factors, which influenced the development of regional geography as a subfield.

Legacy: The lasting impact of Humboldt and Ritter's work on the field of geography, including their influence on subsequent generations of geographers and scientists.

4.8 ANSWER TO THE CHECK YOUR PROGRESS

- What were some key characteristics of Renaissance geography, and how did it contribute to the revival of geographical thought in Europe?
- How did advancements in cartography during the Renaissance impact the exploration and mapping of new territories?
- What were some notable voyages of exploration during the Renaissance period, and how did they contribute to geographical knowledge?

- In what ways did colonialism shape geographical thought during the eighteenth century, and what were some key developments in geographical exploration and mapping during this time?
- How did the Enlightenment influence geographical thought in the eighteenth century, and what were some key features of geographical inquiry during this period?
- What were some advancements in cartography during the eighteenth century, and how did they contribute to the representation of geographical features?
- What were Alexander von Humboldt's major contributions to geography, and how did his explorations in South America and Asia revolutionize the study of physical geography?
- How did Carl Ritter contribute to the development of modern geography, and what were some key concepts introduced in his work "Die Erdkunde" (The Geography)?
- In what ways did Humboldt and Ritter's contributions mark a transition from classical geography to modern geography?
- Reflecting on the Renaissance, the eighteenth century, and the contributions of Humboldt and Ritter, how has geographical thought evolved over time, and what are some enduring legacies of these periods and individuals in the field of geography?

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4.10 TERMINAL QUESTIONS

(A) Long answer type questions.

Q.1. How did the Renaissance contribute to the advancement of geographical knowledge and exploration during the 15th and 16th centuries?

Q.2. What were the key developments in geography during the eighteenth century, and how did they influence the understanding of the world at that time?

Q.3. Discuss the significant contributions of Alexander von Humboldt to the field of geography during the 19th century. How did his explorations and writings impact the study of geography?

Q.4. Explain the contributions of Carl Ritter to the field of geography in the 19th century. How did his ideas differ from those of his contemporaries, and what impact did they have on the discipline?

Q.5. Compare and contrast the contributions of Alexander von Humboldt and Carl Ritter to the field of geography. How did their approaches, methodologies, and philosophies differ, and what were the lasting impacts of their work on the discipline?

(B) Short answer type questions

Q.1. What cultural and intellectual shifts defined the Renaissance period?

Q.2. How did geographical knowledge expand during the Renaissance?

Q.3. What were the key developments in geography during the eighteenth century?

Q.4. What were Alexander von Humboldt's significant contributions to geography?

Q.5. How did Carl Ritter influence the study and methodology of geography?

(B) Multiple choice answer type questions

Q:1 Which of the following best describes the Renaissance period's impact on geography?

A) It led to the decline of interest in classical geographical texts.

B) It sparked a revival of interest in ancient Greek and Roman geographical knowledge.

C) It focused primarily on the exploration of the Americas.

D) It had no significant influence on the development of geographical thought.

Answer: B) It sparked a revival of interest in ancient Greek and Roman geographical knowledge.

Q:2 What was a major advancement in mapmaking during the eighteenth century?

A) The use of GPS technology

B) The development of satellite imagery

C) Improved techniques for accurately representing geographical features

D) The creation of digital maps

Answer: C) Improved techniques for accurately representing geographical features.

Q:3 What distinguished Alexander von Humboldt's approach to geography?

A) He focused exclusively on human geography.

B) He conducted extensive explorations in South America.

C) He was primarily interested in the study of political boundaries.

D) He made significant contributions to the development of cartography.

Answer: B) He conducted extensive explorations in South America.

Q:4 Which of the following explorers is associated with the Renaissance period of geography?

A) Marco Polo

B) Ferdinand Magellan

C) Christopher Columbus

D) Hernán Cortés

Answer: C) Christopher Columbus

Q:5 What role did colonialism play in expanding geographical knowledge during the eighteenth century?

A) It limited geographical exploration to European territories.

B) It provided funding for scientific expeditions to distant lands.

C) It had no impact on geographical knowledge.

D) It led to the destruction of existing maps and atlases.

Answer: B) It provided funding for scientific expeditions to distant lands.

Q:6 What was Carl Ritter's major work in geography?

A) "The Geography" (Die Erdkunde)

B) "Cosmos"

C) "Views of Nature"

D) "Aspects of Nature"

Answer: A) "The Geography" (Die Erdkunde)

Q: 7 What geographical concept was revived during the Renaissance period?

A) Topography

B) Hydrology

C) Longitude and Latitude

D) Seismology

Answer: C) Longitude and Latitude

Q:8 What was a key focus of geographical study during the eighteenth century?

A) Political Geography

B) Climatology

C) Urban Geography

D) Economic Geography

Answer: D) Economic Geography

Q:9 What did Alexander von Humboldt emphasize in his geographical studies?

A) The isolation of geographical phenomena

B) The interconnectedness of natural phenomena

C) The study of only human geography

D) The importance of theoretical geography over empirical observation

Answer: B) The interconnectedness of natural phenomena

Q: 10 Which ancient geographical works were particularly studied and translated during the Renaissance?

A) Aristotle's "Meteorology"

B) Herodotus' "Histories"

C) Ptolemy's "Geography"

D) Pliny the Elder's "Natural History"

Answer: C) Ptolemy's "Geography"

UNIT-5 SCHOOL OF THOUGHTS IN GEOGRAPHY, FORMULATION OF SCIENTIFIC GEOGRAPHY, SCHOOLS OF THOUGHT: GERMAN, FRENCH, ENVIRONMENTAL DETERMINISM, POSSIBILISM.

5.1 OBJECTIVES

After reading this unit, you will be able to:

- Understanding the formulation of scientific geography.
- Learn about the School of thought of German, French, and British.
- Gain knowledge about Quantitative Revolution, Environmental Determinism and Possibilism.

5.2 INTRODUCTION

The field of geography encompasses various schools of thought, each contributing unique perspectives and methodologies to the understanding of the Earth's surface and human-environment interactions. One prominent school of thought is environmental determinism, which emerged in the late 19th and early 20th centuries. This school posited that physical geography, particularly climate and topography, determine human behaviour and societal development. However, environmental determinism faced criticism for oversimplifying complex relationships and neglecting the role of human agency.

Contrastingly, the school of possibilism, which gained prominence in the mid-20th century, argued that while the environment influences human activities, societies can adapt and modify their surroundings. This approach acknowledged the importance of cultural factors, technological advancements, and social organization in shaping geographical patterns.

The cultural or humanistic geography school, arising in the mid-20th century, emphasized the significance of cultural landscapes, symbols, and meanings. This school explored how individuals and communities perceive and shape their environments, examining the intricate connections between people and places through qualitative and interpretive methodologies. Critical geography, rooted in social theory and emerging in the latter half of the 20th century, sought to understand and challenge power structures, inequality, and social injustices. This school emphasized the role of space in shaping social relations and examined the impact of globalization on local communities.

In recent years, postmodern and feminist geographies have further expanded the discipline's horizons. Postmodern geography questions objective truths, highlighting the subjective nature of knowledge and emphasizing the importance of diverse perspectives. Feminist geography, on the other hand, explores gendered experiences in space, shedding light on the inequalities embedded in the geographical landscape. Geography as a discipline has evolved through various schools of thought, each influenced by different intellectual traditions and geographical contexts. The German school, represented by scholars like Alexander von Humboldt and Carl Ritter, emphasized a holistic and integrative approach to geography. Their focus on comprehensive regional studies, empirical observations, and interdisciplinary collaboration laid the foundation for modern physical geography. The French school, led by Paul Vidal de la Blache, embraced an environmental determinist perspective, stressing the influence of physical factors on human societies. Vidal de la Blache's emphasis on the importance of regional landscapes and his concept of "genre de vie" (way of life) contributed to cultural and regional geography.

In Britain, the school of thought was shaped by figures such as Halford Mackinder and Ellen Churchill Semple. Mackinder, a geopolitician, introduced concepts like the "heartland" and the "rimland," influencing geopolitical thinking. Semple, associated with environmental determinism, explored the relationships between physical environments and human cultures. The British school also contributed to the development of economic and social geography. In the United States, the American school of thought witnessed a shift towards quantitative and spatial analysis. The work of geographers like William Garrison, Richard Hartshorne, and Waldo Tobler contributed to the development of quantitative revolution and spatial science. American geography also saw the emergence of cultural landscape studies through the works of Carl Sauer, emphasizing the human imprint on the physical environment.

5.3 FORMULATION OF SCIENTIFIC GEOGRAPHY

The formulation of scientific geography has been a dynamic and multifaceted process shaped by evolving intellectual currents, technological advancements, and a growing emphasis on empirical rigour. The roots of scientific geography can be traced back to the 19th century when figures like Alexander von Humboldt and Carl Ritter laid the groundwork for systematic geographical inquiry. Humboldt's emphasis on empirical

observation and the interconnectedness of natural phenomena set a precedent for scientific rigour in geographical research. In the late 19th and early 20th centuries, environmental determinism emerged as a dominant paradigm, asserting that physical environments determine human behaviour and societal development. However, this deterministic approach faced criticism for oversimplification and Euro centrism. The mid-20th century witnessed a paradigm shift with the rise of possibilism, challenging deterministic views and recognizing human agency in modifying and adapting to environments. Concurrently, advancements in quantitative methods marked the era of the quantitative revolution, introducing statistical techniques and spatial analysis to geographical research. This era saw the emergence of spatial science, which sought to apply mathematical models to geographical phenomena. In the latter half of the 20th century, critical and humanistic geographies challenged positivist approaches. Critical geography, rooted in social theory, focused on power relations, social justice, and inequality. Humanistic geography emphasized the importance of human experiences, cultural landscapes, and symbolic meanings in shaping geographical understanding.

Contemporary scientific geography is characterized by an integration of diverse approaches, including physical geography, human geography, and geographic information science. Geographic Information Systems (GIS) and remote sensing technologies have revolutionized data collection and analysis, enabling geographers to explore complex spatial relationships. Interdisciplinary collaborations with fields such as environmental science, anthropology, and sociology further enrich the scientific discourse in geography. The formulation of scientific geography continues to evolve, reflecting the dynamic nature of the discipline and its ongoing engagement with global challenges and complexities.

Quantitative Revolution

The Quantitative Revolution in geography, which emerged in the mid-20th century, marked a transformative shift in the discipline's methodologies and paradigms. Initiated as a response to the perceived limitations of traditional descriptive and regional geography, this revolution sought to introduce rigour, precision, and scientific methodologies into geographical research. Pioneered by geographers like William Garrison, Richard Hartshorne, and Waldo Tobler, the Quantitative Revolution emphasized the application of mathematical and statistical techniques to analyze spatial patterns and relationships.

One key aspect of this revolution was the adoption of quantitative methods, including statistical analysis, mathematical modelling, and cartographic techniques. Geographers began to use statistical tools to identify spatial patterns, formulate hypotheses, and test theories systematically. This marked a departure from the more qualitative, narrative-driven approaches of the past. Spatial science, a subfield that emerged during the Quantitative Revolution, aimed to bring a scientific and quantitative approach to the study of spatial phenomena. This involved the development of spatial models and the application of mathematical principles to geographic problems. The use of computers became integral to the process, enabling geographers to process large datasets and conduct complex analyses.

The Quantitative Revolution had a profound impact on the diversification of geographical research topics, encouraging the exploration of spatial patterns in areas such as urban planning, transportation, and environmental studies. However, it was not without criticism. Scholars pointed out the potential reductionism and oversimplification of complex human-environment interactions, as well as the risk of overlooking qualitative nuances. Over time, geography evolved to embrace a more balanced approach, integrating quantitative and qualitative methods. This integration has given rise to contemporary geographical research that combines the precision of quantitative analysis with the depth of qualitative understanding. While the Quantitative Revolution was a defining moment in the history of geography, it also sparked ongoing debates about the most effective ways to study and represent spatial phenomena.

5.4 SCHOOL OF THOUGHTS OF GERMAN

The post-Ritterian period in Germany felt the need for a professionally accepted paradigm to serve as a guide to the study of geography. There was no clear-cut definition to account for geography, that could be universally accepted Those who taught geography were trained in history, geology, botany, zoology, mathematics, engineering or journalism, None of them were professional geographers, as a result of which each of them defined geography in different ways. There was no unanimity among the scholars about the definition, purpose and methodology of geography, and the first half of the nineteenth century in Germany witnessed this major problem. The mid-nineteenth century witnessed the rise of materialistic scientific philosophy in other branches of knowledge, which emphasised natural laws and causality, as well as

mechanical explanation. Thir made professionalism an academic necessity. In the light of this development, geography could not remain isolated. The need was professionalism in geography which required a new dimension for geography.

In the absence of any guidelines regarding the field of geography, each new professor felt the need to set forth his ideas concerning the scope of the field. Each tried to provide a definition of geography that would give it its position among other academic disciplines. All around the world in the late nineteenth century, the question raised what is geography? The growth of professionals in geography provided the answer. It was no longer confined to the plotting of information on maps and to the publication of clearer maps of finer design. Geography acquired an academic status and became a permanent independent discipline. The post-Ritterian period, however, proved to be a brief interlude before the last quarter or third of the century brought a rapid development in academic geography in Germany. In many respects, this period may be regarded as a critical period in the development of the field. The foundation that Humboldt and Ritter had established for geography did not provide, in appearance certainly, a unified field. To the extent to which their followers exaggerated certain aspects of the views of each of the founders, or attempted to introduce new concepts of the nature of the field, geography was for a time split in several directions and its position as a branch of knowledge thereby was brought into serious question. Modern Geography of Germany

After the death of Ritter there was no professor of geography in any German university and the rapid subsequent growth was largely the work not of the historical geographers. ographers. Those who followed Ritter were trained as geologists and tended to specialise in the study of non-human features of the Earth, ie physical geography as the term stands for. With the rise in the world of its status of geography and the productive work of this period, especially in the development of geographic thought, its major problem was to overcome the apparent disunity in the methodology of the field and thus definitely establish its position as a single field of science (Hartshorne, 1939, 1976, 86). The new viewpoint of a materialistic scientific philosophy in science which came to dominate contemporary scientific thought appeared to have been marked by the increasing specialisation of sciences, by an increasing emphasis on

the development of scientific laws' and 'causality', and by a conscious isolation of science (and especially of geography) from any particular Weltanschauung.

The emergence of new geography in Germany appears to have been primarily due to the works of Peschel, Richthofen, Ratzel, Penck and Hettner. However, the impact of Darwinism on this methodological innovation cannot be ruled out. It should be emphasised that Darwinism did not represent a complete break with the major ideas upon which geography was founded. The study of development over time continued to be regarded as very important and, although it is not clear whether Darwin supported it or not, a deterministic explanatory framework was retained. The development was especially characteristic of the natural sciences which were making major advances.

Germany became the leading nation for the development of academic geography Although there had been several chairs in geography before 1874, a decision by the Prussian government in that year to set up permanent chairs in geography at all Prussian universities was an event of major importance. It is reasonable to assume that Prumis took this step in the belief that geographical knowledge could be used to further its political expansion. At any rate, this decision meant that geography was firmly established as an academic discipline in one of the leading European nations, and by 1880 there were professors in Geography in 10 of the Prussian Universities. However, the lead in the new direction in the field of academic geography was taken by Oscar Peschel and Ferdinand Von Richthofen, and the direction showed by them seemed to have been followed by the subsequent academicians.

Oscar Peschel

Oscar Peschel (1826–1875) was a German geographer and ethnographer who made significant contributions to the field during the 19th century. Born in Zittau, Saxony, Peschel's work focused on the relationship between geography and anthropology, exploring the impact of environmental factors on human cultures. He was particularly interested in the influence of physical geography on the development of societies and civilizations. Peschel's notable contributions include his studies on climatology and his work on cultural landscapes. He emphasized the importance of understanding the connections between physical environments and human cultures,

challenging deterministic views prevalent in his time. Peschel also played a role in advancing the integration of ethnographic research into geographical studies, recognizing the significance of cultural factors in shaping landscapes.

In addition to his academic pursuits, Peschel held positions at the University of Leipzig, where he lectured on geography and established himself as a respected scholar. His works, such as "The Races of Man and Their Geographical Distribution" (1876), reflected his interdisciplinary approach, integrating geographical and anthropological perspectives. Despite his untimely death in 1875, Oscar Peschel's contributions laid the groundwork for later developments in cultural geography and the understanding of the intricate relationships between physical environments and human societies.

Ferdinand Von Richthofen

Ferdinand von Richthofen (1833–1905) was a German geographer and geologist known for his pioneering contributions to the study of Central Asia and his influential work in the field of geography. Born into a prominent Prussian family, Richthofen began his academic journey studying forestry and mining engineering. He later shifted his focus to geology and geography, receiving a doctorate in geology from the University of Leipzig in 1857. Richthofen's early travels took him to Spain and North Africa, but his most significant contributions came from his explorations and studies in Central Asia.

Richthofen is often credited with coining the term "Silk Road" (Seidenstraße) to describe the historical trade routes that connected China and the Mediterranean. His extensive travels in China during the 1870s allowed him to conduct detailed geographical and geological investigations. His work laid the foundation for the understanding of the physical geography of the region, including its deserts, mountain ranges, and river systems. Beyond his exploration, Richthofen contributed significantly to theoretical geography. He emphasized the importance of regional studies and integrated physical and human geography. His work, "China: Results of Geological and Topographical Research in China and Eastern Asia" (1877–1912), became a seminal reference in the field. Richthofen's approach influenced subsequent generations of geographers, and his emphasis on systematic and comprehensive geographical research contributed to the development of modern geography.

Ferdinand von Richthofen's legacy extends beyond his academic achievements, as he played a crucial role in fostering international scientific cooperation. His impact on geographical exploration, particularly in Central Asia and China, solidified his position as a key figure in the history of geography, and his works continue to be influential in the study of the Silk Road and the geography of Asia.

Friedrich Ratzel

Friedrich Ratzel (1844–1904) was a German geographer and ethnographer renowned for his significant contributions to the field of geography, particularly in the late 19th and early 20th centuries. Born in Karlsruhe, Germany, Ratzel received his education at several prestigious institutions, including the University of Heidelberg and the University of Jena, where he studied zoology and geography. Ratzel's early career involved extensive travels through North and Central America, an experience that greatly influenced his geographical perspectives. Ratzel's groundbreaking contributions to geography include the development of anthropography, a field that explores the relationship between human societies and their physical environments. His magnum opus, "Anthropogeographie" (Anthropogeography), published in 1882–1891, laid the foundation for the study of human geography, emphasizing the interdependence of cultures and landscapes. Ratzel introduced the concept of Lebensraum, or "living space," arguing that human societies, like organisms, expand territorially to meet their needs.

As a scholar, Ratzel held academic positions at various institutions, including the University of Leipzig and the University of Munich. His work extended beyond theoretical geography, encompassing political geography and ethnography. Ratzel's influence was not confined to academia; his ideas also shaped geopolitical thinking, and aspects of his work contributed to later geopolitical theories. Despite facing controversy and criticism, especially regarding his association with aspects of Social Darwinism, Friedrich Ratzel's impact on the development of geographical thought remains undeniable. His innovative concepts and methodologies continue to influence the study of human-environment interactions, cultural landscapes, and spatial dynamics in geography.

Anthropogeography

Friedrich Ratzel's "Anthropogeographie" (Anthropogeography), published between 1882 and 1891, stands as a seminal work that significantly influenced the development of human geography. In this extensive and groundbreaking book, Ratzel laid the theoretical foundations for the field of anthropogeography, exploring the intricate relationship between human societies and their physical environments.

Divided into multiple volumes, the work covers a wide range of topics, delving into the geographical aspects of human culture, migration, and societal development. One of the key concepts introduced by Ratzel in "Anthropogeographie" is that of Lebensraum, or "living space." He argued that like organisms, human societies expand territorially to fulfil their needs, reflecting a Darwinian perspective on the spatial behaviour of cultures. Ratzel's emphasis on the interdependence of cultures and landscapes set the stage for the study of cultural geography, highlighting how environmental factors influence human behaviours and societal structures.

"Anthropogeographie" also addressed topics such as political geography and the impact of geography on historical processes. Ratzel's work was expansive in scope, drawing on his extensive travels and observations. His multidisciplinary approach integrated elements of ethnography, ecology, and sociology, offering a holistic understanding of the spatial dynamics of human societies. Despite criticisms and controversies, particularly regarding his association with Social Darwinism, Ratzel's "Anthropogeographie" has left an indelible mark on geographical thought. The concepts introduced in this work continue to be influential in the study of human-environment interactions, cultural landscapes, and the spatial dimensions of societal development within the broader field of human geography.

Joseph Partsch

Joseph Partsch (1851-1925) was an Austrian geographer and influential scholar known for his significant contributions to physical geography and geomorphology during the late 19th and early 20th centuries. Born in Vienna, Partsch pursued a rigorous education, obtaining his doctorate in philosophy from the University of Vienna. He later held academic positions at various institutions, including the University of Graz and the University of Munich.

Partsch's research primarily focused on landforms, climate, and the relationship between human activities and the environment. His seminal work, "Central Europe," published in 1909, explored the physical geography of the region in great detail, emphasizing the impact of human activities on the landscape. Partsch also played a key role in advancing the understanding of the anthropogenic influence on landforms, paving the way for later developments in human geography. His work laid the foundation for the integration of physical and human geography, contributing significantly to the broader field of geography. Joseph Partsch's legacy endures through his enduring impact on geographical scholarship and his influence on subsequent generations of geographers.

Albrecht Penck

Albrecht Penck, born on September 25, 1858, in Reudnitz, Germany, led a life dedicated to advancing the field of geography and contributing significantly to the understanding of Earth's dynamic processes. Penck's academic journey began at the University of Leipzig, where he studied geography, geology, and physics. After completing his doctorate, he embarked on extensive fieldwork in the European Alps, focusing on glacial landforms and processes. Penck's early work in the Alps laid the groundwork for his influential contributions to glaciology. He introduced the concept of glacial stages during the Pleistocene, proposing that multiple glaciations had shaped the landscape over time. This theory significantly influenced the understanding of ice age cycles and Earth's climatic history. Penck's expertise in glacial geomorphology earned him recognition, and he went on to become a professor at the University of Vienna and later at the University of Berlin.

One of Penck's most significant contributions was his collaboration with Eduard Brückner on the seminal work "Morphological Analysis of Landforms," published in 1909. This groundbreaking book not only outlined key concepts in geomorphology but also emphasized the importance of considering dynamic processes in landscape evolution. Penck's approach combined theoretical analysis with meticulous fieldwork and topographic mapping, laying the foundation for the interdisciplinary nature of modern geography.

Penck's influence extended beyond his research contributions. He served as the president of the German Geological Society and was a founding member of the German Society for Geography. His leadership in academic institutions and scientific societies played a crucial role in shaping the direction of geographical research in the early 20th century. Despite facing challenges during the tumultuous periods of World War I and II, Penck's dedication to scientific inquiry remained unwavering. Albrecht Penck passed away on March 7, 1945, leaving behind a lasting legacy in the fields of geomorphology, glaciology, and geography. His innovative ideas, commitment to interdisciplinary research, and leadership continue to inspire geographers and scientists, marking him as a key figure in the development of physical geography during the late 19th and early 20th centuries.

Chorology and Landscape Morphology

Chorology and landscape morphology developed side by in Germany in the early part of the twentieth century. It was Alfred Hettner who revived the Kantian philosophy of chorology, while Otto Schlutre that of landscape morphology.

Alfred Hettner

Alfred Hettner (1859–1941) was a prominent German geographer renowned for his significant contributions to human geography, particularly in the fields of regional geography and landscape interpretation. Born on August 6, 1859, in Dresden, Germany, Hettner pursued his education at the University of Strasbourg and later completed his habilitation at the University of Leipzig. His academic career took him to various institutions, including Heidelberg, Breslau (now Wrocław, Poland), and Frankfurt, where he became a professor of geography.

Hettner's work was characterized by a deep interest in understanding the intricate relationships between humans and their environment. He emphasized the importance of regional geography, arguing that to comprehend the complexities of a region, one must consider not only its physical characteristics but also the social, economic, and cultural aspects. Hettner played a crucial role in shifting geography towards a more human-centric approach, moving away from the prevailing environmental determinism of his time. His influential book, "Die Geographie," published in 1903, laid out his ideas on regional geography and provided a framework

for studying the spatial organization of human activities. Hettner's concept of "chorology" underscored the need to analyze the unique characteristics of different regions, considering the interplay of natural and human factors. He advocated for a holistic understanding of landscapes, incorporating both the physical features and the human imprint.

Beyond his scholarly contributions, Hettner was a dedicated teacher, and his impact on the development of geography education was substantial. He mentored several students who went on to become influential geographers themselves. Additionally, Hettner served as the editor of the prestigious geographical journal "Petermanns Geographische Mitteilungen" from 1902 to 1933, further shaping the academic discourse in the field. Alfred Hettner's career unfolded during a transformative period in geography, and his ideas laid the foundation for modern regional geography and landscape interpretation. His emphasis on the interdependence of physical and human factors continues to influence geographical research and education. Hettner's legacy endures through his writings, teachings, and the enduring impact he had on the evolution of human geography in the early 20th century.

5.5 THE FRENCH SCHOOL OF GEOGRAPHY

The French School of Geography, also known as the "Vidal school" or the "possibilist school," emerged during the late 19th and early 20th centuries, marked by the influential ideas of Paul Vidal de La Blache and his followers. Vidal de La Blanche's approach, often referred to as possibilism, argued that human societies can shape and adapt to their environment rather than being solely determined by it. This perspective allowed for a more nuanced understanding of the complex relationships between humans and their surroundings. The French School emphasized the importance of studying regions as unique entities, taking into account both the physical and human aspects. The school also stressed the significance of fieldwork, considering firsthand observation essential for a thorough understanding of a region.

One of the key features of the French School was its interdisciplinary nature. Geographers associated with this school engaged with disciplines such as history, anthropology, and sociology, recognizing the interconnectedness of various factors

influencing the development of regions. This interdisciplinary approach contributed to the richness and depth of their analyses.

While the French School of Geography went through changes and adaptations over time, its core principles of regional analysis, possibilism, and interdisciplinary collaboration left an indelible mark on the discipline. The school's legacy is evident in the continued importance of regional studies, the integration of physical and human geography, and the recognition of human agency in shaping landscapes and societies.

Vidal de la Blache

Paul Vidal de La Blanche (1845–1918) was a pioneering French geographer whose life and work had a profound impact on the development of modern geography. Born in Pézenas, France, in 1845, Vidal de La Blache was educated at the École Normale Supérieure in Paris. He later became a professor at the University of Nancy and subsequently at the Sorbonne in Paris. Vidal de La Blanche's academic journey unfolded during a transformative period in the discipline, marked by a shift away from environmental determinism.

Vidal de La Blanche is perhaps best known for his development of the concept of possibilism, a theoretical framework that argued against the deterministic view that the physical environment strictly determines human development. Instead, he proposed that human societies can adapt and shape their surroundings, opening up new possibilities for cultural and economic development. This perspective was a departure from the prevailing environmental determinism of the time, and it laid the foundation for a more nuanced understanding of the relationship between humans and their environment.

His approach to geography emphasized the importance of regional studies. Vidal de La Blanche believed that studying specific regions allowed geographers to explore the unique interactions between physical and human elements, fostering a deeper understanding of the complex relationships that shape landscapes. His commitment to empirical observation and fieldwork further distinguished his work, influencing generations of geographers to engage in firsthand studies to enrich their analyses.

In addition to his theoretical contributions, Vidal de La Blache was a prolific writer. His magnum opus, "Tableau de la Géographie de la France," co-authored with Marcel Dubois, exemplified his regional approach and demonstrated how geography could be a dynamic and living science. His work also extended beyond the academic realm, as he actively participated in advising policymakers on regional planning and development. Vidal de La Blanche's influence extended to his students, many of whom went on to become influential geographers in their own right. His ideas permeated the French School of Geography, which continued to shape the discipline in subsequent decades. Vidal de La Blache passed away in 1918, but his legacy endures through the enduring impact of his ideas, particularly his emphasis on possibilism, regional studies, and the dynamic interplay between human societies and their environments.

Vidal de la Blache's Law of Terrestrial Unity

Vidal de La Blache's Law of Terrestrial Unity is a foundational concept in geography that underscores the interconnectedness of Earth's physical and human phenomena. Proposed by the French geographer Paul Vidal de La Blache (1845–1918), this law asserts that the Earth is a unified and interconnected system where physical and human processes are intertwined, shaping the diverse landscapes and societies found across the globe. According to Vidal de La Blache, the relationships between climate, topography, vegetation, and human activities are so interdependent that they cannot be fully understood in isolation.

Vidal de la Blache's Pays

Paul Vidal de La Blache's concept of "pays" is a crucial element in his regional geography framework. The term "pays" refers to a distinctive and cohesive territorial unit, a region with unique characteristics that result from the dynamic interplay between its physical environment and human activities. In Vidal de La Blache's view, a "pays" is not just a geographical space; it is a living entity where the physical landscape and human society are intimately interconnected. This concept challenges the notion of static, predefined administrative boundaries and encourages geographers to examine the organic relationships between nature and culture within a specific area.

Vidal de La Blache's "pays" encapsulates the idea that each region has its own identity shaped by the historical, cultural, economic, and environmental factors specific

to that area. The emphasis on the uniqueness of each "pays" aligns with Vidal de La Blache's rejection of environmental determinism and his advocacy for possibilism, asserting that human societies can shape their environments. This concept has influenced the field of regional geography, guiding scholars to delve into the complexities of individual territories, consider the nuances of their development, and understand the intricate relationships between the physical and human aspects that define them.

Lean Brunhes

Jean Brunhes (1869–1930) was a French geographer and sociologist known for his significant contributions to the fields of human geography and regional studies. Born in Toulouse, France, in 1869, Brunhes pursued a diverse education in both the natural sciences and the humanities. He obtained his doctorate in 1892, and his early academic career involved teaching physical geography. However, Brunhes soon shifted his focus towards human geography and sociology, influenced by his interest in the relationships between people and their environments.

Brunhes played a crucial role in the development of the French School of Geography, building upon the ideas of his mentor, Paul Vidal de La Blache. His most influential work, "La Géographie Humaine," published in 1910, emphasized the importance of integrating physical and human geography, advocating for a comprehensive approach to understanding the complexities of human societies within their spatial contexts. This publication marked a significant departure from the environmental determinism that dominated geography at the time, aligning more with the possibilist approach championed by Vidal de La Blache.

Apart from his theoretical contributions, Brunhes was a dedicated field researcher, conducting extensive studies in France and around the Mediterranean. His empirical research focused on topics such as rural sociology, cultural landscapes, and regional variations in human activities. Brunhes believed in the necessity of fieldwork to complement theoretical insights and enhance the understanding of spatial patterns.

In addition to his academic pursuits, Brunhes held various leadership roles, serving as the director of the School of Advanced Studies in Social Sciences (École des Hautes Études en Sciences Sociales) and contributing to the founding of the

International Geographical Union. His work was not limited to academia, as he actively engaged with policymakers and contributed to discussions on regional planning and social issues.

Tragically, Jean Brunhes's life was cut short when he passed away in 1930. However, his legacy endures through his contributions to the French School of Geography and the broader field of human geography. His holistic approach, integrating physical and human aspects, continues to influence contemporary geographical research and education, emphasizing the interconnectedness of societies and landscapes.

Franz Schrader

Franz Schrader (1844–1924) was a German geographer, cartographer, and photographer known for his significant contributions to the field of Alpine geography. Born in Cologne, Germany, in 1844, Schrader pursued his education at the Universities of Bonn and Strasbourg, where he developed a keen interest in geography. His early career involved teaching and research, and he quickly became recognized for his expertise in alpine studies.

In addition to his photographic work, Schrader was a skilled cartographer. He produced detailed topographic maps of the Alps, combining his field observations with precise mapping techniques. His maps were not only aesthetically impressive but also contributed significantly to the understanding of alpine geography, glaciology, and geomorphology.

Schrader's devotion to alpine research culminated in his influential book "Die Alpen im Rahmen der allgemeinen Erdkunde" (The Alps in the Context of General Geography), published in 1907. This comprehensive work synthesized his extensive fieldwork, cartographic expertise, and photography to provide a holistic understanding of the Alps within the broader geographical context. Franz Schrader passed away in 1924, leaving behind a legacy that not only enriched the field of geography but also enhanced public appreciation for the beauty and complexity of alpine landscapes.

Emmanuel De Margerie

Emmanuel de Margerie (1862–1953) was a French geographer and explorer renowned for his pioneering work in polar and alpine regions.

Born into a distinguished family of scientists in Paris, France, in 1862, de Margerie developed an early fascination with geography, driven by a keen interest in the Earth's most remote and challenging environments. He received a comprehensive education, earning degrees in law, history, and geography, before devoting his life to exploration and scientific inquiry. Emmanuel de Margerie's scholarly contributions extended beyond his field expeditions. He served as a professor of geography at the Sorbonne, where he influenced and inspired future generations of geographers. His commitment to interdisciplinary research, combining geography with other scientific disciplines, marked him as a trailblazer in the integration of various branches of knowledge.

Emmanuel De Martonne

Emmanuel de Martonne (1873–1955) was a prominent French geographer renowned for his significant contributions to the fields of climatology and regional geography. Born in Chabris, France, in 1873, de Martonne received a comprehensive education in geography, meteorology, and mathematics. He completed his doctoral studies in 1900 at the University of Budapest, Hungary, under the supervision of the renowned meteorologist Albrecht Penck. His most influential work, "Traité de Géographie Physique" (Treatise on Physical Geography), published in 1925, synthesized his extensive research and laid out key principles in physical geography. De Martonne's approach emphasized the importance of integrating physical and human geography, advocating for a holistic understanding of the complex interactions between the environment and human activities. Emmanuel de Martonne's academic contributions extended beyond France. He served as a professor at the University of Cluj in Romania and the University of Strasbourg before assuming the chair of geography at the Sorbonne in Paris. His leadership roles and prolific publications, including articles and textbooks, established him as a leading figure in European geography during the early to mid-20th century.

Albert Demangeon

He was one of the forerunners of ‘La tradition Vidalianne’. He studied under Vidal Blache. He was a contemporary, student, friend and colleague of de Martonne. He started his career as a school teacher in Picardy. He was appointed to the University of

Lille, and there he remained till 1911 when he was appointed to the chair of geography, alongside de Martonne, at the Sorbonne in Paris. He remained there until he contributed to human geography and produced a manual of human geography. His monograph on La Picardie (1905) reflected the conceptual framework of the Vidalian tradition. Demangeon moved across every lane in Picardy before publishing the monograph. In its preparation

5.6 THE BRITISH SCHOOL OF GEOGRAPHY

British geographical thought has played a pivotal role in shaping the discipline globally, with a rich history spanning centuries. Rooted in classical geography, early British scholars like Strabo and Ptolemy laid the groundwork for understanding the Earth's surface and its features. However, it was during the late 19th and early 20th centuries that British geography witnessed significant theoretical developments, notably through the lens of environmental determinism. Scholars such as Halford Mackinder and Ellsworth Huntington argued that physical geography and climate largely determine the development of human societies, influencing colonial and geopolitical perspectives of the time.

Geography, one of the oldest fields of human curiosity, drew very little attention in Britain until the middle of the 19th century. Exploration of new lands, description of travels and voyages, and description of the newly discovered lands and their people were considered areas of geographical studies. Geography was introduced in educational institutions at a very late stage; in schools and colleges, memorization of facts, and names of places, mountains and rivers used to be taught by historians and geologists. Up to this time, geography to the British was nothing but an encyclopaedia of information. In the middle of the 19th century, academics were. Busy in accumulating facts and information about the newly discovered places of the world. In 1859, Darwin published his Origin of Species which attracted the attention of biologists, geologists and sociologists.

After this evolutionary theory, British scholars started paying attention to the earth as the home of man. It was at the end of the 19th century that geography was introduced as a discipline in British universities.

Halford J. Mackinder:

Halford J. Mackinder, a scholar of dynamic personality and a person who can give simple expression to complex ideas, with an imaginative mind, is known as the founder of the British School of Geography. He was the first recorded person to climb Mt. Kenya. Before becoming known for his writings on geopolitics, Mackinder was active in lecturing to audiences around the country on his vision of geography. On the strength of his views, he was appointed to a position at Oxford University becoming the first of a new generation of academic geographers and a vocal supporter of geographical education. In his opinion to become a discipline rather than a mere body of information, the subject had to bridge the natural sciences and humanities and take as its core "the interaction of man in society and so much of environment as varies locally".

Mackinder's version of the geographical experiment held physical and human geography together in an evolutionary perspective while stressing the utility of the subject for teachers, scientists, statesmen and merchants alike. His views have often been recalled in debates as to whether human and physical geography should be kept together. His thinking was governed by visualization, both on the map and in the mind, of the world's regional complexes as combinations of varied physical and human elements. He considered geography as a bridge between the humanities and the natural sciences, between history and geology. He applied these concepts to the interpretation of world political affairs.

With the appointment of Mackinder as Professor of Geography at the University of Oxford in 1887, geography started growing in the United Kingdom. In the initial stage, the British geographers were exclusively concentrating on the field of physical geography, in which there was hardly to be found any description of man as an agent of change in the physical surroundings. Mackinder identified geography as a discipline that traces the interaction of man with his physical environment. In 1904, he formulated the concept of the geographical pivot of history which is also known as the 'Heartland Theory of Mackinder'.

He summarized his view of global strategy in the famous lines:

Who rules East Europe commands the Heartland;

Who rules Heartland commands the World Island;

Who rules the World Island commands the World.

Mackinder declared that throughout the history of mankind, the coastal lands had always proved vulnerable to attack from the heartland, and the heartland remained invulnerable because sea power could be denied access to it. Thus, Mackinder was mainly concerned with a global view. He repeated the same view in 1943—a few years before his death during the Second World War. He warned of the danger of the heartland falling in its entirety under the control of the Soviet Union and of Russia's ability then to strike out to peripheral lands to the east, south and west of the 'World Island'. His regional concept also pervaded his interpretation of countries. According to some scholars, Mackinder's thinking was a generation ahead of his time.

Mackinder wrote Britain and the British Seas, which was published in 1902. This book is considered a classic in modern British literature which shows a more mature and sounder approach to a regional interpretation of Britain and its seas. His second great work Democratic Ideals and Reality was published in 1919. In this book, he discussed world power politics. A contemporary of Mackinder, H. Robert Mill wrote a book Realm of Nature in which he discussed the races of man.The concept of 'region' was a popular theme for British geographers before the First World War. The British geographers were influenced by Vidal de Lablache and the leading French sociologist F.Le Play. Sir Patrick Geddes—the Scottish geographer—was a follower of Le Play, who carried on research on family life-styles and family budgets. He recognized that family life is dependent on family lifestyle and family budgets.

George Chisholm

George Chisholm was a Scottish geographer and scholar who is considered the father of economic geography. He made pioneering contributions to the field through his writings and teachings in the early 20th century. Chisholm viewed economic geography as an independent field that studied the spatial organization of human economic activity and how various economic activities are distributed across different locations based on factors like transportation networks, resources, markets and more.

Through his writings in works like 'Handbook of Commercial Geography' and his teachings as a professor of geography at the University of Oxford, Chisholm helped

establish economic geography as a unique subfield that analyzed patterns of production, exchange, consumption and spatial interconnectedness of economies. He emphasized understanding how geographic factors influence choices made by producers, consumers and other economic agents. Chisholm also trained and mentored several generations of geographers who further advanced the intellectual development of economic geography in their works. His ideas and framework influenced generations of geographers to systematically study core topics in economic geography like industrial location theory, trade theory, spatial interaction and the role of transportation in economic development. Chisholm laid the foundation for economic geography to emerge as an important field of inquiry focused on relationships between geographical context and economic processes.

George Chisholm was born in 1873 in Scotland. He studied classics at the University of Glasgow and obtained his MA degree with First Class Honours in 1895. After graduation, Chisholm worked as a school teacher for a few years. He then decided to pursue further studies in geography. In 1900, he enrolled at the University of Edinburgh and studied under renowned geographers like Arthur Geddes. Chisholm earned his PhD in 1904 with a thesis titled 'The Coastline of Scotland: Its Evolution and Forms'. After completing his doctorate, Chisholm was appointed as a lecturer in geography at the University of Edinburgh. He taught there for over three decades until his retirement in 1937. During his long academic career, Chisholm made seminal contributions to establishing economic geography as a specialized field of study. He authored several influential books and scholarly articles that laid the foundations for theories, methods and principles of economic geography. Chisholm also trained and mentored many generations of geography students who further built upon his pioneering work and advanced the emerging discipline of economic geography.

George Chisholm (1850-1930) is considered the Father of Economic Geography due to his pioneering work establishing economic geography as an academic field of study. In the late 19th century, Chisholm recognized the importance of studying the economic activities of people concerning their geographic locations. At the time, the study of geography focused mainly on mapping physical landscapes and features. Chisholm pushed for a new focus on understanding how economic processes shape and are shaped by geography.

1. In 1887, Chisholm published the first textbook on economic geography, Handbook of Commercial Geography, which became a seminal work in the field.
2. In this book, he analyzed economic phenomena like trade, industry, and commerce in terms of their geographic influences.
3. Chisholm examined factors like natural resources, transportation networks, labour markets, and access to ports in determining the economic development of a region.
4. His innovative approach established key principles of locational analysis that became central to economic geography.
5. Chisholm served as a geography professor at University College London from 1893 to 1915. He trained many students who went on to become prominent economic geographers themselves, further establishing the discipline. Through his academic work, Chisholm demonstrated that geography and economics were interdependent fields that should be studied together. By illuminating this important spatial dimension to economic activities, George Chisholm played a pivotal role in founding the distinct field of economic geography.

Hugh Robert Mill,

Hugh Robert Mill, (born May 28, 1861, Thurso, Caithness, Scot.—died April 5, 1950, East Grinstead, Sussex, Eng.) was a British geographer and meteorologist who exercised a great influence in the reform of geography teaching and on the development of meteorology. Mill was educated at Edinburgh University, graduating in chemistry (1883) and specializing in the chemistry of seawater for his doctorate (1886). Love of the sea and boats led to his famous pioneer survey, *The English Lakes* (1895). Indifferent health and physique—he became blind in later life—prevented his becoming an explorer, but from 1892 (when he was appointed librarian of the Royal Geographical Society and settled in London), he became an acknowledged world expert in oceanography and Antarctic exploration.

It was through *The Realm of Nature* (1891) that he influenced the reform of geography teaching. As director of the British Rainfall Organization (1901–19), editor of *British Rainfall* and *Symons' Meteorological Magazine,* and honorary secretary of the Royal Meteorological Society from 1902 until 1907 (when he became president), he had a profound influence on the development of meteorology, which was recognized by the

institution of a Hugh Robert Mill medal given by the society, with Mill as the first recipient. He served as vice president of the Royal Geographical Society from 1927 to 1931 but was compelled by ill-health to refuse the presidency in 1933. His autobiography was in proof when he died. Mill's other publications include *Hints to Teachers &Students on the Choice ofGeographical Books for Referenc e and Reading, with Classified Lists* (1897); *New Lands* (1900); *The Siege of the South Pole* (1905); *The Life of Sir Ernest Shackleton* (1923); *Hugh Robert Mill: An Autobiography,* with introduction by L. Dudley Stamp (1951). He also edited *The International Geography* (1911) and was the geographical editor for the 11th edition of *Encyclopædia Britannica* (1911).

Patrick Geddes

Patrick Geddes was a man of diverse interests and talents. Today he is probably best known as a town planner. However, he has also been described as a biologist, sociologist, conservationist, educationist and ecologist. Geddes did much to improve the living conditions in this local environment and was also a figure of international importance. He travelled widely and corresponded with the key thinkers and writers of the time such as Charles Darwin, Mahatma Gandhi, and Nobel laureate Rabindranath Tagore. Above all, his aim was " to see life whole", and to achieve a better understanding of human beings in their natural, built and social environment. His ideas and concerns about the environment, education, and conservation are still as relevant today as they were in his own time.

Patrick Geddes was born in Ballater but spent his early childhood in Perth. He started his professional life as a Geologist and, in 1879, discovered chlorophyll. Unfortunately, ill health prevented him from pursuing what would have likely been a glittering career as a natural scientist. He turned instead to social analysis and applied his scientific methodology to the processes of economic, social and environmental change. In 1888, he took up the post of Professor of Botany at University College, Dundee and held this part-time position until 1918. Geddes was based principally in Edinburgh during this time and in parallel to his academic interests became interested in urban and regional planning and urban renewal issues.

In light of the connection to Dundee and Patrick Geddes' research interests in planning and environmental management, Town and Regional Planning has established him as a representative of its research interests, professional practice and teaching activities. To this end, the Geddes identity is now an integral part of the School. Sir Patrick Geddes (1854-1932) was a 'polymath'— a man of many parts. He was a biologist by training, a pioneering town planner who influenced various generations of urban planners, a sociologist and an educator throughout his life. A powerhouse of intellect and energy, Geddes blazed his course from project to project at home in Scotland and around the world for half a century. Instead of becoming a specialist, he was happy being a 'generalist', who held a holistic view that to live we must be able to see the intertwined link between the natural and social sciences.

Andrew John Herbertson

Andrew John Herbertson (1865-1915), a British geographer, was born at Galashiels on Oct. II 1865, and educated at Galashiels Academy and Edinburgh Institution. He served for some time with a firm of surveyors in Edinburgh, but later entered Edinburgh University, where he was engaged in research work under Prof. Tait. He subsequently carried out investigations on hygrometry at the Ben Nevis observatory. In 1894 he was appointed lecturer in Geography at Owens College, Manchester; in 1896 lecturer at the Heriot-Watt College, Edinburgh, and 1899 assistant to the reader in geography at Oxford. He became a reader in geography in 1905 and 1910 received the title of professor. The same year he was president of the geographical section of the British Association. He edited, with Dr Buchan, the volume on meteorology for *Bartholomew's Physical Atlas* (1899) and, with O. J. R. Howarth, a *Survey of the British Empire* (1914). His paper on *Climatic Regions of the Globe* attracted much attention, and his numerous text-books on geographical subjects and the leading part he took in the foundation and development of the Geographical Association enabled him to exert a powerful influence on the improvement of the teaching of geography. He died at Chinnor, near Oxford, on July 31, 1915.

In 1892, he was appointed to assist Patrick Geddes with the teaching of botany at University College, Dundee. in 1892 he was made a Fellow of the Royal Geographical Society. He then moved in 1892 to Fort William, Scotland to work on a meteorological observatory on Ben Nevis. In 1894 he moved to Manchester to become a

lecturer in political and commercial geography at the University of Manchester. From 1896 to 1899, he lectured in industrial and commercial geography at Heriot-Watt College, Edinburgh. In 1896 he was elected a Fellow of the Royal Society of Edinburgh. His proposers were Peter Guthrie Tait, Sir John Murray, Ralph Copeland and Alexander Buchan.

In 1898, he received a doctorate (PhD) from the University of Freiburg-im-Breisgau. In 1899 he moved to the University of Oxford to become a reader of geography; then became the first Oxford Professor of Geography in 1905. He would become head of the geography department at Oxford in 1910. In 1908 he was made a Fellow of the Royal Meteorological Society. He died of a heart attack in Radnage, Buckinghamshire. He is buried with his wife Frances Dorothy (who died two weeks later) in Holywell Cemetery nearby.

Herbert John Fleure

Herbert John Fleure, British geographer and anthropologist, has done much to further the view that the study of man and his societies should not be divorced from the study of their environments and that an evolutionary approach to the condition of man and his cultures in the various regions of the world is essential to the discipline of human geography. He vigorously championed this subject at a time when it was not generally recognized as a university discipline in Britain.

Fleure grew up in Guernsey. In 1897, when he was 20, a scholarship to the University College of Wales, Aberystwyth, enabled him to take courses in the natural sciences; he specialized in marine zoology. He spent the years 1903-1904 studying at the University of Zurich, where Rudolf Martin stimulated his interest in anthropology. The following year he returned to Wales and received the degree of D.SC. He then began to teach courses in zoology, geology, and botany at Aberystwyth and in 1907 was elected to a newly established lectureship in geography. His intellectual development was influenced by Darwinism and by the works of such German earth scientists as Eduard Suess and Ferdinand von Richthofen.

Fleure became a professor of zoology in 1910 but continued to teach geography, and in 1917 his persistent advocacy of this subject was rewarded by his appointment to the endowed (Gregynog) chair of geography and anthropology. In the same year, he became honorary secretary of the Geographical Association and editor of its journal

(now *Geography*), and through these agencies, he worked strenuously to advance the cause of human geography in education. From 1930 until his retirement in 1944, Fleure was a professor of geography at the University of Manchester. He has been president of three sections of the British Association for the Advancement of Science and of many learned societies. In 1936 he was elected fellow of the Royal Society.

Fleure quickly established his reputation as an anthropologist with an anthropometric survey of Wales conducted in 1916 (Fleure & James 1916). He first outlined a scheme of world regions, defined by the quality of life within them, in an article published in 1917. Suspicious of the concept of "natural regions," he saw, long before prehistoric archaeology and paleoecology had established the antiquity and extent of man's alteration of his surroundings, that human societies can fashion their environments and that "environment" is a term of cultural appraisal. In his *Human Geography in Western Europe* (1918) he first presented his conception of that discipline. The first of the ten volumes of *The Corridors of Time,* written in collaboration with Harold Peake, appeared in 1927, and the last volume appeared in 1956. From the first volume (*Apes and Men*) to the last (*Times and Places),*

This series presents Fleure's mature views on the development of human societies in the major regions of the world since prehistoric times. A balanced judgment on such issues as diffusion and independent development springs from a broad training in the sciences of man.

Environmental Determinism

Environmental determinism is a philosophy within human geography based on how society interacts with the physical environment, but what is the definition of environmental determinism?

Environmental determinism is a geographical and philosophical theory that claims that physical attributes of the environment, such as landscapes and climate, can significantly influence humans and therefore, the ability to impact society and development. Essentially, this means that the environment can control (or *determine*) how a population behaves. The theory states the physical makeup of an environment can psychologically influence individuals within a population, and this can spread within a population to ultimately define the society's behaviour and culture as a whole.

In terms of the history of geography, the philosophy of environmental determinism dates back to the Ancient Greeks, although the term environmental determinism wasn't officially formalized until the 1860s, by a geographer named Friedrich Ratzel. The theory became most prevalent in modern geography during the early 19th century, due to geographers such as Alexander von Humboldt and Carl Ritter who heavily advocated the theory. Herbert Spencer used Darwinism (the theory of evolution, by natural selection) to explain social progress through a theory of social evolution to justify environmental determinism. However, modern scholars largely disregard this theory now. In the late 20th/early 21st century, Ellen Churchill Sumple became another leading player in environmental determinism.

However, the theory's popularity rapidly declined as critics such as Carl Sauer began suggesting the theory of environmental determinism was incorrect. (The criticisms of environmental determinism will be made clear later in the explanation). Eventually, the theory saw a more recent revival around the late 20th/early 21st century, mainly because of the geographer Jared Diamond. The main features of environmental determinism are climatic, ecological and geographical factors. These different factors are said to influence human factors in society. They are:

- Economic Development - this is the economic progress within a community.
- Cultural Development - this is when a society has an array of cultural activities. The more diverse the activities, the more cultural development within the society.
- Societal Development - this is measured by the quality of life in a society. Therefore, if the quality of life within a community is high, societal development is also considered high in that community.

Environmental determinists believe that the environment's physical features can influence an entire culture. One example claims that people who reside in the tropics are lazy because of the hot climate, whereas those who live at latitude outside the tropics are hard-working due to the variation in climate. This suggests that the environment, more specifically the climate, influences the cultural and societal development of a civilization, and this can sometimes be called **climatic determinism**. Climatic determinism is also similar to the concept of the **equatorial paradox**. This is the idea that countries that are located close to the equator are poor and less developed, whereas

countries further from the equator are richer and more developed. This is based on the suggestion that civilizations that are found close to the equator have a physical environment that is not suitable for economic development to occur.

Therefore, this example focuses on the human aspect of economic development. Another example of environmental determinism is that island societies do not share the same traits as people from continental societies because of the remoteness of island societies. This proposes the idea that geographical factors of environmental determinism influence cultural and societal development.

Possibilism.

Possibilism is a concept that is most commonly associated with the work of the French geographer Vidal de la Blache. Vidal de la Blache developed this geographical approach as a reaction to a more traditional geographical way of thinking, which is known as environmental determinism. While this latter tradition "regarded all the facets of human activity (from farming practices to political systems) as ultimately determined in character by the natural environmental context", the former way of thinking about the relationship between people and their surroundings is shaped by the idea that "the natural environment offers possible avenues for human development, the precise one chosen being very much a human decision". This is not to say that people are completely free to determine their directions, but rather it assumes that there exists an "ongoing „dialogue" between natural environments and the human communities they support" („milieux" and „civilisations"), which, according to Vidal de la Blache, results in a "human world full of different genres de vie („lifestyles"), distinctive to particular people living in particular places". Thus, Possibilism explains that the environment does not dictate what people become, but rather that the environment offers opportunities for people they choose to be. People adapt to the different conditions the earth has to offer at different places and that is how different living conditions and habits arise.

It was the French historian Lucien Febvre who elaborated further on the concept of possibilism, by writing that, when it comes to human behaviour about their environment, "there are no necessities, but everywhere possibilities; and man, as a master of the possibilities, are the judge of their use. Thus, according to Febvre, because men have the most influence as a geographical agent on the earth, we should put a man

in the first place, and no longer the earth, nor the influence of climate, nor the determinant conditions of localities"

What is the Possibilism in Geography?

Possibilism is the philosophy introduced by Fabvre, to explain man and environment relationship in a different way than determinism, taking man as an active agent in the environment; which asserts that the natural environment provides options, the number of which increases as the knowledge and technology of a culture group. According to Fabvre, 'there are no necessities, but everywhere possibilities'. The possibilism saw in the physical environment a series of possibilities for human development, but they argued that the actual ways in which development took place were related to the culture of the people concerned, except perhaps in religion of extremes like desert, tundra, equatorial and high mountains. The possibilism emphasises that it is impossible to explain the difference in human society and the history of that society regarding the influence of the environment, and they hold that man himself brings his influence to bear on that environment and changes it. According to them, nature is never more than an adviser. In marginal environments of equatorial forests, cold deserted areas and tundra regions man's choice may be very extremely restricted; but in areas of the warm and cool temperate zones, man's techniques were highly developed, and the possibilities were more numerous. Thus, Bowman asserted while the physical laws to which mankind response are available in their application and degree of effect yet is also true that all men everywhere are affected to some degree by physical conditions.

Inspire of the fact that man has numerous possibilities in a given physical setting; he cannot go against the direction laid by the physical environment. Thus, the possibility approach was criticized by many scholars. G. Taylor, while criticizing possibilism stressed that the task of geography is to study the natural environment and its effect on man, not all problems connected with man or the cultural landscape. Moreover, Possibilism does not encourage the study of geography and it promotes anthropocentrism in geography. Alfred Hettner, a German Geographer known for his concept of chorology (the study of places and regions) is most widely considered one of the pioneers of the school of thought of Possibilism. However, even earlier than him, a French geographer Paul Vidal de la Blache became the first active advocate of

Possibilism. Vidal is credited with introducing geographic possibilism and defined it in the sense that in a given natural environment, humans have a range of potential actions available to them, which they can deploy to overcome the natural limitations placed upon them Man Has Changed the Environment‟ – Examples of Possibilism Man has brought changes to the environment by increasing its capacity to meet his largely increased needs and demands. The most visible and common examples in this regard are the Industrial revolution, agricultural advancement, technological revolution.

Historical Background

Since ancient times, determinism has been important notion defining the man environment relationship. The idea was that man is a product of nature or physical environment moulds the human culture. Most of the early scholars like Aristotle, Eratosthenes, Strabo, and Hippocrates were deterministic in their approach. For Example, Aristotle believed that the worlds climatic zones – frigid, temperate and torrid; determined habitability of man. In medieval time, France scholar Montesquieu in his work The Spirit of the Laws (1748) discusses how climatic conditions govern the degeneration and persistence of cultural traits. This philosophy even dominated the writings of Arab scholars especially Al- Masudi, Ibn Battuta, and Ibn- Khaldun. In the early modern period, Kant vehemently supported determinism.

Ritter, one of the founding fathers of Modern geography also had a tilt towards an anthropocentric approach and advocated geographical determinism. Ratzel (1844-1904) also propagated new determinism where he emphasized that man holds a higher position than other organisms; still accepting that determinism is a dominant force in explaining the man-environment relationship. In the second volume of „Anthropogeographie‟, he analyzes the socioeconomic activities and culture of man in the physical environment. This concept at a later stage became an inspiration for Vidal de la Blache. Apart from determinism, scientific concepts like the deductive approach, Darwin‟ 's theory of evolution, and Newtonian cause-and-effect relationships in the latter half of the twentieth century and early twentieth century influenced several geographers in France. This led to the foundation of the modern school in France (France School of Geographical Thought) which had its roots in the philosophy of possibilism. Vidal de la Blache, Gallois, Brunhes, Demangeon, Emmanuel De Martonne, Blanchard, and all advocated the paradigm of possibilism. This philosophy is

in direct contrast to determinism and puts man in the first place that is a man and no longer the earth or climate influences man‟ 's habitability. Thus, presents man as an active rather than a passive agent.

The doctrine of possibilism tries to explain the relationship of a human being with the environment in a different way; it puts humans at a higher level and regards them as an active agent. It is a principle that claims that the environment provides opportunities and man being an economic man chooses from those possibilities. Febvre (1932) in „A Geographical Introduction to History‟ stated „there are no necessities, but everywhere possibilities; and man, as the master of these possibilities, is the judge of their use. The roots of possibilism can be traced back to the works of Plato, who is considered the master of deductive reasoning. Though his idea went into gloom for hundreds of years; the contrasting doctrine of determinism continued to grow and flourish. It got support from the writings of the French scholar of the eighteenth century – Montesquieu, who is credited with developing a doctrine analogous to the modern paradigm of possibilism. He opined that man possesses free will and can choose from a series of opportunities. Similar thoughts were also put forward by another eighteenth-century French philosopher, Comte de Buffon. He believed that man was ordered to conquer the earth and even transform it. Their views laid the base for the crytopossibilistic hypothesis.

In the nineteenth century, George Perkins Marsh and Kirchoff made an attempt to put forward a non-deterministic approach to human geography; they focused on the man himself. It was only in the latter half of the nineteenth century that under the leadership of Vidal De la Blache (1845 – 1918), a possibilistic view of an environment developed. The focus of this philosophy was “Nature has set boundaries and has provided possibilities for human settlement, but the way a person responds to these conditions or adjusts it depends on the traditional way of life." Vidal rejected the concept of material determinism and advocated favourability. He even rejected Durkheim‟ 's opinion of human geography as social morphology rather insisted that man was a partner and not a slave of the environment (Dikshit, 2009). He was critical of Darwinian Ratzelian heritage which proposed environmental determinism and put forth the concept of possibilism. He sought a scheme for understanding the interaction of nature and culture that eschewed both environmental determinism and radical

possibilism to seek answers or solutions for the dichotomy between humans and the environment.

He vehemently rejected the idea that society and nature stood out as adversaries in the human-nature confrontation. For him, man was part of nature and therefore, its most active collaborator. To resolve this dichotomy he generated the concept of „genre de vie". „Genre de vie" (way of life) includes all activities, practices, and techniques that characterize the adaptation of a human group to the milieu – the natural surroundings of their habitat. Vidal pointed out that the same genre de vie had different interpretations for various human groups.

Thus, his works gave a sound methodological as well as a philosophical foundation for the doctrine of possibilism. This growth somewhat weakened the hold of Darwinian Determinism within the geographical thinking. Possibilism was further flourished by acclaimed historian Lucien Febvre (1878-1956). He puts forward - "Whatever the men do in their environment, they cannot completely get rid of themselves completely." Febvre emphasized human initiative and motivation against the environment, destroying the environmental deterministic reasoning and as part of the environment of any group, as well as other humans, because they belong to the next group's cultural surroundings or the constraints of the environment are influenced by such thinking. He stated that in the view of possibility, a homogeneous region does not necessarily result in a homogeneous society. This is because people residing in any area have the choice of possibilities from time to time and also in the quantity they want.

Bruhnes followed Blanch's ideas and took them to the next step, he not only transmitted Blanche's philosophy in France but also disseminated it to different parts of the world. In 1910, his monumental work La Geographie de L'Histoire was published. His prime focus was on the actualities of exploitation of the earth by man. Commented: "The power that is meant is limited, and it meets in it the bounds of nature that it cannot cross human activity can change within its boundaries and its environment. But it cannot be removed from its environment, it can only modify it, but it can never cross it, and it will always be conditioned by it. "He also stated that - "Nature is not compulsory but the approval." Futility is also associated with the French school of geography; French geographers saw a series of possibilities for human development in the physical

environment but argued that the development in real development was related to the culture of related people, perhaps in the field of extremes like deserts and tundra.

5.7 SUMMARY

In the development of geographical thought, various schools of thought have emerged, each offering distinct perspectives on the relationship between human societies and their environments. Among these, the German and French schools stand out for their significant contributions to shaping the discipline. The German school of geography, particularly prominent in the 19th century, emphasized the importance of regional studies and the integration of physical and human geography. Scholars like Alexander von Humboldt and Friedrich Ratzel played pivotal roles in advancing this holistic approach to geography, which sought to understand the interconnectedness of natural and cultural landscapes. Humboldt, in his extensive explorations of South America, emphasized the unity of nature and the interconnectedness of environmental phenomena. Ratzel, on the other hand, introduced the concept of Lebensraum (living space), highlighting the role of geographical factors in shaping the expansion and development of nations.

In contrast, the French school of geography, influenced by thinkers like Paul Vidal de la Blache and Jean Brunhes, focused more on human geography and the study of regional differences.

Vidal de la Blanche considered the founder of modern French geography, emphasized the importance of the "possibilist" approach, which argued that while environmental factors provide a framework for human activity, human societies have the agency to adapt and transform their environments. This perspective was reflected in Vidal de la Blanche's emphasis on the study of regions as dynamic entities shaped by human action and cultural practices. Furthermore, environmental determinism and possibilism represent contrasting perspectives within geographical thought regarding the influence of the environment on human societies. Environmental determinism, as previously discussed, posits a deterministic relationship between physical geography and human behaviour, suggesting that environmental factors largely determine the development and characteristics of societies. This perspective was prominent in the works of scholars like Halford Mackinder and Ellsworth Huntington, who argued that

climate, topography, and natural resources exerted a decisive influence on the course of human history.

On the other hand, possibilism, associated with the French school of geography, offers a more nuanced view that acknowledges the role of human agency in shaping responses to environmental constraints and opportunities. Advocates of possibilism argue that while environmental factors provide a range of possibilities for human activity, cultural, social, and technological factors mediate the relationship between society and its environment. This perspective allows for a more flexible understanding of human-environment interactions, recognizing the capacity of human societies to innovate and adapt in diverse geographical contexts.

5.8 GLOSSARY

Schools of Thought:	Diverse theoretical frameworks within geography.
Scientific Geography:	Rigorous study of geographical phenomena.
German School:	Geographical tradition emphasizing systematic observation.
French School:	Focuses on historical geography and cultural landscapes.
Environmental Determinism:	Theory stating environment shapes human behaviour.
Possibilism:	Idea humans adapt to environmental constraints.
Geographical Determinism:	Influence of geography on human outcomes.
Spatial Analysis:	Quantitative study of spatial patterns.
Critical Geography:	Examines power dynamics in spatial organization.
Cultural Landscape:	Human-modified environment reflecting culture.

5.9 ANSWER TO CHECK YOUR PROGRESS

- What distinguishes the German School of Geography in its approach to geographical inquiry?
- How did the French School of Geography contribute to the understanding of cultural landscapes?

- What fundamental belief characterizes Environmental Determinism in geography?
- How does Possibilism challenge the deterministic views of Environmental Determinism?
- What pivotal moment marked the transition to rigorous scientific inquiry within geography?
- What were some key contributions of the German School of Geography to the discipline?
- How does Possibilism offer an alternative perspective to Environmental Determinism?
- What are the main characteristics of the French School of Geography?
- In what ways did the formulation of scientific geography shape the development of the discipline?
- How does the concept of Schools of Thought encapsulate the diversity within geographical theories and methodologies?

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5.11 TERMINAL QUESTIONS

(A) Long Answer type Questions

Q.1- How did the formulation of scientific geography contribute to the evolution of the discipline, and what were the key factors driving this transition?

Q.2- What were the main principles and methodologies associated with the French School of Geography, and how did it influence geographical thought?

Q.3- Discuss the key characteristics and contributions of the German School of Geography to the discipline, highlighting its impact on shaping geographical inquiry.

Q.4- Explore the development of British geographical thought, including its major themes, theoretical perspectives, and influential figures.

Q.5- Compare and contrast the perspectives of environmental determinism and possibilism in geography, examining their implications for understanding human-environment interactions.

(B) Short Answer type questions

Q.1- What does the term "School of Thoughts" refer to, and why is it important in geography?

Q.2- Briefly explain the significance of the formulation of scientific geography in the development of the discipline.

Q.3- What are the main characteristics of the French School of Geography, and how did it contribute to geographical thought?

Q.4- Describe the key features of the German School of Geography and its impact on geographic inquiry.

Q.5- What are the fundamental differences between environmental determinism and possibilism in understanding human-environment interactions?

(C) Multiple choice questions

Q-1. Which geographical tradition emphasizes systematic observation and regional studies?

a) French School of Geography

b) German School of Geography

c) Possibilism

d) Environmental Determinism

Answer: b)

Q-2. Which theoretical perspective posits that the physical environment primarily determines human behaviour?

a) French School of Geography

b) Environmental Determinism

c) Possibilism

d) Scientific Geography

Answer: b)

Q-3. Which school of thought in geography focuses on historical geography and cultural landscapes?

a) Environmental Determinism

b) Scientific Geography

c) French School of Geography

d) Geographical Determinism

Answer: c)

4. What is the rigorous study of geographical phenomena called?

a) French School of Geography

b) Possibilism

c) Scientific Geography

d) Critical Geography

Answer: c)

Q- 5. Which concept proposes that humans can adapt and innovate in response to environmental conditions?

a) Geographical Determinism

b) Environmental Determinism

c) Possibilism

d) German School of Geography

Answer: c)

Q-6. Which term describes the influence of geography on human societies and historical processes?

a) French School of Geography

b) Geographical Determinism

c) Spatial Analysis

d) Possibilism

Answer: b)

Q- 7. What methodological approach in geography involves the examination of spatial patterns using quantitative techniques?

a) Critical Geography

b) Environmental Determinism

c) Spatial Analysis

d) German School of Geography

Answer: c)

Q- 8. Which contemporary school of thought within geography examines power dynamics in spatial organization?

a) French School of Geography

b) Geographical Determinism

c) Possibilism

d) Critical Geography

Answer: d)

Q- 9. Which term refers to the diverse theoretical frameworks within the discipline of geography?

a) Possibilism

b) Schools of Thought

c) Scientific Geography

d) Environmental Determinism

Answer: b)

Q-10. Which perspective acknowledges the role of human agency in shaping geographical outcomes?

a) French School of Geography

b) Environmental Determinism

c) Possibilism

d) Geographical Determinism

Answer: c)

UNIT-6 NEO-DETERMINISM AND PROBABLISM, CONTRIBUTIONS OF BRITISH, AMERICAN, AND FORMER SOVIET UNION SCHOOLS

6.1 OBJECTIVES

(Warp Materials) After reading this unit you should be able to:

- Understand neo-determinism
- Gain knowledge about probablism
- Explain the contributions of British school
- Know about American school
- Contributions of Soviet Union Schools

6.2 INTRODUCTION

Striking a balance between extreme determinism and extreme possibilism, Griffith Taylor developed a new philosophy called "stop and go determinism" or neo determinism, in the early 1940s. it will be seen that nature has only in large part determined the programme; man, who plays an important part determines the rest. Moreover, man only follows natures programme if 'he is wise;' presumably he can act foolishly, which admits the possibility contention that within broad limits set by environment man can choose, at the very least Taylor concedes him the choice between wise and foolish action.

UNIT 6.3 NEO-DETERMINISM AND PROBABLISM, CONTRIBUTIONS OF BRITISH, AMERICAN, AND FORMER SOVIET UNION SCHOOLS

NEO-DETERMINISM

Neo-determinism holds that although human activity is determined by the physical environment, humans could choose which activities they engage in. As a result, humans can make informed decisions about the possibilities that are available to them in their natural environments. Another name for this perspective is Stop-and-Go Determinism. Australia's Griffith Taylor is among the principal exponents of this viewpoint. He thought that people make intelligent decisions based on their immediate physical surroundings. These are the best choices that people have made and are then putting into practice in any given setting. They may be used as planning tools that any country can employ to grow. According to him, the purpose of human endeavours must be in harmony with the natural order. Taylor claims that because humans are wise enough to recognize the signals provided by their physical surroundings, they possess the capacity to accelerate, move slowly, or stop completely.

In this sense, humans are like traffic controllers, able to alter the speed without changing the direction of travel. This is where the concept of Stop-and-Go Determinism originates. Taylor shared the possibilistic viewpoints that not all environments will present the same opportunities. For example, harsh climates require more work from humans than moderate climates, where nature may be more generous in its gifts to humans and therefore require less work. The whole compensation that humans provide to the natural environment for permitting them to engage in specific activities to support themselves is the ratio of the worth of effort to the value of return. Furthermore, it is acknowledged that human activity also serves to satisfy, priceless needs, therefore in these situations, no cost is too high for humanity to pay to the natural world.

Taylor shared the possibilistic viewpoints that not all environments will present the same opportunities. For example, harsh climates require more work from humans than moderate climates, where nature may be more generous in its gifts to humans and therefore require less work. The whole compensation that humans provide to the natural environment for permitting them to engage in specific activities in order to support themselves is the ratio of the worth of effort to the value of return. Furthermore, it is acknowledged that human activity also serves to satisfy particular, priceless needs, therefore in these situations, no cost is too high for humanity to pay to the natural world. As a result, humans just follow the pattern established by nature and adapt to its "limits." Additionally, he promoted the idea that the majority of the world's climates—which can be too dry, too cold, too wet, or too hot—direct human activity. Humans can utilize technology to change the circumstances, but they are powerless to change the fundamental physical environment; as a result, they must accept the routes that nature has laid out for them to follow.

Environmental determinism is not the same as stop-and-go determinism. The distinction is that, while the latter denies that humans have choice in their physical surroundings, which is thought to be the final arbiter of all their actions, the former introduces the idea of choice that humans have in any type of physical environment for carrying out their activities. Thus, Neo-Determinism promotes the idea that human endeavours and activities will be fruitful if people make sensible decisions in accordance with the blueprint provided by nature.

This is a more grounded philosophy that is a modified form of environmentalism or determinism. It is also known as scientific determinism since it is founded on a scientific methodology. The majority of geographers began to embrace positivism by the middle of the 20th century, and those who maintained determinism also criticized earlier forms of determinism, emphasizing how modern and scientific they were. Ancient fatalism's proponents were continually trying to show that man is a slave to nature and that nature has power over him.

This ideology is overblown because, in the modern, civilized world, man has liberated himself from the bonds of nature in many respects. The ideology of Possibilists holds that man is the conqueror of nature. Given that both extreme ideologies appear to be far from reality, it is especially important that they coordinate in the current context. Deterministic modern thinkers pursue the middle route, but they nevertheless value nature and the natural environment. According to George Tym, "control" is substituted for "influence," and "adjustment" or "response" is used in lieu of "control" (the terms they employ are milder, "control" is substituted for "influence," and "influence" is used for "response" or "adjustment"). In his view, natural components have a definitive influence on human activity and life, so for human growth, man must not neglect nature and seek its cooperation. Neo-determinism, or neo-determinism, is the word for this new ideology that has been altered by determinism. Another name for it is Neo Environmentalism. Renowned geographer Griffith Taylor is credited with spearheading the neo-determinist movement. Taylor held academic positions at universities in Australia, the US, and Canada. He provided determinism a new shape, elucidating nature's effect rather than its control, and therefore defending determinism grounded in a scientific method.

Taylor has underlined that although the environment can be lessened or controlled, its influence on human life cannot be entirely disregarded. For instance, man is still subject to the shackles of nature and cannot escape its power in the icy tundra regions of North America and Eurasia, the snow-covered continent of Antarctica, the Sahara, and the barren deserts of Australia.Like the densely populated regions of Asia, Europe, and North America, many areas with unfavourable geographical characteristics are almost uninhabited and will not be able to develop in the foreseeable future. The primary cause of this is that nature has such strong grip over this area.

According to Taylor, his version of determinism is known as scientific determinism. He has also referred to "Stop and Go determinism" as scientific determinism. Taylor claims that nature is like the traffic cops stationed at a junction, controlling traffic but frequently not altering the course of travel. When the traveller reaches the crossroads, he continues forward, looking both left and right and using his own judgment, albeit he might need to pause briefly. Humans should operate with the laws of nature in mind, much as it is beneficial for travellers to abide by traffic regulations for their own safety. If not, they may encounter unanticipated difficulties or have an accident. 'Stop and Go's literal meaning is most likely associated with this emotion.

Neo-determinism thus suggests that although nature does not have absolute power over humans, its effect is undeniable. This Taylorian worldview is known as "Pragmatic Possibilism," according to Canadian geographer George Tatham. Nature offers man a variety of options from which he might select. As a result, this worldview is more pragmatic and like positivism. Ellsworth Huntington, an American geographer, had declared his belief in scientific determinism. His numerous works from the first part of the 20th century all exhibits this ideology. He tried to clarify how the natural world affected human activity on the social, cultural, and economic fronts. He believed that the most significant natural phenomenon was the climate. In his view, racial, religious, and social variables are just as significant in defining a region's human culture and civilization as environmental ones. According to British geographer A. F. Martin, scientific determinism is essential. According to what he has stated, we can explain the laws by which a particular action takes on its form at the scientific level because of the overall cause-and-effect synthesis. He viewed cause and effect as comprehensive and intricate. For this reason, he put up the argument that "determinism must exist, but the cause-and-effect chain is extremely complicated."

While acknowledging Martin's points of view, Lewthwaite (G.R.) has noted that geographers just state that their field of study is connected to other fields and do not assert that the physical environment is the sole or most significant driver of human behaviour. Testing this set of determinants is the goal. Neo-determinism advanced significantly in the second half of the 20th century because of deterministic ideology being refined. The American geographer Carl Sauer has underlined the necessity of adjusting the relationship between man and nature, embracing a modified deterministic

approach. According to his theory, man should adapt to the natural world by both modifying it as needed and changing himself to some extent. The only concept discussed by early determinists was adaptation. As a result, while neo-determinists emphasize adjustment, ancient determinists place more emphasis on "adaptation."

The British geographer (A.J. Herbertson) was a neo-determinist as well. He classified the world into natural areas based on vegetation, which he believed to be the primary determinant. However, he attempted to demonstrate that human aspects and natural elements are identical in every natural region. He thought that inner forces had such a powerful effect on people that it shows up in their daily lives and actions. Along with environment, human challenges have also been highlighted by British geographer HJ Fleure. Although he acknowledged that natural influences cannot be disregarded in the study of human areas, he held the opinion that human regions transcend the boundaries of climate and mountains. In doing so, he has highlighted the central idea of neo-determinism—the cooperation of human and natural forces.

Both Possibilism and Determinism are extreme ideologies whose relevance in the real world has greatly diminished. Human power also has a role in determining human life, human activities, socio-cultural conditions, etc., which are not found to be the same in two separate places with similar natural environments. Thus, human friendship is what leads to this regional relationship. The term 'probabilism' was first used in 1957 by British geographer O.H.K. Spate. This ideology holds that the natural environments of the various regions of the earth's surface are what give each place its diversity and uniqueness. Certain elements are more beneficial to humans in one location than they are in another. There are some things on earth that are not equally helpful to humans in every location. The natural environment is favourable for mining, industrial development, animal husbandry, and agriculture in some areas, but not for agriculture in others.

Thus, every land area has a plethora of alternatives. a few of which yield higher profits. Man should select the alternative that is more helpful and advantageous for him out of all the options that nature has to offer. Man must comprehend the surface's natural characteristics or spatial possibilities to select the most appropriate one. The idea of probabilism places emphasis on how environmental determinism and positivism work together. It highlights the significance of human talent and efficiency as well as the

features of the natural world. However, it is a modified version of possibilism, closer to Blasch's ideas, and it also acknowledges the significance of nature.

This idea states that the only way to produce as much as possible in an area (such as West Bengal) where the land conditions are ideal for rice cultivation is to cultivate rice. If another crop is planted in its stead, there may be a loss. Comparably, it is advantageous and in the best interests of humanity to manufacture just those goods in regions where the environment is conducive to their growth. Stochasticity, thus, emphasizes choosing the option that is most valuable out of all the options.

Contributions of British, American and Former Soviet Union Schools

The human-nature dialogue has been examined and analysed from a variety of angles throughout the history of geographical thinking. Determinism was the first of these theories to discuss the relationship between humans and nature. Determinism, to borrow Platt's 1948 terminology, is the belief that everything in human existence is inexorably brought about by circumstances or events from the past. The physical environment served as determinists' main source of explanation at first, and their theoretical framework was based on the idea that human behaviour was governed by the constraints of the environment, which served as their home.

One of the most significant concepts that persisted until World War II in one form or another is determinism. According to this paradigm, the differences in natural environments around the globe can be used to explain the behavioural differences observed in people. Deterministic ideology holds that the physical elements of the environment, regardless of scale, are the only factors that can determine the degree of growth of history, culture, lifestyle, social group, or nation. Determinists typically view people as passive agents who are constantly influenced by physical circumstances, which shapes their behaviour and way of thinking. To put it briefly, determinists think that the majority of human actions can be accounted for as reactions to the natural environment.

The Path of Determinism in Geography

The environmentalism paradigm in geography has generated a lot of discussion in the newly formed field of geography. Within this field, the terms "determinism" and "environmentalism" are sometimes used interchangeably, with the basic understanding being that all human behaviour is determined by the natural world. We won't argue that

environmentalism and determinism are not the same thing here; instead, we'll focus on how important this paradigm is to geographical thought. According to Beck (1985), one of the longest-running discussions in the annals of the social science of geography revolved around environmental determinism. Furthermore, it gave geography its definition as the study of the interactions between humans and their environment.

There have been years of discussion on the problem, but no clear resolution has been reached. Instead, it was a notion that sparked debate before being rejected by the majority who believed it was unworthy of more discussion. Despite that decision, the hypothesis has occasionally surfaced to cause confusion for both the general public and academics. It is worth taking into consideration that it keeps coming up in the works of different authors, academics, and other people. Rather a considerable work has been done in recent years on this perennial theme of man and the environment and it leaves little doubt that though some have pronounced environmentalism as dead as the dodo, it may prove to be, as Spate in his article *Quantity and Quality in Geography* published in the Annals of the American Geographers in 1960, has affirmed, an "*Immortal bird, not born for death.*"

The introduction of geography into modern science was through environmental determinism (Peet, 1985). Because of its biological foundations, geography was able to play a major role in the naturalism that was popular in the post-Darwin era, when science rather than religion provided the justification for social behaviour. By carrying out this ideological role and offering related practical abilities (such as surveying, mapping, boundary drawing, and exploration), geography became a contemporary, widely replicated science. In an effort to provide a scientific explanation for the imperial events of late 19th- and early 20th-century capitalism, determinism established geography's standing as an analytical science within the sciences. It is essential to take into account the historical background of determinism in order to comprehend why it turned into an intellectual pariah in human geography. Greek and Roman intellectuals made the first attempt to explain the physical attributes and character qualities of various people and their cultures in the context of the influence of natural conditions. This endeavour at the period involved not just geographers but also academics from other disciplines, such as the physician Hippocrates, the philosopher Aristotle, and the historians Thucydides, Polybius, and Herodotus. During the Greco-Roman era, the study of history and geography were closely related.

Thucydides and Polybius attributed Athens' success to its physical location and natural surroundings. For instance, Aristotle discussed how climate factors distinguish people in Northern Europe from those in Asia, elucidating Rome's glory and citing comparable Strabo occurrences in his explanation of these differences.

Strabo contended that their bravery was a result of Europe's extreme cold. According to Aristotle, people who lived in hot climates in Asia were smart, but they occasionally became slaves because they lacked souls. Aristotle's belief that the centre of space, Greece, was the best combination of all potential worlds is not surprising, as humans tend to think of their home as the best place (Glacon, 1967). Aristotle fervently argued that some nations' progress can be attributed to their advantageous natural circumstances. During the Middle Ages, Montesquieu provided an explanation for why people in colder climates are less physically powerful, brave, lucid, vulnerable, and sly than those in warmer climates. He quotes that people in hot weather are terrible, weak in body, dull and inactive.

Arab academics' publications were dominated by deterministic approaches. They emphasized the physical and cultural traits of the castes and castes in various regions, dividing the world into seven terrestrial zones based on climate. Within the conceptual framework of determinism, Al-Baruni, Al-Masudi, Ibn-Hawkal, Al-Idrisi, and Ibn Khaldun made an effort to relate human behaviour and living situations to the environment. Historian George Tatham also analyzed the disparities between the individuals in the eighteenth century in terms of the variations between the countries in which they lived. Kant, another influential figure, claimed that people in New Holland (the East Indies) had their eyes half closed and could not see their head from a distance until they bowed. Thomas Malthus was a scientific determinant (1766-1834) he not only emphasized the effect of different environments but also emphasized the boundaries that were imposed on social milieu because of these different environments.

When geography was connected to other sciences in the 19th century, deterministic reasoning persisted. German geographer Carl Ritter established the conceptual foundation for determinism in geography by taking an anti-human stance. Ritter attempted to alter the bodily makeup, health, and physical characteristics of males residing in various physical environments. "A study of the relationship between people's density and the nature of their land" was how many of his students defined geography. Many of their school's geographers had stated that their primary responsibility was to determine how

physical, cultural, and geographical factors affected the political fortunes of people living in any region, both in the past and in the present. Alexander von Humboldt, one of the founders of 'Modern Geography' and a contemporary of Ritter, also said that the life of the residents of a hill country is different from those in the plains.

The beliefs of Darwin and the acceptance of Newton's cause-and-effect relationships dominated the scientific environment in the later half of the 19th century and the early decades of the 20th century. Charles Darwin's work, whose seminal work The Origin of Species (1859), had a profound impact on numerous geographers and is credited with inspiring scientific determinism. It is now well acknowledged that evolutionary biology had an impact on the evolution of contemporary geographic theory. According to Stoddart (1966), the very advancement of geography as a science was made feasible by Darwin's biology, which was essential in determining the human species' place in the natural world. The dualism between natural and human phenomena, as well as the methodological issues associated with studying human-environment links, were overcome by the organismic analogy (Stoddart 1967).

The theory of determinism was the dominant perspective in American geography at the close of the 20th century, and it fit in well with the surrounding intellectual milieu. The majority of these drew inspiration from Darwin's theories, which William Morris Davis expanded upon in the cycle of erosion model. Recording the environment's power or effect over human society was the focus. The father of "new" determinism, Friedrich Ratzel, created the conception of the state as an organism and added aspects of "Social Darwinism" to "classical" geographical determinism. He thought that there was a prerequisite and that the "man" was the result of development, which was determined by natural selection based on a type's capacity to adapt to its physical surroundings. He and his student Ellen Churchill Semple rose to prominence as the most outspoken representatives of the deterministic geography method.

Man is a product of the Earth's surface, according to Semple in her 1911 book Influences of Geographical Environment. This work has been widely and enduringly used in geographic education (Wright 1966). James, Bladen, and Karan (1983) state that she "trained a large proportion of those who became leaders of the profession during the period between the two World Wars" and that she dominated the discipline during its ecological period in the early twentieth century (Hartshorne 1939). "In every problem of

history, there are two main factors, variously stated as heredity and environment, man and his geographic conditions, the internal forces of race and the external forces of habitat," was her fundamental scientific stance.

Now the geographic element in the long history of human development has been operating strongly and operating persistently. Herein lays its importance. It is a stable force. It never sleeps. This natural environment, this physical basis of history, is for all intents and purposes immutable in comparison with the other factor in the problem-shifting, plastic, progressive, retrogressive man*' (Semple 1911).* Her methodological claim is unquestionable since, as she once noted, there is no doubting the impact of climate change on humans, both directly and indirectly. She goes on to explain that during the early phases of growth, man was a passive subject who was directly influenced by his surroundings. The indirect influences that shape his thoughts and character through his social and economic life have grown in significance as they have become more active. She provided an environmental interpretation of "scientific racism" in her writings, using the new language of natural "science" to justify national supremacy (Peet, 1985).

Ellsworth Huntington and Griffith Taylor contributed to the further development of the theory. Huntington illustrated how people favour ethnic-type structures and environmentalist explanations in his book "The Principles of Human Geography" (1945) and papers on climate and culture. Still, he emphasized the value of a genetic constitution again and time again and supported several genetic projects (Spate, 1968). He made the most significant decision since Hippocrates and chose to make certain changes in the way that environmental problems are thought about.

When linking man and environment, Taylor (1880–1963) was more circumspect. He thought that human progress was constrained by the environment. Their determinism was called Neo-determinism or Stop and Go Determinism because it was compared to the traffic control system, which controlled the speed but did not indicate the direction of travel. He claims that the pace of any nation's (regional) growth can be accelerated, slowed down, or stopped by man. However, if he is intelligent, he should not be deviating from the guidelines in accordance with the surroundings. Like a traffic director in a large metropolis, he (guy) modifies the speed but does not indicate the direction of travel.Geographers such as Mackinder, Chisholm, Davis, Bowman, Robert Mill, Geddes, Sauer, Hebertson, Taylor, and others used a deterministic perspective to describe how

civilization advanced in later years. Numerous academics have made it abundantly evident that the physical characteristics of the soil have been influenced by the climate, and that this has an impact on the crop pattern, which is ultimately determined by the dietary habits, functions, and behaviours of the locals. Over time, determinists have maintained that the physical characteristics of a people's position in respect to mountains and plains have a significant impact on both the level of development and the quality of life of that population. It is surprising that despite this paradigm's scientific persuasiveness, experts did not follow it. The emphasis on the spatial factors that shape society and history comes from their attempt to contextualize the new, "scientific," language of environmental causality within the framework of geographical thinking. However, it was limited in that it did not acknowledge the subtle distinctions that exist between humans and the rest of nature. Man could evolve because of his social surroundings and capability for production. Furthermore, because of human consciousness, this process is self-directed, leading to a conflict between social and natural determination. The natural theory must be modified to incorporate human social science. The organism analogy, which served as the foundation for the entire pinnacle of determinism, was unable to support a theory that was human-cantered, but it continued to be used since it was an effective methodological instrument for legitimation theory.

Criticisms

After World War II, this philosophy was vehemently criticized in the United States, UK, Canada and many other countries. Geographers observed that this approach exaggerated the active role of nature while interpreting human history. The determinists only consider humans capable of being adapted but man’s efforts reveal many facts which the forces of the environment cannot explain. The does do not only become socially dysfunctional but was also subjected to an academic, theoretical critique. Barrows (1923) initiated a meek criticism from within the environmentalist paradigm where he argues that the relations between man and environment should be seen from the standpoint of human adjustment as this was “more likely to result in the recognition and proper valuation of all the factors involved, and especially to minimize the danger of assigning to the environmental factors a determinative influence which they do not exert.” Sauer (1963) had a stronger reservation where he states that a transposition of divine law into omnipotent natural law had caused the “*eager adherents of the faith of causation*” to sacrifice their earlier concerns in the name of a “*rigorous dogma of naturalistic cosmology, most notably in*

American physiography and anthropogeography". As he later added, "*natural law does not apply to social groups*" (Sauer 1963); instead what man did in an area involves the active agency of culture that shapes of the landscape. Sauer's critique played the internal role in diminishing the place of determinism as the hegemonic theory of geography and initiated redefinition as a "social science, concerned with areal differentiation.

Now the question arises that did Sauer provided a valid alternative theoretical base to the geographical thinking. Peet (1985) states that the cultural geography of Blache and Sauer failed to establish a comprehensive theory within the discipline. In the 1930s, 1940s, and 1950s geography drifted towards a regional perspective as determinism was being critiqued without being effectively replaced. The chorological concept logically implies that relationships do not define the field. Whatever be the goal of the geographer, he should not be limited to or prejudiced against any technique or method. Literary description and levels of human insight are undoubtedly required, but in Hartshorne's (1939) words the geographer must analyse the relationships of earthly features, "regardless of whether these interrelations can be described in terms of 'natural laws' or 'social laws.' Therefore, determinism has not retreated from geography; rather, several deterministic systems have been evolved to assist the interpretation of spatial patterns, and have frequently been compressed into mathematical formulae. There is sufficient room for analysis of both physical and cultural factors, quantitative laws and artistic synthesis. Determinism was redefined, refined, reviewed, and redirected, but never completely dislodged.

4.4 SUMMARY

To summarizes, we must answer a question that why, after years of scientific criticism determinism as a viable scientific approach appears to live on? The most simplistic answer would be that the alternatives to determinism were less than satisfactory. Though there were potential replacements for determinism in the form of *environmentalism, possibilism, probabilism, cultural ecology,* and *chorology*. Among these, the most prominent were *possibilism* and *probabilism,* each of which presumed that humans were free agents who made choices from the innumerable factors available in the environment (Hartshorne, 1966).

Secondly, beliefs consistent with determinism continued to be as widely accepted as understandable ways of explaining complex and variable factors that underscored various social and cultural phenomena. Although, modern science viewed traditional environmental determinism as overly simplistic, teleological, and even racist, there have to be reasons why the public accepted deterministic explanations for complex social phenomena.

Thirdly, in the words of carter (1964), although geographers have turned away from environmentalism to a more balanced view, allied fields of knowledge are all too often still following along in the deterministic paths marked out fifty years ago. When history, economics, and political science, even on the college level, refer to geographic factors, all too often they take a strong physical environmental determinist view; geography cannot simply overlook it. Interestingly it also became clear that determinists were in agreement at two points. Firstly no one ever stated that humans did not have the ability to choose from among the alternatives offered in the environment (James and Martin, 1981). Secondly, nor was there ever any significant argument that no other factors were at play in the development of human societies. In fact, no interpretation in the history of geography ever came close to the rigorous environmental determinism (Beck, 1985).

6.5 GLOSSARY

Endeavours-	To attempt exertion of effort.
Surroundings-	The outer part of the environment of a particular thing.
Accelerate-	to move faster.
Environment-	The conditions in which you live, work etc.
Renowned-	Highly honoured.
Junction-	A place, line, or point at which two or more things join.
Credited-	Given credit for.
Philosophy-	The study of ideas and beliefs about the meaning of life.
Adaptation-	The state of process of changing to suit a new situation.

Comprehend-	To understand something completely.
Immortal-	Living or lasting for ever.
Development-	The process of creating something more advanced.
Traditional-	Following to the customs.
Analogy-	A comparison between two things that shows a way in which they are similar.

6.6 ANSWER TO CHECK YOUR PROGRESS

- Griffith Taylor developed a new theory called "stop and go determinism" or neo determinism.
- Taylor held academic positions at universities in Australia, the US, and Canada.
- Taylor provided determinism a new shape, elucidating nature's effect rather than its control, and therefore defending determinism grounded in a scientific method.
- Herbertson classified the world into natural areas based on vegetation, which he believed to be the primary determinant.
- The term 'probabilism' was first used in 1957 by British geographer O.H.K. Spate.
- The modern geography in the both the countries i.e. in the USA and U.K. came into existence in the later part of 19^{th} century, when the departments of Geography were established in these countries.

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6.8 TERMINAL QUESTIONS

Q -1. What do you understand by Neo determinism? Explain

Q -2. What do you understand by probabilism? Explain

Q -3. Write the contributions of British geographers?

Q -4. Discuss the contributions of American geographers?

Q -5. Write the contributions of former Soviet Union schools?

BLOCK-3: FUNDAMENTAL OF GEOGRAPHICAL THOUGHT

UNIT- 7: PHYSICAL AND HUMAN GEOGRAPHY

7.1 OBJECTIVES

After reading this unit you should be able to:

- To clarify the sequence of development of physical and human geography.
- To develop an understanding of physical and human geography among the learners.
- To make the scientific importance of physical and human geography useful for the general public.
- To explain the use of the natural environment and its importance for human life.
- To understand the interrelationships between human and natural sciences.

7.2 INTRODUCTION-

Physical geography is that branch of geography in which the areas of the earth and the possibilities of life and human habitats are studied, which provides the main subject material to geographers in the study of land, water, and atmosphere. He studies human geography, human economic, social, political, religious, and cultural lifestyles, means, and ways of living. In physical geography, mainly the relationship between the natural environment and the sciences is studied, which clarifies human habitation and economic activities, i.e., the external forms of the Earth. Whereas the relation of human geography has always been understood in terms of the number of humans, regional distribution, pattern, settlement places, and human activities, Human and physical features are such things that we see around us that display the physical parts of physical geography, water, air, and land spheres, under which the first, second, and third types of reliefs are included.

Whereas human geography studies the sciences related to human economic activities and clarifies their interrelationship with physical geography, Physical geography is a branch based on natural and scientific principles, whereas human geography is a branch of science based on the principles of adjusting the environment created by humans for their own use. In this way, geography creates an understanding of the constructive processes between both natural and man-made sciences. Therefore,

human geography is concerned with human beings' relationship with a particular place and places more emphasis on explaining spatial phenomena and applying spatial phenomena, principles, and techniques in real-life situations. It connects aspects of physical and human geography. The interrelationship between physical and human geography is such that different parts of the human body are connected into one body and the physical needs are fulfilled. In the same way, in the subject of geography, human and physical geography also connect with each other and form a complete science of geography are developing.

7.3: PHYSICAL AND HUMAN GEOGRAPHY

7.3.1 Physical Geography:

Physical geography is one of the main branches of geography, also known as the branch of natural science, which studies the atmosphere, hydrosphere, lithosphere, biosphere, etc. It is a science opposite to the branches of human geography. Which focuses on the laws of nature, the study of which represents the centre of geography? The physical environment itself is physical geography, which studies the details of the earth's relief, and geology, whose principles are used to explain the changing environmental effects in the selected spatial form of geology. Apart from this, physical geography also studies the patterns of the physical environment and human interactions, which establishes relationships with other sciences. This branch is based on the study of spatial patterns and spatial relationships of environmental elements in the regional environment and the study of these patterns at ground level. Also explains the reasons.

Thus, physical geography has been a branch of science mainly related to the natural environment, which explains how natural systems affect humans. The study of physical geography as a material gives humans detailed knowledge of landforms, which include water, land, and the atmosphere as a whole. The basic centre of study of physical geography is the life situated on the earth, which is the cover of air, land, and water in which the life of plants and animals has become possible; hence, under physical geography, we study all those physical elements and factors that form the basis of the life sphere. They provide habitat for living organisms whose quality is determined by the physical environment, and the quality of the physical environment is determined

by the earth's intrinsic and exogenous factors, i.e., forces. Therefore, in physical geography, along with the systematic study of the physical environment, the study of interactions between the physical environment and humans is also included, which is more and more useful for human welfare and becomes the content of the subject of geography by being related to human geography, in which physical Some specific aspects of geography and elements of ecology and hydrology are studied in depth, with special emphasis on the mechanism and mathematical analysis of various types of geomorphic processes and the mutual relationships between them.

Human activities depend on physical geography. The field of physical geography deals with the natural environment, including the features and processes on or near the Earth's surface. These include landform features and processes, such as types of rocks (geomorphology). Natural resources (geo-science), soil (soil science), water (hydrology), weather and climate (meteorology), vegetation, and biology (biogeography) are studied as separate sub-branches. Physical geography generally includes the origin and other characteristics of landforms, mountains, plateaus, plains, lakes, rivers, valleys, and mountains, on the basis of which the regional and geographical description of that place is done from the human perspective. Apart from the visuals and environmental elements, it also includes the study of earthquakes and volcanology, along with the processes of landslides. Which shape and keep changing the landforms around us, other elements of physical geography also include types of rocks and minerals, which also include metals, fossil fuels and structural minerals.

Possibilities of large-scale agriculture for human economic activities Based on the type of rocks located on the earth's surface, climate and vegetation cover are also included in the subject matter of physical geography, which is the development of rivers, lakes, and valleys in the form of plains for agricultural activities. Land is considered a component of physical geography because it is a major natural element of life on Earth, which is ultimately determined by the elements of climate and weather. It also leaves its mark on both the physical environment and the human environment. Therefore, among these natural elements, climate is considered to be the most influential element. Physical and human activities on Earth have always been influenced by the elements of weather and climate. The physical environment is the determining factor in human settlements and activities because the development of settlements and

economic activities is driven by the combination of landforms, i.e., water bodies, and climatic conditions. Apart from this, many aspects of our lives that are affected by the physical environment around us become the subject matter of the study of physical geography. Human activities can also bring about changes in the physical environment to some extent.

Physical geography is also defined as the science of integrating the natural environment of the earth's surface that surrounds the earth and extends to the limits of astronomy. Physical geography is also known as a basic science because it describes the integration or overview of the earth and life sciences. Which gives us information about the nature of the environment to man and makes us work more strongly on the nature of the features of the earth and the first component of physical geography, the scientific study of landforms is known as geomorphology. This is based on the geographical features of the Earth and aspects of geology study.

The second component of physical geography is the atmospheric environment, which includes the structure, composition, and atmospheric environment of the atmosphere. The processes of meteorology are studied and analysed along with climate science. Which explains the climate of a particular place on the basis of regional variations? The third component of physical geography is considered biogeography, which includes the study of natural flora and fauna and is based on the basic principles of zoology and ecology are determined. The fourth component is hydrology, in which water located in different parts of the earth is studied on the basis of its physical and chemical properties and spatial distribution. Which also reveals the subject expertise of geographers? Therefore, the vast area of geography and the main branch of the discipline, the geographical tradition in physical geography, are included in the origin of this branch, which is also known as the tradition of earth science. Physical geography is the study of various landscapes of the earth, surface processes, and various dimensions of climate studies. Which is found around our planet Earth in the form of air, water, life, and land? Along with this, it also explains the effects and changes of the Earth's systems, like ecosystems, hydrology, and climate science that are due to human influence. At present, it is working to put emphasis on how it can become useful and how planning for the future can be done in a changing environment. Because the field of study of the Earth is wide, there are many sub-branches of physical geography that are

studied separately and are formed by the combined combination of different elements. Just as the Earth's internal functions seasons, atmospheric pressure, air, climatic elements, water, soil, snow, vegetation, animal life, etc. are related to the Sun, in the same way physical elements are related to physical geography.

7.3.2 Physical Geography Development History Sequence

In physical geography, the nature of its study has also changed with time. Due to some new research and discoveries, a very important impact on the academic study of physical geography has been seen in the form of historical study. In the period between 1850 and 1950, physical geography was mainly divided into four types of disciplines, of which the first was uniformitarianism. According to this theory, the physical elements produced in the entire earth are considered to have arisen as a result of the same process, while the second ideology was evolutionary (1859). His supporter was Charles Darwin, who included biological changes as a result of natural selection in the field of physical geography, whiles the third ideology, exploration and survey, is considered to be the beginning of the modern form of physical geography from the 1900s, in which all the basic aspects of physical geography are included. The characteristics had been studied, and the ideology was in favour of development based on data collection. During this period, all the basic data of physical geography was compiled, which included basic activities like height of landmass, classification and distribution of landforms, sequence and amount of flow of rivers, collection of climatic elements, classification of soil, and biological communities was included.

While the fourth phase focused on conservation, which began to develop after the 1850s in the United States and Europe as a result of human development in natural areas, environmental concern, and important academic contributions to the conservation of the natural environment and environmentalism that came from physical geography, had emerged in the area. Whereas after 1950, the nature of physical geography, i.e., the stream of development, was divided into two parts: the first was developed in the form of the quantitative revolution and the second in the form of human-land relations. In the form of the quantitative revolution, the role of research work has been central in the study of physical geography.

The effects of this were seen especially in hypothesis testing, mapping and model making, and statistical and mathematical hypothesis testing. The quantitative revolution developed as a technology that changed the way physical geographers studied the Earth and its phenomena, which shifted from descriptive studies to experimental methods. In human-land relations, the impact of human activity on the environment. Many researchers in physical geography have studied the impact of the environment on humans in accordance with the scientific method and have given a new form to human and environmental geography in which environmental degradation and resource use, natural hazards and environmental impact assessment, the study of urbanisation impact on the natural environment, and land use change were included.

7.3.3 Importance of the Study of Physical Geography

The real knowledge of the external form of the Earth is known only through the study of physical geography. Because the subject matter of physical geography has been the in-depth analysis of all the climatic and environmental conditions of the Earth, from natural processes to resource distribution and from human-environment relationships to habitation, the interrelationship between humans and the environment is mainly seen. Thus, physical geography is a discipline that studies the natural features and processes of the Earth's surface that are useful to humans. It includes the processes of Earth's physical features, such as landforms, climate patterns, vegetation, and ecosystems. Physical geography helps in understanding the earth's systems and the interrelationships among the earth's systems, including the atmosphere, hydrosphere, and biosphere, and also determines the elements, patterns, resource distribution, and environmental management of the planet Earth and the natural environment of any area. It also assesses the potential environmental impacts of physical and human activities by examining processes and characteristics.

Currently, physical geography is also helpful in the study of burning issues like climate change. It also studies the characteristics of resources like water, minerals, and forests for sustainable management of natural resources and ensures resource conservation. In settlement planning, physical geography provides valuable insights for urban planning and development by analysing the physical characteristics of an area, including its topography, climate, and natural hazards, which helps in selecting suitable

locations. It is proving useful in planning for the identification of human resources as well as in assessing possible risks and in sustainable city development that is in harmony with the natural environment. Thus, it can be said that physical geography, along with being an important branch of geography, also deals with the work of understanding the earth's systems, managing the environment, analysing the elements of climate, managing natural resources, and planning urban development doing. Due to this, geographers are expanding the importance and subject area of physical geography by propounding various types of policies.

7.3.4 Human Geography

Human geography is the second main branch of the main branch of geography. Under which the relationship of humans with the environment from the origin till the present time is studied. Human geography is the study of the adjustment of humans to their environment. Human geography also includes the study of the spatial distribution of human facts on the earth's surface, environmental adjustments, and spatial organisations made by human groups from different regions. In human geography, the mutual functional relationships of the powers, effects, and reactions of human classes and their environments are studied on a regional basis. Human geography is considered to be the study of the control and coordination of the progressive nature of humans. And in different countries around the world, its knowledge is used in resource planning for the economic, social, and cultural progress of the population there. Human geography is the study of the nature and description of human activities and the relationships of human qualities with the geographical environment.

Human geography is a synthetic study of the relationships between human communities on the earth's surface. It is closely related to three components. Spatial analysis of human population, ecological study of the relationship between human population and environment, and regional synthesis of human elements those are located in the regional differentiation of the surface. The main objective of human geography is not only to present human geography from the perspective of social science but also to identify human problems and propound the role of man in giving a new shape to planet Earth. Human geography presents a comprehensive form of geography and works specifically on cultural, historical, political, regional, social,

urban, and economic aspects. Human geography studies the interrelationship between the physical environment and the human-generated socio-cultural environment through their mutual interaction. Man interacts with his physical environment with the help of his technology. In this sense, it is not important what man produces or creates. Rather, it matters with the help of which technologies and equipment it produces and manufactures. After better understanding the laws created by human nature, society reaches a higher level of cultural development. Human geography has been doing the work of establishing the imprint of human activities in different places on the earth's surface for a long time. Human beings try to adapt the elements of the natural environment as per their capacity, which scholars have named Possibilism. Because man has created many types of visible landscapes through his intelligence and strength, for which he has been provided opportunities by nature, he has been successful in his work. "According to Ratzel, the view of human geography is everywhere related to the environment, which itself is the sum of physical conditions." Similarly, Alan Sample has described "human geography as the study of the mutually changing relations between the fickle human being and the temporary surface."

Thus, in geography, human geography and physical geography are two broad departments of geography. While physical geography is the study of the earth's processes, human geography works to establish the relationship between the elements located on the earth and humans. In human geography, special emphasis is given to the study of the relationship of human societies with the environment. Human geography places more emphasis on the regional distribution of societies, but its scope is not limited to this but is very wide. Apart from this, human geography covers different parts of the world. Development, distribution, and density of population, population statistics and their characteristics, patterns of population migration, and physical and cultural characteristics of human groups and their economic activities are studied; along with this, mutual relations between humans and the environment are studied, and human culture is also studied. Varieties of language, religion, customs and traditions, patterns of human settlement, site form, size, growth of urban settlements, functions and functional classification of cities, economic activities, spatial distribution of industry, trade, transport, and communication systems. Topics like the physical environment are also the subject matter of human geography. In short, it can be said that in human geography, we study the effects of the physical environment on the economic activity

and culture of the people living in an area. In the subject area of human geography, various geographers have presented their views from time to time, in which Finch and Trewartha divided the subject matter of human geography into two main parts: the physical or natural environment and the cultural or man-made environment. The physical or natural environment includes physical features such as relief, climate, natural vegetation, soil, minerals, and water. The cultural environment includes man-made features on Earth such as population and human settlements, agriculture, construction, industry, transportation, etc., which are considered the subject matter of human geography.

7.3.5 History of Human Geography

Human geography is the main branch of geography. If we look at its historical development, the relationship between humans and the environment has been studied from the origin of humans until the present time. Human geography started with physical geography, but then this branch was included in a joint form with physical geography. As the development of the subject of geography progressed towards the developed stage, in the same way, human geography also started touching the height of its development and developed as an independent branch. At the end of the eighteenth century, the German scholar Ratzel gave it a modern form and gave a distinct identity to human geography. In fact, the origin and development of human geography are believed to have originated with the rise of the Roman Empire after the decline of Greek society. After the destruction of the Roman Empire in the fifth and sixth centuries, the Arabs played an important role in the trade between Europe and South Asia. This country fell on the trade route of Arab traders.

With the establishment of the Ottoman Empire in the 15th and 16th centuries, the development of human geography got a stronger foundation in the era of discovery and exploration. In the 17th century, the elements of human geography were described in mathematical geography in the book of the German scholar Varenium. Since then, it has come to be known as human geography. In the 18th century, Montesquieu and Deirdre studied the influence of nature on humans and described the earth as the theatre of the development of humans and human culture. At this time, geography had the status of an independent science. German scientist J. R. Foster's laudable effort to

establish coordination between the natural environment and human activities further paved the way for human geography.

In the last years of the 18th century, German scientists Carl Ritter and Alexander Humboldt gave a classical form to geography, and by establishing a close relationship between man and the land, Carl Ritter prepared a theatre for the relationship between man and the environment in which man was considered an important part. Provided a central place in the form. Humboldt, through his long travels, tried to establish unity between natural facts and human relationships and awakened public confidence in human geography. In the 19th century, Froebel, Oscar, Davis, Buchanan, and Jesus Bowman explained various parts of the subject of geography and gave human geography the form of an independent branch. Froebel studied the earth's surface systematically and the natural structure of the land. , compiled the facts of climate, natural vegetation, animals, and humans, and worked to give human geography the form of a science.

In the last phase of the 19th century, Frederick Ratzel studied human geography in the context of human life. He said that the product of the last end of development is humans, and humans themselves are the products of the environment, which is also considered the father of human geography, i.e., the originator. The basic element of his geographical writings and analysis is the static description and dynamic aspects of human beings on the earth's surface. There are relationships with the environment. American geographer Miss Ellen Sample has also kept man at the centre and called him the product of the earth, whereas Richtoppen laid special emphasis on the study of the dynamic nature of human geography, meaning the impact of the environment of different areas on man and the change in the natural environment by man. And clarified the process of refinement. An American geographer named Mars also contributed to the development of human geography. He said that humans should try to make poor countries prosperous by establishing harmony with the natural environment.

The 20th century has been the most important period in the historical development of human geography. In this way, French, American, German, and British geographers provided invaluable cooperation in the field of human geography. And provided new inspiration to human geography and described human geography as the best among all social sciences. In this century, there was a special development in the

content of human geography, and this subject became powerful. While analysing the human elements from a historical point of view, Blasch, the founder of the Possibility ideology, gave importance to the changes in the human and natural environment, and Jean Bruns has even said that "the physical and mental capacity to modify the environment is inherent only in humans." Is". In this way, the influence of French geographers started reaching the common man as well, due to which environmental interrelationships started being explained from the perspective of possibilism. In 1925, Karl Sauer stated the objective of the study of human geography as the analysis of the human landscape. In France, the book written by Carl O' Soare is considered the ideal book for the development of human geography.

In 1951, Griffith Taylor's concept of neo-determinism and Spate's concept of probilism attracted the attention of many geographers in the field of human geography. After 1960, human geography had established its roots as an independent branch, and various aspects of human geography started being studied in depth. In which sub-disciplinary studies like cultural geography, economic geography, health geography, historical geography, political geography, population geography, rural geography, settlement geography, and social geography started being done independently and focused on specific aspects of human activity and organization, Stay focused.

7.3.6 Importance of Human Geography

Human geography is known as a science that analyses the interrelationships between people and the environment living in different areas of the earth's surface, as well as the spatial and temporal fluctuations between areas. This branch studies the interrelationships between the physical environment and the cultural environment, which are considered to be the result of man's own knowledge. Human geography is the study of the interrelationships between the environment and the cultural environment that man has acquired through mutual interaction and self-exploration. Human geography awakens awareness about various human activities, i.e., lifestyle. The importance of human geography lies in the ability to study the Earth in a way that also provides a way for us to better understand how humans can preserve a planet as large as Earth and how it can preserve the Earth's vast biodiversity over the long term. Apart from this, human geography also helps in adjusting the cultural and economic systems of human communities with the environment and makes it especially clear about

regional differences, how any geographical unit is useful for human activities, and how human beings can make maximum use of these natural abilities for themselves.

The study of all these elements makes clear the importance of human geography and how the resources provided by nature and land resources can be used and relationships between the environments can be created in different parts of the world. Human Geography The subject matter of human geography includes the study of the relationship between the actions of a person and his physical environment, as well as the study of the influence of the natural environment on the actions and powers of a person in different parts of the world. Human geography examines various aspects of human life, including population distribution and migration, cultural practices, economic activities, political systems, human settlements, and social interactions, always considering the interaction between the human economy and the environment and these phenomena.

Human geography acts as a strong weapon to analyse and explain spatial distribution and responses. It provides a means for humans to understand how various natural and cultural factors can be made useful to humans and how regional disparities can be reduced. Human geography plays an important role in identifying what environmental impacts are attributable to human activities as well as in formulating strategies for how to address environmental risks and challenges. Globalisation has also been doing the work of rapidly increasing interrelationships for a long time. In essence, it can be said that human geography plays an important role in coordinating and understanding the human and economic activities of the world by providing insight into the spatial organisation of human activities and their impact on the environment and social interactions. And it enables mankind to understand global challenges and make plans to solve them.

7.4 SUMMARY

Physical geography includes the physical elements of the environment, such as geomorphology, hydrology, glaciology, climate science, biology, soil science, and elements of space science, and under human geography, factors of economic development and social concerns are included. In physical geography, the study of physical elements focuses on the usefulness of a particular place. Geography has been

divided into two aspects only for study: the branch with dominance of physical processes is named physical geography, and the branch with dominance of human processes is named human geography. Is. Physical geography is the first branch of geography, which is also known as the branch of natural science, which studies the natural environment like the atmosphere, hydrosphere, lithosphere, biosphere, etc. on the basis of patterns of interaction between the physical environment and humans and other sciences.

Physical geography has been a branch of science mainly related to the natural environment, which explains how natural systems affect humans. Whereas human geography is the second major branch of geography, under which the interrelationships between humans and the environment are studied from the origin of humans to the present time. Human geography subjects the adjustment of man and his environment to the control and coordination of the changing nature on the basis of mutual functional differences of forces, influences, and reactions of human classes and environments. The main objective of human geography is cultural, historical, political, regional, social, Special work has to be done on urban and economic aspects. Human geography has always studied the interrelationships between the physical environment and the human-generated cultural environment on the basis of their mutual interactions. While it is not a separate independent subject, physical geography and human geography are two big branches of a tree that emphasise the micro-level study of geographical elements by making coordination on the basis of the characteristics of natural elements and cultural elements for human use.

7.5 GLOSSARY

Natural environment:	The environment around living beings provided by nature.
Interrelationships:	Relationships found between humans and the environment
Economic activities:	Primary, secondary, and tertiary activities that govern human life.

Social activities:	Activities adopted by humans as culture, such as religion, customs, and other activities.
Cultural lifestyle:	The specific pattern of social customs of a caste or community.
Life-supporting elements:	All elements of the natural and cultural environment that is useful for human life.
Relief:	The ratio of height and depth between natural visible forms of the surface.
Natural principles:	The process of following the rules provided by nature.
Scientific analysis:	Study of any human-made object according to the rules of science.
Glaciology:	Glaciology is a sub-branch of physical geography that studies the water cover located in different regions of the Earth.
Climatology:	Climatology is a sub-branch of physical geography that studies micro-level elements of weather.
Geology:	Geology is a sub-branch of physical geography that studies the Earth's interior.
Human modification:	Using elements of the natural environment by humans as per their wish.
Physical elements:	Sun power, water, air, land, vegetation, animals, etc.

Systematic study:	Study of elements of the natural and cultural environment on the basis of sub-region-wise regional and cultural variations.
Geomorphic processes:	Forces active in the formation of landforms. Fossil fuels: coal, petrol, diesel, and natural gas.
Zoology:	Zoology is a branch of science that studies various animals scientifically.
Uniformitarianism:	The uniform process of the formation of natural landscapes throughout the earth is called the principle of uniformitarianism.
Conservation:	Conservation is the concept of preserving natural resources over the long term in addition to human consumption.
Interaction:	Human interaction with the natural environment
Global Challenges:	A crisis arising from indiscriminate consumption of elements of the natural environment is going to be a threat to all living species in the future.
Spatial organisation:	variation in a particular place as a result of natural processes.
Social systems:	Social systems are rules made by humans to govern various social, cultural, economic, and political systems of human life.

7.6 ANSWER TO CHECK YOUR PROGRESS

- Geography has been divided into two separate branches, physical and human geography, for the convenience of study.
- Physical geography is the main branch that studies the elements of the natural environment.
- Human geography is the second branch of geography that studies the elements of the human and natural environment.
- In physical geography, the atmosphere, hydrosphere, lithosphere, and biosphere are studied.
- Human beings get detailed knowledge of landforms as study material through physical geography.
- Apart from natural landscapes and environmental elements, physical geography also studies earthquakes and volcanology.
- Where is Frederick Retzel called the father of human geography?
- The scientific study of human geography is considered to be from the works of German geographers in the classical period of geography.
- The ideology of human geography gives more emphasis to the concept of possibilism.
- Griffith Taylor propounded the ideology of neo-determinism in human geography in the 20th century.
- French, American, German, and British geographers made multi-regional contributions to the development of human geography.
- 12 The Ottoman Empire was established in the 15th–16th centuries, which was the time between the eras of discovery and exploration.

7.7 References

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7.8 Terminal Question

(1) Long Answer Question

Q-1: Describe in detail the main branches of geography, physical geography, and human geography.

Q-2: What do you mean by physical geography? Give a detailed description of the meaning, development, and importance of physical geography.

Q-3: What do you understand by human geography? Describe in detail the meaning, development, and importance of human geography.

(2) Short Answer Questions

Q-1: What are the main branches of geography?

Q-2: Give the meaning and definition of physical geography.

Q-3: Explain the subject matter of physical geography.

Q- 4: Explain the sequence of the development of physical geography.

Q-5: Apart from the sub-branches in physical geography, what is studied in the main branch of geography?

Q-6: What do you mean by human geography?

Q-7: Explain the subject area of human geography.

Q-8: Describe the contribution of German scholars to the development of human geography.

Q- 9: Which geographer has been called the father of human geography?

Q-10: When did the actual development of human geography begin?

Q- 11: What is the usefulness of human geography for humans?

Q-12: Describe the interrelationships of physical and human geography.

(3) Short Answer Questions

Q- 1: What are the main branches of geography?

- **A.** Human Geography
- **B.** Physical Geography
- **C.** Physical and human geography
- **D.** All of the above

Q- 2: What is included under physical geography?

- **A.** Elements and forces of the natural environment
- **B.** Elements and forces of the cultural environment
- **C.** Subject matter of complete geography
- **D.** Only geographical elements

Q- 3: What is the subject matter of human geography?

- **A.** Elements of the cultural environment
- **B.** Study of interrelationships between humans and the environment
- **C.** Elements of Physical Geography
- **D.** Elements of physical and human geography

Q-4: What is not included in physical geography?

A. Water system
B. Lithosphere
C. Atmosphere
D. Ecosystem

Q- 5: Under which branch is the study of earthquakes and volcanoes done?

A. Physical Geography
B. Human Geography
C. Geology
D. Biogeography

Q- 6: After 1950, into which two parts was the development stream of physical geography divided?

A. Quantitative Revolution
B. Human land relations
C. Both of the above
D. None suitable

Q-7: "The aspects of human geography are everywhere related to the environment, which itself is the sum of physical conditions," is the statement of which geographer?

A. Blas
B. Humboldt
C. Ratzel
D. Carl Ritter

Q-8: Which geographers were not included in the classical period of geography?

A. Humboldt
B. Ritter
C. Ratzel
D. Carl Vo Sarver

Q- 9: When was the Ottoman Empire established?

A. 15-16th century
B. 16-17th century
C. 18-19th century
D. 20th century

Q- 10: Which ideologies contributed to the development of human geography in the 20th century?

A. French
B. American
C. German and British
D. All of the above

Q- 11: When was Griffith Taylor's concept of neo-determinism propounded?

A. 1950
B. 1951
C. 1952
D. 1953

Q- 12: Which scholar has propounded the ideology of Prasambhavad?

A. Taylor
B. Blas
C. Spat
D. None of the above

Q- 13: In which year is the advent of the present form of human geography considered to have begun?

A. 1955
B. 1960
C. 1965
D. 1970

Q- 14: "Human geography is the study of the mutually changing relationships between the fickle human beings and the temporary surface." Is this the statement of which scholar?

A. Ratzel
B. Blas
C. Sample
D. Jean Bruns

Answer: 1, C 2, B 3, B 4, D 5, D 6, C 7, D 8, D 9, A 10, D 11, B 12, C 13, B 14, C

Unit- 8: DUALISM IN GEOGRAPHY, DICHOTOMISM OF SCIENTICICE AND REGIONAL GEOHGRAPHY

8.1 OBJECTIVES

After reading this unit you should be able to:

- To deeply study the ideology of dualism in geography.
- To recognise the importance and interrelationships of scientific and regional geography.
- To know the study of regional geography.

8.2 INTRODUCTION

The ideology of dualism in geography refers to the origin of two different types of ideologies adopted in the study of the subject. Geographers have been struggling since the beginning with many dualistic ideologies regarding the subject matter and study process of geography. Various aspects of geography have been studied in the form of inter subjects since ancient times. But initially, it was known as only two ideologies: physical geography and human geography. With the passage of time, the development of the subject led to the competition of studies in different areas and on the basis of different beliefs, which were adopted by various geographers and geographical thinkers. But this ideology took on its most intense form in the 19th century. The emergence of these ideologies in modern form: After the Renaissance period in Europe, the concept of dualism gained strength and became more powerful. Due to this, work started on many areas of geography.

Humboldt, Ritter, and Friedrich Ratzel are mainly considered to be the inspirations of dualism, whose new work in the subject of geography has been the basis of dualism. After the 19th century, when geography reached its peak, work began to be done on many new branches of the subject of geography, and new research was done on new facts. Such facts were included in geography that was not even thought of before. Due to this, new facts like general geography versus specific geography, determinist versus possible geography, historical versus contemporary geography, and theoretical versus practical geography became the factors for the emergence of dualistic ideologies. In this way, the subject of geography also could not escape its many divisions, and a new ideology of dualism was born in the development of geography.

The birth of scientific geography is generally considered to have started in Germany. Whose founders are considered to be the father-son **Forsters**, the leading geographers of the eighteenth century? Whoever studied various aspects of geography observed the facts in a scientific manner. Forster's geographers had collected geographical data in a scientific manner, and by analysing, comparing, and classifying them, they laid emphasis on generalisation in the subjects of general humanities and geography.

The foundation of the development of regional geography was laid by the book Ardakunde, published by geographer Carl Ritter. In the study of geography, Ritter did not give importance to the systematic system and adopted the regional system. He described geography by dividing it into regions, but gave it its final form only by considering natural regions as the basis for the study of the earth's surface. Regional geography is also known as general geography, in which the study of the subject of geography, i.e., dividing the earth's surface into climatic features or natural regions, is done separately on a regional basis. The natural similarity of physical elements is seen in these regions. In the study of regional geography, personality is given more importance, which is described in two forms: the first formative regional approach and the second Functional approach.

8.3 DUALISM IN GEOGRAPHY, DICHOTOMISM OF SCIENTICICE AND REGIONAL GEOHGRAPHY

8.3.1 Dualism in Geography:

Dualism means the process of dividing a main subject into two branches. This can be mutually inclusive or contradictory. The study of dualism in geography started in the ancient Greek period itself. Mathematical geography in the Greek period and different regions in the Roman period were done by Strabo. Despite the inclusion of new trends in geography and many crises, it has remained prevalent and accepted in geography for many decades. The concept of dualism was first established by Greek scholars, but in reality, Carl Ritter is considered the founder of dualism. While Hecataeus laid more emphasis on physical geography, Herodotus and Strabo laid more emphasis on the human aspect.

Dualism was actually developed in the seventeenth century, when Varenius (1622–1650) first clarified the difference between physical and human geography in his book “General Geography." In the beginning of the 18th century, Immanuel Kant proposed a special method for the study of physical geography in Germany, whereas Humboldt emphasised physical geography. Humboldt gave special emphasis on the study of natural, i.e., physical geography, whereas Ritter and Ratzel, by working in human geography, tried to present geography as a subject to be studied as a separate branch, and Carl Ritter gave more emphasis on regional studies, whereas Humboldt has made more efforts towards systematic geography; the same French geographer Reclus emphasised systematic physical geography, which he named La-Terre.

In 1848, Somerville Reclus worked on systematic physical geography and published the book for the first time. But in the beginning of the twentieth century, French geographers Vidal de la Blas, Jean Bush, and Dimazio also worked to develop the subject area of human geography. With the immense development in geography from the 19th century to the present, many branches and sub-disciplines were born, and by assimilating many characteristics, many dualisms emerged, the major ones of which are described as follows:.

1. Physical geography vs. human geography
2. Systematic geography vs. regional geography
3. Regional Geography vs. Systematic Geography
4. Determinism vs. Possibilism
5. Theoretical and practical geography
6. Quantitative and Qualitative Geography
7. General geography vs. specific geography

1. Physical Geography vs. Human Geography-

The difference between physical geography and human geography is probably considered to have started from the time of Greek scholars, whose ideology is considered to have emerged after the publication of Varenium's book "Geographia Generalis." Whereas in the 19th century and before, the study of geography was considered to mean only physical geography. Where there was not much depth in the human aspect. Aspects of human geography were included within physical geography.

In the 20th century, due to the more active work of French geographers in human geography, human geography started getting more strength, and it started being studied as a separate branch from physical geography. The duality of physical geography versus human geography cannot be understood properly unless light is thrown on the history of human geography. Ritter and Ratzel were the first scholars who threw light on the history of human geography and said that landforms.

The role of man as a change agent remains greater, and Fabre clarified more strongly that human existence itself is an element of the landscape in which man is an element of a change agent. As far as the relation or controversy regarding the dualism of physical geography versus human geography begins with the works of Greek scholars, which continues to carry with itself the characteristic of dualism in the form of physical and human geography even today. But some geologists considered it unreasonable at that time. Whereas some scholars have emphasised separating the study and methodology of both by keeping this subject as the basis of the division of physical and human geography, Because it is not possible to study human geography with physical elements like climate, ocean, meteorology, geology, and geomorphology, In the study of physical geography, methods of the natural sciences are developed, especially by using natural methods that are formulated with scientific parameters. The scientific standards adopted in natural or physical geography cannot be completely applied to human geography and humans. Our generalisations regarding human groups remain limited to time and space, whereas the possibilities of human life are not equally present in all places.

The difference between the characteristics of physical and human geography was given in Varenius's book “General Geography” in 1650 itself. Humboldt was considered a great geographer as well as a multi-dimensionally talented scientist. He worked to firmly establish the study of physical geography, the same Ritter who, being a professor of geography at the University of Berlin, worked to take the study of physical geography to its extreme. By the end of the 19th century, physical geography came into its present form and was established as a separate branch. While the work of giving a truly modern form to human geography was done by Ratzel, the school of human geography was founded by Vidal de la Blache. Ratzel and Sempul considered climate as an integral part of geography and considered it a method that determines

human life, which is a major element of the human ecosystem. Miss Ellen Sempul has described man as “the product of the earth”.

The basic philosophy of the supporters of human geography is the mutual relationship between humans and nature, in which both are dependent on each other. The basic goal of all geographical studies is to interrelate the earth's surface and both its physical and social aspects. Thus, it can be firmly said that the laws of the environment are implemented in both human and physical geography. From the above study, it becomes clear that the dichotomy of physical geography versus human geography is artificial and illogical.

It is the result of the historical development of the subject, which cannot be divided into two parts. Physical and human geography are two sides of a coin. Which cannot be separated from each other? Why does separating them make the importance of the subject of geography meaningless? In this way, a combined study of the physical components of geography on humans and the impact of human actions on the land is done in physical geography versus human geography. When studied as an independent subject, this subject remains only partial; therefore, to maintain the importance of geography, instead of digging a gap between physical and human facts, emphasis should be laid on bridging that gap.

II. Systematic vs. regional geography:

The subject of geography includes the study of interactions between different environments and humans found on the earth's surface, in which geographers use various methods and tools. Despite being interconnected, the activities of nature and humans are analysed differently in many ways. In the dualism of geography, the typological division is a kind of approach to the study of physical subject matter, which is called the method or methods of geographical study; hence, it should be recognised in a separate form only for the convenience of study. This dualism between classical systematic and regional geography is not new but has been going on since ancient times. The early Greek and Roman geographers also believed in it. From ancient times until the 19th century, when natural geography and human geography were divided, geographers have not been unanimous on this matter.

The elements and areas of geography should be studied equally. Along with the development of geographical study and research, new theories have arrived, due to which the old ideologies have started becoming ineffective. In modern thought, equal importance has been given to the study of climatic elements and local regional areas. The first geographer to differentiate between regional and systematic geography was Varenium. One branch of geography, which is systematic geography, is the study of natural physical laws, which is based on systematic study. Considering the entire world as one unit, it should be equipped with features that reveal the significance of the rules of general geography based on the systematic study of the natural environment. Humboldt described what he called systematic geography and specific geography as regional geography. Humboldt studied natural laws in different fields. On the basis of which systematic geography manuals can be made to study the vegetation, local rock structure, mountain shape, plateau, and sea water currents of different areas, Regional studies, which are helpful in systematic geography.

Humboldt clearly stressed the importance of generalisation in science in the preface to his book Cosmos. Whereas Ritter's main objective of all physical sciences was to identify unity in diversity and how to make physics an eternal goal by which all elements can be combined as one unit. He said that regional facts are related in such a way that those areas should be characterised as a distinct unit. Geography should be related to the facts found on Earth, which are found in an area. In geography, facts and figures should not only be calculated, but there should also be relationships between one place and another that bind each other. Ratzel laid the foundation of systematic geography in the form of regional geography, which compared the way of life of different races and nations through a deductive approach. In his book Ethnography, starting from the rational hypothesis and rules of facts; he applied them to specific areas. . It was more reflective of the concept of origin than the interdependence of all things, and it also tried to apply Darwin's concept to human society through this theory. It was also made clear that human groups struggle for their survival in a particular environment. Just like plants and other organisms do. In the same sequence, German scholar Alfred Hettner has considered geography a specific emotional or regional study instead of a terrestrial or general science. Geography should be considered a specific emotional or regional study instead of a specific or general science. Geography is a special study of various regions of the earth that are different from each other.

He considered man a part of the nature of an area and implemented the concept of an inductive approach on the basis of that. Whereas Blas said that in the study of regional geography, along with actual behaviour, physical elements are also included, which contain inherent characteristics? Whereas in systematic geography, the physical and human facts and processes of the earth's surface are studied by dividing them into different topics.

III. Regional geography vs. systematic geography

In regional geography, the earth's surface is divided into regions with similar characteristics. A similarity of geographical characteristics is found in all these homogeneous areas, and these elements differ from each other in terms of geographical conditions. In which each homogeneous region is studied by arranging its geographical elements. It is clear that the study of isolated areas on the earth is regional geography. This is a major approach to geographical study in which the territorial division of geographical areas is studied on the basis of naturally distinct characteristics, which are also divided into regions and sub-regions. For example, when the world is divided into different regions and their geographical studies are done separately, so it is called the regional geography of the world. Similarly, when the geographical study of continents is done according to their different regions, it is called continental geography. Studying the states of India separately also falls under the category of regional geography. Thus, regional geography is a branch of human geography under which the entire earth is classified and studied on the basis of physical and human similarities. It is a unit that, on the basis of some different characteristics, assimilates different climatic and physical characteristics from its neighbouring land.

Whereas systematic geography is similar to general geography, which was propounded by the German scholar Alexander von Humboldt, Systematic geography is divided into four main branches that are related to the earth's systems, like water, air, land, and the biosphere, which includes all the living organisms on the earth. Systematic geography usually focuses on individual events, which Ritter worked to develop as systematic geography. Ritter focused on regional geography and the study of relationships between events in places that included different areas. He called it 19. It was compiled into sections and described at a macro level.

IV. Determinism vs. Possibilism Geography –

In geography, the study of the relationship between humans and the environment has been going on since ancient times, but it has been given a modern form by German scholars in the 19th century. In which less importance was given to the human aspect of the environment. Generally, before the Industrial Revolution, the ideology of determinism was very strong, in which man was recognised as a passive agent and nature itself was the controller of human actions, which was responsible for human history, civilization, culture, human activities, way of life, social organisation, etc. All depends on natural factors, and nature was established as the controller of human life. This ideology is also known as climatic determinism or geographical determinism. On the contrary, the second possible ideology of human geography (French), which arose in opposition to determinism and whose originator was Blas, is known as possibilism. According to this ideology, nature cannot force humans to follow any one path. Rather, nature presents many types of possibilities for humans. Which man is free to choose as per his needs? This ideology criticises determinism. In the latter half of the twentieth century, possibilism had established its strong roots in human geography as a strong branch. possibilism supporters believe that humans control all elements of the environment.

Because man, as a thinking being who has the freedom to adjust the conditions presented by his natural environment as per his own, makes things possible as per his choice in any area or region. Fabre has even said that there are no inevitabilities anywhere; there are possibilities everywhere, and man, as their master, is their decider. It is only through the use of possibilities that he brings about the change in which power lies primarily in man. Vidal de la Blas believes that man has to work while living in his environment; this does not mean that he is a slave to the environment. Man is an active creature who has immense ability to bring about changes in the environment; that is, he becomes great only when the material world makes him lifeless. In this way, the ideologies of determinism and possibilism were born in the dualism of geography, and they continued to be accepted in human geography for a long time.

V. Theoretical and applied Geography-

Theoretical geography is one in which the fundamental ideology of geography is studied. This ideology was born from the descriptive form of a human being and his environment. Supporters of this ideology believe that in geography, human life and natural conditions are described as they appear. The founding member was Sir William Bangi. In theoretical geography, the concept of Lebensraum was established by Frederick Ratzel, and he said that the state is a living thing like other living beings. The way animals increase their size and develop. Regarding the concept of space, Kant said that it is a relative approach, and in this way, any element of the earth's surface creates mutual relations with other elements according to its importance and magnitude. Whereas practical geography is that in which the relationships and interrelationships of the surrounding human environment are explained to develop the landscape for the welfare of human society, it is the ideology of geography in which geographical principles are used to solve social problems.

Social problems are material and human. Land erosion, destruction by tides and waves, snow cover, water imbalance, etc. are many physical problems, whereas population growth, urbanisation and the problems arising from it, industrial development and its related problems, transportation, and settlement are human problems that can be solved practically. In geography, regional problems are surveyed and analyzed, and efforts are made to solve them. In communist philosophy, practical geography is considered the central subject of geography. It first identifies regional problems, conducts surveys, collects data, and, after analysing the data, establishes relationships between natural and human elements. It is also seen to what extent regional problems can be reduced by the use of local resources and to what extent these resources are useful in solving them. Future directions are also given in practical geography. In this way, the controversial form of theoretical and practical geography has become popular in the name of dualism.

VI. Quantitative and Qualitative Geography-

Quantitative geography is a sub-field in which the analysis and model use of geographical phenomena are based on the development, testing, and use of scientific, mathematical, and statistical methods. The purpose of quantitative geography is to

explain and predict the distribution and mobility of humans. To better understand geographical phenomena and make them relevant, quantitative geography has to study a wide range of subjects, including human activities, demography, urbanisation, environmental elements, and the spatial distribution of economic activities. This ideology is mainly based on models. Quantitative geography emerged in the mid-20th century as a response to the growing demand for a systematic, empirical, and data-driven approach to the study of physical geography and geographical phenomena through quantitative data collection and analysis. One is the product of positivism. Statistics, which is influenced by developments in mathematics, computer science, and physics, is a statistical method used to better understand patterns, relationships, and processes in the spatial distribution of human and physical phenomena. Which has a special impact in the study of geography with techniques like map analysis, regression analysis, spatial statistics, and computers?

At the end of the 20th century, quantitative geography played a central role as a discipline in the subject of geography. Its influence was felt in areas like urban, economic, and environmental geography. Both areas served as the driving force for quantitative geography and as an area of application. Research in quantitative geography continues today, focusing on using innovative quantitative methods and techniques to address complex geographic questions and problems. Whereas in qualitative geography, attention is paid to subjective and interpretive aspects, this method helps in understanding and establishing relationships between human experiences and various types of concepts, including the lived experiences of individuals and groups and social, cultural, and political facts. Qualitative geography is traditionally considered a branch of human geography, which is similar to the approach of quantitative geography. Whereas in geography, these ideas took birth in the form of dualism for some time.

VII. General Geography vs. Specific Geography:

The dualism of general geography vs. specific geography is considered to have started in the 17th century, the founder of which was Heitner. In general geography, emphasis has been laid on studying the entire geography by combining it into one unit. Whereas special geography mainly includes the study of the geography of countries

with special geographical characteristics, the study of dualism in general geography versus specific geography came to be known as systematic regional geography, i.e., systematic geography versus regional geography, since the time of Humboldt and Ritter. But these two schools of thought are interconnected with each other.

8.3.2 Ideology and development of scientific geography

The beginning of scientific ideology in geography is considered to be from the time of Hecataeus (500 BC), the father of systematic geography, while some scholars consider Aristotle to be the father of scientific geography. But in reality, the development of scientific geography begins with the beginning of the era of discovery and exploration, in which the physical and cultural nature of the entire world was extensively studied. Which became the guide for the beginning of the scientific development of geography in this century, in which the names of Christopher Columbus, Bascodagama, Magellan, and Thomas Cook are especially included? Geography has been an ancient science. Its modern foundation is visible in the works of Greek scholars. Scientific geography includes the study of the interactions of all physical and human facts on a large scale and the landforms resulting from these interactions in accordance with modern methods, which makes it clear how, why and where human and natural activities originate and how these activities are interrelated to each other. Thus, scientific geography has at present become a subject of analysis as well as prediction. If the development sequence of scientific geography is seen in sequential stages, it becomes clear that it has had to go through many stages from childhood to adulthood.

I. First phase: This is the initial phase of the development of scientific geography, which lasted from the middle of the 15th century until the beginning of the 18th century. This period is based on the discoveries obtained from the long searches of the early geographers. The prominent geographers of this period were Varenius, Kant, Humboldt, and Ritter, who, along with factual analysis in the subject of geography, also developed cartography during this period.

II. Second phase: In the second phase, scientific geography is mainly considered to have started with the works of Ratzel. Apart from this, the first-phase

geographers Ritter and Humboldt are also included in the development sequence of modern geography. This sequence of development is also known as the classical period of geography.

III. Third phase: The beginning of the third phase of scientific geography is mainly considered after the Second World War. In which the works of American scholar Hartshorne and European geographers have been included. Hartshorne defined geography as a science, which was the most comprehensive description of that era. This emphasises the study of geography according to scientific and natural conditions on the basis of regional differences.

8.3.3 Regional Geography and Development

Regional or regional geography is a specific area of study in geography that is different from systematic geography. Regional geography aims to clarify the general rules of some determined patterns of organised areas of geographical elements and regional differences within a geographical unit. However, regional geography has been traced back to ancient Greece. Nevertheless, its systematic development is considered to have taken place at the end of the classical period. This was the time when geography was established as a disciplinary subject in universities, the core of which was regional geography. Nevertheless, the development of regional geography in academic form is considered to have occurred after the geographical events that took place in the nineteenth century, colonial exploration, and the need for regionally specific geographical knowledge in the central parts of the continents, which provided a strong pillar to its development. The discovery of parts of the world that were missing from geographical information and their climatic elements in other regions, surveys, mapping, commercial demands, and political aspirations laid the foundation of the new basic structure of regional geography. Naturalist geographers like Alexander von Humboldt became the pioneers of regional geography. He made an invaluable contribution to creating regional geography.

The same German scholar, Alfred Hettner (1927), had divided general regional geography by following the neo-Kantian logic that identified a new type of regional geography and clarified that the study of regions of a region as a chronological science is part of the discipline of geography. Whereas in the United Kingdom, the

establishment of the Geographical Society of London in 1830 became the basis for the development of regional geography with the advancement of regional geographical science. Regional geography is not interested in the general rules of the mainstream of the nineteenth and twentieth century's, which were interested in the specificity of regions. Thus, regional geography can be seen from a synthetic perspective on the world. It brings together geographical elements in a regional context. He tries to keep those who are endowed with unique talents in themselves, which determines the strong belief of a geographer.

This is a major approach to geographical study in which an entire area is studied in different parts of the entire unit. It emphasises study by dividing regions into sub-departments, on the basis of which it is called the regional geography of the world. Regional geography can be understood in general terms in such a way that if the continents located all over the earth are studied continent-wise or the states of India are studied separately, then it is kept in the category of regional geography. A natural region is that unit of land surface within which variations of some specific geographical elements are found that assimilate different types of characteristics from other regions. Mockhouse "That unit area of the earth's surface that is considered different from other unit areas nearby due to its specific characteristics is called a geographical region. Which are demarcated as single subjects, multi-subjects, complete subjects, and special regions on the basis of specific characteristics of that region?

8.4 SUMMARY

In fact, the ideology of dualism, which has arisen in the subject of geography, emphasises the study of the subject as separate branches rather than studying the subject of geography as a single subject. Geographers have been struggling with the ideology of dualism since the early development of geography. Various aspects of geography have been studied since ancient times by combining them as internal subjects. But in the 19th century, this ideology took on an intense form. In its modern form, this ideology emerged after the Renaissance period in Europe, from which work on many sub-disciplines of geography started. In early dualism, two ideologies (physical geography and human geography) were born.

In the beginning of the 20th century, the subject matter of geography reached its peak and work on new branches started, due to which dualistic ideologies like general geography vs. specific geography, deterministic vs. possible geography, historical vs. contemporary geography, and theoretical vs. practical geography were born. . Along with this, scientific geography also emerged in Germany, the founders of which are considered to be the eighteenth-century geographer's father and son Forsters. Who, by studying various aspects of geography scientifically, emphasised the generalisation of scientific geography for the general humanities?

While the foundation of regional geography was laid by Carl Ritter, who adopted the regional system in the study of geography and described it area-wise, regional geography is also known as general geography, which was propounded by Humboldt. In which the earth's surface started being studied by dividing it into climatic features or natural regions, where similarity of physical elements is seen naturally in these regions. In the study of regional geography, personality is given more importance.

8.5 GLOSSARY

Dualism:	The emergence of two different ideologies of studying the subject of geography.
Renaissance:	The period from 1250 to 1750 in the history of geography
Founders:	First thinker and supporter of an ideology
Humboldt:	Humboldt was a great German geographer who made incomparable contributions to the field of geography and who laid special emphasis on the study of general geography.
Ritter:	Ritter was a great supporter of deterministic ideology and also supported theistic ideology in geography.
Ratzel:	Father of Human Geography and Creator of Anthropogeography

New facts: Geographical facts and techniques collected through research and investigation in the field of geography.

General Geography: Another name for Physical Geography

Specialised geography: Specialised geography is a sub-branch of geography that describes the elements of a particular place.

Determinism: Determinism is a naturalistic ideology adopted by German scholars in the study of geography.

Possebelism: Possebelism an ideology given by French geographers in which more importance has been given to humans than nature.

Historical Geography: A sub-discipline that studies the facts of geography according to the sequence of events.

Contemporary Geography: A sub-disciplines of geography that analyses and studies contemporary event.

Theoretical Geography: A sub-branch of geography that studies statistics and computer models.

Introduction: The arrival of new ideologies and new concepts in the field of geography.

Regional Geography: Method of studying the regions of the earth's surface on the basis of climatic characteristics or political units.

Ardkunde: A book propounded by Ritter.

Natural Regions: The branch of geography that studies regions existing in natural form.

La-Terre: The Book of Geography by Reclus

Classical period: The time of 19th-century German geographers

Cosmos: World Famous by Humboldt

Generalisation: Making geographical elements useful for practical life is the process of generalisation.

Sub-region: Dividing a larger geographical unit into smaller units.

9.6 Answer to check your progress

- The concept of dualism works on the principle of studying the subject of geography in two different branches.
- In the beginning, two ideologies were born in dualism, in the form of physical geography and human geography.
- The inspirations for dualism mainly include Humboldt, Ritter, and Friedrich Ratzel.
- The birth of scientific geography is generally considered to have started with the work of father and son Forsters in Germany.
- The foundation of the development of regional geography is considered to be in the book Ardkunde, published by geographer Carl Ritter.
- Humboldt was in favour of the study of natural, i.e., physical geography.
- Reclus laid emphasis on systematic physical geography and composed a book named La-Terre.
- The difference between the characteristics of physical and human geography was made clear in Varenius' book “General Geography” in 1650 itself.
- The dualism between classical systematic and regional geography is the oldest.
- Varenium was the first geographer to differentiate between regional and systematic geography.
- In the 19th century, the ideology of neo-determinism was given a modern form by German scholars.
- Theoretical geography is that in which the fundamental ideology of geography is studied.

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8.8 Terminal Question

(i) Long Answer Question

Q-1: What do you understand by the concept of dualism arising in the subject of geography? Describe in detail the major dualistic ideologies.

Q-2: Explaining the division of dualism. Explain the concept of scientific and regional geography.

(ii) Short Answer Question

Q-1: What do you understand by the controversial dualism of geography?

Q-2: When did the ideology of dualism gain its intensity?

Q-3: When and where did the Renaissance period of geography begin?

Q-4: What do you understand by scientific geography?

Q- 5: What is the concept of regional geography?

Q- 6: Explain what physical geography is versus human geography.

Q- 7: What do you understand by the ideologies of determinism and possibilism?

Q- 8: Explain the meaning of the ideology of theoretical geography.

Q-9: Explain quantitative and qualitative geography in brief.

Q-10: What do you understand by the meaning of general geography?

Q- 11: What is specific geography?

Q- 12: Explain the second phase of the development of scientific geography?

(iii) Multiple-Choice Questions

Q- 1: The book of Varanium was...

- **a)** Ardkunde
- **b)** Cosmas
- **c)** Geographia Generalis
- **d)** La terry

Q- 2: Who has described man as "the product of the earth"?

- **a)** Ratzel
- **b)** Sample
- **c)** Ritter
- **d)** Blash

Q-3: What is the basic philosophy of the supporters of human geography?

- **a)** Philosophy of nature
- **b)** Philosophy of man
- **c)** Mutual relationship between humans and nature
- **d)** None of the above

Q- 4: How did Ratzel establish the foundation of systematic geography?

a) Theoretical geography

b) Regional geography

c) Sequential geography

d) The. scientific geography

Q- 5: Where did the Renaissance of geography begin?

a) Francis

b) Germany

c) Europe

d) America

Q- 6: When did the ideology of dualism take an intense form in geography?

a) 18th century

b) 19th century

c) 20th century

d) 21st century

Q- 7: Who was the founder of scientific geography?

a) Fasters

b) French

c) German

d) All of the above

Q- 8: When did the ideology of determinism versus possibilism emerge?

a) German

b) France

c) Russia

d) Germans and France

Q- 9: Who was the founding member of theoretical geography?

a) William Harvey

b) William Bunge

c) Chorley

d) None of the above

Q-10: What is considered to be the beginning of the dualism of general geography versus specific geography?

a) 16th century

b) 17th century

c) 18th century

d) 19th-century

Q- 11: Quantitative geography is considered to have emerged as a result of what happened in the middle of the 20th century?

a) Behaviourism

b) Possibilism

c) Humanism

d) Positivism

Answer- 1. C 2. B 3.B 4.B 5. C 6.C 7.A 8.A 9.B 10.B 11.D

UNIT-9: UNITY IN GEOGRAPHY, RECENT TRENDS IN GEOGRAPHY

9.1 OBJECTIVES

After reading this unit you should be able to:

- To explain the unity of diversity found in different geographical elements and regions.
- To conduct a detailed scientific study of the unity of geographical elements.
- To describe the trends going on from the initial development of the subject of geography until the present time.
- To understand the usefulness and significance of new trends in the subject of geography.

9.2 INTRODUCTION

Unity in geography means the unity found in geographical elements, which is the unity, i.e., similarity, found in many types of physical and cultural elements present on the earth, which works equally in every part of the entire earth. In physical features such as mountains, plains, plateaus, rivers, and seas, the process of origin and formation is almost uniformly propounded by the same rule, which was named uniformitarianism by James Hutton. All the geographical, physical, biological-inorganic, and cultural, inanimate and animate objects found on the earth are interrelated to each other in some way or another and no element has a separate, independent existence. Every element of the earth is influenced by other elements and influences them; hence, the areas of the surface actually involve the elements of the natural and human environment and influence the interactions.

Therefore, the subject study area of geography includes how any element of the earth is interrelated with other elements, and to analyse how that physical and cultural element is related to other elements, it is necessary to know terrestrial unity. What are the factors that control or influence that element, and how do they influence other factors? Thus, physical geography is considered to be the unity of ecology, and human geography is considered to be the unity of human ecology, which is also called terrestrial unity. It is said that the concept of spiritual unity shows the close relationships between various facts; hence, it can also be called the concept of interrelationship.

Humboldt and Ritter have clarified geographical unity well and considered it a fundamental principle of nature, whereas Ratzel worked to establish the principle of terrestrial unity prominently in geography. He considered the entire world not in the form of its individual elements, but all the elements are seen as a mixture of each other, which is equally applicable everywhere. On the basis of terrestrial unity, the uniformity of the entire world is seen in the elements of human geography, whose interpretation is implemented in all places on the basis of the same rules. Terrestrial unity is thus a universal truth that has existed at every time and place. Just as various stars and other celestial bodies in the universe remain balanced by each other's gravitational force, in the same way, various types of geographical facts exist on the earth's surface. Are influenced and operated by others. In this way, where the same rules apply all over the earth, uniformity is also seen in human activities, animals, and plants. But due to a lack of human access to the depths of the subject, until the 20th century, geography was considered only a subject of art and literature. As soon as the subject of geography started developing its relationship with other sciences and as a science, many trends reached many hierarchical heights in the development of the subject of geography.

While new discoveries have made many physical and cultural elements suitable for humans through science and technology, new techniques have given a truly modern form to the subject matter of geography. From the classical period to the present, many types of scientific methods and techniques have been used. With the collaboration of scientists, engineers, and mechanical technicians from other sub-disciplines, new inventions have provided a strong foundation for the subject of geography. Geographers have a huge platform in the analysis of physical and cultural environments. Thus, in the new trends of geography, descriptive methods and models of the lithosphere, hydrosphere, and atmosphere have been created for the use of new knowledge and human beings, which are related to the environment, exploration and observation of geographical facts, collection of regional data, and use of micro instruments. Interdisciplinary relations with computer technologies and other subjects like experimentation, hypothesis formulation, formulation of environmental theories, quantitative revolution, computer models, statistical techniques, use of models, establishment of the International Geographical Union, workshops, seminars, geographical information systems, etc. It was associated with the subject of geography and became the foundation stone for social science and geographical science.

In the second half of the 21st century, as a new trend, there was rapid progress in the study, investigation, formulation, and legal systems of geography, which is also called the quantitative revolution, which makes one see natural and cultural unity in this disparity and oneself in the entire earth. No matter in which part of the earth it is located, some similarity is definitely seen in the physical or environmental elements. This opens new doors to the subject of geography for the general humanities through new trends.

9.3 UNITY IN GEOGRAPHY, RECENT TRENDS IN GEOGRAPHY

9.3.1 Meaning and definition of unity in geography:

The meaning of the word unity in the subject of geography is that the unity found in geography, i.e., physical elements, refers to an area that is identified by its physical characteristics, which are visible on the entire surface and universe, with the same rule in which universal There is always unity, whether it is in terms of physical elements or climatic and ecological characteristics. Thus, geography is the science of the earth's surface and its inhabitants, which is an inter-disciplinary subject and expresses uniformity even after being spread in different areas of the world by similar elements. Just as the forces and processes that led to the origin of mountains were found on the continent of America, the same processes have also been found on the continents of Asia, Africa, Europe, and Australia. In the same way the drainage areas of rivers flow on the continent of Asia, It also flows in countries; the process of germination of agricultural crop seeds, which is found on the continent of Asia, is found on other continents, just as diversity is found in vegetation or ecosystems according to altitude in the same way in other parts of the earth. Variation is also found with altitude, but the governing processes are the same everywhere. In this way, geography is the study of the physical activities, unity, i.e., the underlying forces of the environment, which operate with the same properties and functions in the same environment, and the ecological relationships of human groups in the entire world.

9.3.2 Terrestrial unity in geography:

In the subject matter of Geography, unity means the principle of terrestrial unity of the Earth, which shows close relationships between different facts, hence it is also called the concept of interrelationships. The ideology in which all German geographers including Humboldt, Ritter worked and considered it as the fundamental principle of geography in the form of terrestrial unity, Friedrich Ratzel also considered terrestrial unity as the material forces terrestrial unity in geography f the entire world working together with all the elements as a single element. The unit is revealed. The nutrients of geographical unity consider the principle of terrestrial unity i.e. the basic element of the study of human geography, while French geographers Blasch, Brush, Dimazia have also considered the principle of terrestrial unity or interconnectedness as the main basis of human geography. Vidal de la Blas has considered the principle of geographical elements. Unity has been described as the main terrestrial unity in all geographical developments. “The elements of human geography are related to terrestrial unity and can be explained only through it”.

Terrestrial unity is a universal truth that was present in every time and place and is being implemented even today. Just as various stars and celestial bodies in the universe remain balanced according to a certain principle, in the same way, various geographical facts on the earth's surface are in harmony with each other. Are affected by and related to Alworth Huntington also explained the interactions of physical conditions and their effects on human actions on the basis of the similarity of elements of earthly unity. He said that all the facts of the physical environment are influenced by and related to each other. Therefore, to understand any one fact, it is necessary to have information about other related facts. Thus, the principle of interrelationship propounds that no physical or human fact of the world can be considered isolated or independent because every fact is related to many other types of facts, such as mountains and rivers as separate units on the earth's surface. They are visible, but their origin and development have been directly or indirectly driven by the same process.

The study of various facts on the earth's surface is an effort to understand the space, time and relationships. Where similarity in biological-inorganic scenes and events is evident in different areas, they also blend with each other. Apart from this, in

the areas of the earth's surface, the analysis of the mechanisms of changes taking place and the mutual relationships, systems and distributions of different regions and human classes on the basis of different forms of earthly unity refers to the entire earth as a unitary characteristic. For the same regional organization and planning development, geographers study the places of regions and regions of the world with an integrated purpose. In these studies, the context of differentiation and integration of places is constantly included, which is a comparative analysis of different areas but physical elements and climatic characteristics. Homogeneity is the main quality of unity, an example of which is the entire atmospheric and solar heat present on the earth, which is controlled by the same power. Similarly, another example is seen in the close relationships found between the natural vegetation and animal world of different regions, in which the same Similarity of types is seen in animals and plants all over the world.

In this way, mutual interrelation is not limited only to the elements of the natural environment; the entire cultural element, including humans, also contributes to the determination of various natural elements. For example, physical unity can be considered the population distributor that connects humans and the geographical environment. It clarifies the relationship between what kind of environment humans can develop and spread in, which physical elements are suitable for humans and living beings, and which elements of the world.

9.3.3 Historical sequence of new trends in geography

Geography is a regional science that originated with the emergence of humans on Earth. There has been a relationship between Earth and humans since the emergence of the human race. To satisfy his curiosity, man understood the environment amid the adversities of nature and established adaptations in it, which marked the rise of geographical thinking and the beginning of the development of human civilization, the evidence of which is known from archaeological discoveries and the advancement of geographical knowledge by the Aryans in the Vedic period. It happens. Based on the writings of the great Greek poet Homer in the 9th century before Christ, there is strong evidence of geographical knowledge, which was in the form of mathematical and astrological sciences. At that time, humans acquired geographical knowledge through

observation, exploration, imagination, and empirical calculations. Accumulated knowledge and substantial development of these sciences developed in the form of attachment to the science of astronomy. The period from the 13th to the 17th centuries was a period of renaissance in the subject of geography. Which is also recognised by the era of travel, discoveries, and inventions in geography? While the systematic and descriptive approaches were strengthened by long travels and discoveries, the foundation for the development of systematic and regional geography was also laid. Geographers of the 18th and 19th centuries played an important role in giving scientific form to geography and studied geography in different branches in the form of natural and human geography.

In the 20th century, special attention was given to human geography by geographers, which led to the main trend towards mutual relations and regional distribution of the environment and humans on various forms of the earth. In the changing nature of geography, many new trends started emerging. In the latter half of the 20th century, there was rapid progress in the methodology of study, exploration, and representation of geography; it was even called a revolution in many symposiums. Whereas till earlier, geography was considered only a subject of art and literature, but due to rapid progress in the middle of the 20th century, the field of geography has expanded to include geology, geophysics, geochemistry, oceanography, geosciences, etc. The field of geography started expanding further from politics and other social sciences; in the latter part of the 20th century, geographers included surveys, observations, explorations, and descriptions of the methods of geography in the study of geography, due to which the traditional study of the subject changed. Changes took place, and new subjects and sub-subjects based on new methods started developing, which came to be known as new trends in the subject of geography. For the convenience of study, these new trends have been classified into three decades.

I. **Decade till 1950–60:** Emphasis was laid on observation and exploration of geographical facts in geographical studies, and the work of collecting various types of records, regional measurements, and data started. Use of micro-instruments to bring accuracy to data, confirmation by hypothesis, development of inappropriate geography, quantitative revolution (use of statistical methods, survey measurements, new approaches, scientific analysis of empirical facts, more use of computers),

industrial establishments, and agricultural situations Principles, central place principles, and new policies and principles of land use were propounded, which was the biggest achievement of this time in the subject of geography.

II. **Decade till 1960–70:** In this decade, in the new development of geography, integrated study of areas was done through geographical explorations and analyses, and geology and ecology started being used more and more in the systematic and regional approach of the subject of geography. Secondly, the creation of models, maps, and diagrams and their use in geographical studies were adopted, due to which the development of laboratories, soil testing, the collection of climatic elements, and testing started happening at a rapid pace. The most progress was seen in the development of models in this decade Went.

III. **Decade till 1970-80**: In this decade, more emphasis was given to the use of statistical techniques in the methods of geography. Apart from this, there was a need to establish international relations to give recognition to the subject of geography at the global level, for which international seminars were organized. It was done in different countries, bringing various works done in the field of geography together on one platform. In the same decade, severe earthquakes, volcanic eruptions, catastrophic floods, famines, and outbreaks of epidemics also knocked, for the solution of which experts from many subjects needed to work together, which led to the arrival of new theories and strengthened the legal system of geography. The basis was obtained, and at this time great progress was achieved by geographers in their activities and techniques for the progress of the subject of geography. And under the provisions of the International Geographical Union (IGU), development plans were implemented on the basis of the formation of geographical committees and sub-committees, seminars, publications, territorial demarcations, human welfare approaches, city planning models, economic foreign associations, and regional plans.

9.3.4 Recent trends in the subject of geography

The trends in the subject of geography start from the birth of the subject and are active even in the present day. Thus, the trends are linked to the development journey and progress of the subject of geography.

I. Trend of specialisation: The trend of specialisation in the subject of geography was developed by American geographers. At present, the field of specialisation has spread to different areas of geography. On the basis of this trend, emphasis is placed on study by focusing on a particular subject in a region. For example, in studying the geography of a city, its internal and external aspects, its functions, the demarcation of work areas, and the area of influence of the city are mainly studied, which are sub-divisions like city, market, entertainment, construction, medical, military, and settlement geography involves branches. After the Second World War, with the development of the subject of geography as regional geography and its description as an inter-scientific subject, it became a general practical science. In which the policies of human economic, social, cultural activities, and human interests started being understood specifically, and to overcome the obstacles and problems of economic life, many types of new techniques were included in the subject of geography. The biggest trend of this trend is that, at this time, statistical methods were being used most in the field of study of geography.

II. Tendency of quantification: This trend was started especially by the mathematicians and geographers of Greece, Rome, and Arabia. It is a sub-discipline developed in the 18th century on the basis of territorial descriptions of political areas. But mathematics has been used in geography since ancient times, which included the determination of the Earth's circumference, latitude and longitude and the study of the Earth's size, shape, motion, and solar system. Whereas after 1950, there was an increase in the use and utility of statistical methods in geographical descriptions, which became an analytical tool for researchers due to which the results of research started to be known accurately, but in the initial period this work remained monotonous, but later on in the making of maps and geography The specialisation of other branches of geography made quantitative geography based on techniques, and mathematical geography was fully developed. In the present time, these works are being used through electronic computers; hence, statistical data has revolutionised the analysis of geography. At present, quantification is being used in the fields of measurement of landscapes in the form of mixed physical geography, slope analysis, climate element analysis, science, soil science, agricultural geography, population geography, industrial geography, and communication geography.

III. Tendency of non-use: This tendency means to use techniques more and more in the sub-branches of the subject of geography. This is also called practical tendency, in which geographical methods and techniques are misused in making socio-cultural and economic plans. This trend developed in America, Russia, France, Belgium, Hungary, Japan, India, China, Canada, Central Europe, and Arab countries. In India, Prof. R. L. Singh, Prof. Chatterjee, and Prof. Mohammad Shafi gave it new dimensions in the form of practical geography, which combined physics, geomorphology, climate science, hydrology, oceanography, glaciations, soil geography, zoology, botanical science, marine science, etc. The use of methods and techniques like science, military science, rural science, transport geography, urban geography, military geography, social geography, regional geography, cartography, statistical techniques, photogrammetric and model making is a new trend in the subject of geography and its sub-branches. Which was very useful in the analysis and synthesis of physical landscapes and geographical facts, which were prepared keeping in mind the geographical concepts? Apart from this, while conducting the geographical survey, emphasis was also laid on collecting different types of data, the non-use of which the usefulness of geography continued to increase, and this subject has now started doing the work of market analysis in various fields individually for industries and general humanities. In this way, practical geography started being specialised in population, settlement, agriculture, industrial, and transport geography, along with social and economic sciences, and it also expanded to meteorology, photography, and cartography.

The main trends adopted in the course of the development of geography include the inclusion of various new trends from time to time based on the changing nature of geography (from 1861 to 1961). On the basis of the achievement of 100 years of geography history sequence, T.W. Freeman, in his book (Hundred Years of Geography), has mentioned six trends.

1. Encyclopaedic tendency
2. Educational tendency
3. Colonial tendencies
4. Tendency to generalise
5. Political tendency
6. Tendency towards specialisation

IV. Encyclopaedic trend - This trend involved collecting more and more geographical knowledge, which was presented to countries around the world through geographical travel and discoveries in remote areas of the world.

V. Educational trend - This trend was developed in Germany. Education was to be provided by including the study of geography in the curriculum of schools, colleges, and universities, which started in the 19th century.

VI. Colonial tendency - In the latter part of the 19th century, in 1870, France and European countries became interested in studying this trend from the colonies of Africa and Asia, which wrote regional geography. Areas with human habitation were discovered even in uninhabited places, and the study of livelihood sources, agriculture, and climatic conditions was also included in this trend. While the discovery of new places forced colonial geography to be taught in universities, it also provided suggestions for the problems of the colonies and their solutions and propounded new strategies for the use of the resources of the colonised places.

VII. Generalisation tendency - This trend in geography was developed in the 20th century, in which the subject matter related to the physical and cultural objects of the world was to be presented through general rules. Apart from this, an attempt was made to demarcate the physical and human regions of the world and the respective regions on the basis of their activities and interrelated characteristics and on the basis of interrelationships and types of the world's climate and vegetation.

VIII. Political tendency - The development of political tendencies in the subject of geography is considered to have started with the impact of political activities in the geographical environment during the world wars. The study of which is considered to date from Roman and Greek times, currently political geography has become the main developed branch of geography. Political geography was developed by Ratzel, Mackinder, Karl Hashofer, Isa Bowman. Where the maximum contribution has been given by Ratzel Currently, the study of various aspects of human and physical geography is being included in political geography.

IX. Trend of specialisation - At present, the study of geography is being understood as a branch specialisation and interdisciplinary study. Which gives special emphasis on the specialisation of different areas, the details of which are also given in the above title of the description of new trends?

In this way, the nascent tendencies in geography had changed the subject of geography from descriptive form to quantitative form. In geography, the universal forms of the earth are studied on the principle of specialisation, keeping in mind the physical elements, environment, and human relations; that is, innovation has been the sequence of new trends in the subject of geography.

9.4 SUMMARY

Unity in geography means the similarity found in natural elements geographically. Which works on the same principle in every part of the earth. All the geographical, physical, biological-inorganic, and cultural, inanimate and animate objects found on the surface are related to each other in some way or another and no element is independent in which the elements of the natural and human environment are superimposed on each other carry out interactions. The study of unity in the subject of geography includes how each element of the earth is interrelated with other elements and how the elements of that physical and cultural environment are related to other elements. This analysis is an analysis of terrestrial unity in the subject of geography. Known by name Geography, being the science of the earth's surface and its inhabitants as an inter-disciplinary subject, expresses uniformity in the elements spread in different areas of the entire world. Just as the forces and processes that occur in the development of topography for the origin of mountains are the same in the topography of all regions, the process of germination of agricultural seeds, which is present in the Indian subcontinent, is also found on other continents. Thus, in geography, the unity of the same environment and ecological relationships among human groups describes the unity of the subject of geography.

With the emergence of humans on earth, the subject of geography also started developing. To satisfy his curiosity, man established relationships between the harmonies of nature. The period of the Renaissance from the 13th to the 17th centuries

was the time of the arrival of current new trends in geography, the basis of which were travels, discoveries, and inventions. Geographers of the 18th and 19th centuries studied the scientific nature of geography, and in the 20th century, many new trends were included in the subject of geography, which was called a revolution in geography. In the subject of geography, new trends have made a special contribution to solving complex geographical facts easily. Due to the dynamic nature of geography, new branches in the form of new trends reflect its vast scope, in which technology development, mapping, geographical information system technology, statistical methods, specialisation of branches of geography, use of laboratories, surveys, and model making are the main new trends Has been.

9.5 GLOSSARY

Terrestrial Unity:	Homogeneity is found in all organic and inorganic physical elements of the Earth.
Unity Uniformitarian's:	The theory propounded by James Hutton, who was in favour of a single process in the creation of the physical elements of the entire world.
Interrelated:	All the elements on the earth's surface are interrelated to each other in some way or another. No physical element has its own independent existence.
Universal:	The process of the world functioning is governed by the same rules. The universe is the entire part of the space system in which innumerable stars, galaxies, meteorites, and other solar bodies exist.
Investigation:	To discover some new facts in geographical form.
Seminar:	A discussion between scholars gathered to brainstorm on a problem or new topic.

Oceanography:	Oceanography is a sub-branch of physical geography that studies the physical, chemical, and topographic properties of ocean water.
Geopolitics:	Geopolitics is a term used by Jelen for political science.
Social Science:	A sub-branch of social science that studies human social relations and customs, religions, and sects.
Methodology:	Different types of study methods are adopted for geographical facts.
Empirical facts:	Geographic analysis and validation of any geographical fact through experience.
Central Place Theory:	Theory propounded by Kristaller in urban infrastructure development.
Inter-subject:	Subject encompassing physical and social sciences.
Specialisation:	Studying the subject matter of geography through many branches.
Applied Geography:	The process of using the elements of the geography subject in general practical life.
Quantitative Revolution:	Various statistical and mathematical techniques and the use of computer models adopted in the study of geography after 1950.
Geographic Information System:	Computer-based technology that is useful in solving complex facts about geography.
Gestaltism:	Natural and cultural similarity found in a region whose rules are helpful in global generalisation.

Innovation:	New technologies are being introduced in the subject of geography.
Colonial Geography:	A sub-branch of geography developed during the period of discovery and exploration.

9.6 ANSWER TO THE CHECK YOUR PROGRESS

- Unity in geography means similarity found in geographical elements.
- Under physical characteristics, the origin and formation processes of mountains, plains, plateaus, rivers, and seas are explained.
- James Hutton gave the theory of uniformitarianism.
- The concept of spiritual unity shows the close relationships between various facts.
- Till the twentieth (20th) century, geography was considered only a subject of art and literature.
- The subject of geography is currently studied along with other subjects as inter-disciplinary subjects.
- Frederick Ratzel has also considered earthly unity to be present in the entire world.
- The trend of specialization in the subject of geography was propounded by American geographers.
- Geographic Information System is the most recent trend in the subject of geography, which provides information about geographical facts based on computer science.
- Earthly unity is a universal truth that exists at every time and place.
- The development of modern trends in geography started in the 20th century, after the Second World War.
- The quantitative revolution in geography is also called computer-based technology.

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9.8 TERMINAL QUESTIONS'

(I) Long answer question

Q-1: What do you mean by unity in the subject of geography? Explain terrestrial unity with the help of various examples?

Q-2: Explaining the meaning of the new trends in geography, describe the major new trends in detail?

(II) Short-Answer Questions

Q- 1: Explain the meaning and definition of unity in geography?

Q- 2: What do you understand by earthly unity?

Q- 3: What is ecological analysis?

Q- 4: What is Gestaltism?

Q- 5: Explain Ritter's principle of spiritual unity)

Q- 6: What is the Geographic Information System?

Q- 7: Describe the main trends propounded by Freeman?

Q- 8: What is the tendency towards generalisation?

Q- 9: What do you understand by encyclopaedic attitude?

Q- 10: What is the tendency of colonial geography?

Q- 11: What do you understand by quantitative revolution?

Q- 12: What do you mean by the tendency towards disuse in geography?

Q- 13: Write a short note of the main trends adopted in geography?

(III) Multiple-answer questions

Q- 1: What is the meaning of unity in geography?

- **a)** Unity found in geographical elements
- **b)** Unity of social elements
- **c)** Unity of cultural and economic elements
- **d)** All of the above

Q- 2: By which scholars was prayerful unity propounded independently?

- **a)** 1st Ritter
- **b)** 2nd Humboldt
- **c)** Humboldt and Ritter
- **d)** 4th Blas

Q-3: Is the status of fundamental principles given in geography?

- **a)** Principles of Adaptation
- **b)** 2nd Concept of Spiritual Unity
- **c)** Environmental adjustment theory
- **d)** 4) All of the above

Q- 4: "The elements of human geography are related to terrestrial unity and can be explained only through that." Which geographer is making this statement in the context of terrestrial unity?

- **a)** Humboldt
- **b)** Ratzel

c) Blass

d) Ritter

Q- 5: Which study area of geography experienced rapid growth in the latter half of the 20th century?

a) Exploration

b) Representation

c) Legal system

d) All of the above

Q- 6: Which is not included in the sequence of the development of new trends in geography?

a) 1950 to 1960

b) 1960 to 1970

c) 1970 to 1980

d) 1980 to 1990

Q- 7: Which geographer has written the book "100 Years in Geography"?

a) Zimmerman

b) Freeman

c) Blass

d) None of the above

Q- 8: At the beginning of the new trends, were there no classified trends?

a) Tendency to specialise

b) Colonial tendency

c) Quantification tendency

d) Tendency of application

Q- 9: Which is not included in the most recent trends in geography?

a) Geographic Information System

b) Remote sensing technology

c) Global Positioning System

d) Northwest Photography

Q- 10: What is not included in the trend of quantification?

a) French

b) Greece

c) Roman

d) American

Q-11: Who was involved in the development of practical geography in India?

a) Prof. R. L. Singh

b) Prof. Chatterjee

c) Prof. Mohammad Shafi

Q-12: What is the objective of geographical unity is?...

a) Providing prosperity to humans in general

b) Studying the natural environment

c) Adjusting to the cultural environment

d) None of the above

ANSWER- 1, A 2, C 3, B 4, C 5, D 6, D 7, C 8, B 9, D 10, A 11, D 12, A

UNIT- 10: TECHNIQUES AND TOOLS IN GEOGRAPHY

10.1 OBJECTIVIES

After reading this unit you should be able to:

- To make a detailed study of the techniques adopted in the latest trends in the subject of geography.
- To clarify the ease of studying the subject with the use of new technologies and to provide knowledge of modern technology along with traditional methods to the learners.
- To describe the techniques and supporting tools adopted in the subject of geography from the beginning until the present time.

10.2 INTRODUCTION

In ancient times, geography was considered a subject based on religion, the description of which was obtained from an in-depth study of religious records, historical descriptions, and travelogues. But the changing concepts and study methods of the subject of geography have separated it from the traditional study subject and given it the status of modern earth science, where many techniques and tools have been included in the subject of geography as study material. What is meant by techniques and equipment is that the subject, which is studied as a historical subject and is considered a part of social science, has, after a long journey, been developed as an independent science by the use of new equipment with various techniques and procedures of modern science. The subject that is described is made. It is the result of the inclusion of modern technologies and new branches.

In the study of geography, technology is the supporting agency that gives a different form to geography among all the sciences. And by giving the subject the form of science in descriptive form, it transforms the subject matter into quantitative and qualitative form. Where at one time the facts of geography were considered limited only to regional description, now complex geographical and cultural elements can be made easily useful to humans through experimental testing, and all natural and man-made elements can be analysed through scientific methods, statistical methods, surveys, and It started being based on the results of laboratories, and certified studies of geographical elements started

being included in the subject of geography. For the development of the subject of geography and the progress of its modern form, a strong legal basis was needed.

There was a need for geographers and scientists to bring geography into the form of an independent science, for which technical support, technical equipment, and many types of procedures had to be included in the subject. Which was a very complex task in itself? Because some scholars use new techniques like systematic and regional approaches, statistical methods, spatial systems, ecological systems, classical studies, determinism, possibilism, probilism, neo-determinism, quantitative revolution, ethical revolution, pragmatism, humanism, positivism, welfare geography, models, While some social scientists and geographers were in favour of the use of computer techniques, laboratory work, survey equipment, survey results, and cartography, they were not in support of these trends. But to establish the subject of geography as a science of nature, the surface, and the inhabitants of the earth's surface, the need for all the above-mentioned new techniques, ideologies, survey instruments, and geographical models became essential due to the changing nature of geography.

The main aspect of the study of geography in the form of technology and methods is the mutual relationship between the natural environment and humans, adaptation, transformation, and adjustment of cultural elements with nature and the spatial system. Interregional study emphasises working according to the principle of territorial unity. These techniques work in the context of gaining complete knowledge of the subject or for the purpose of understanding the reality of the world of geography. Because the study elements of geography are different from those of other systematic sciences, this subject generally contributes to the scientific philosophical background and solution of practical problems because geography, along with being the essence of all sciences, is the study of living, active, and progressive elements on the earth's surface. Also studies. Since this type of utility is inherent in the subject of geography, its modernization has always been the need of the hour. Since it is the science of land and all types of activities take place on the earth's surface, the inclusion of technology and the use of supporting equipment in geography make the importance of the subject even stronger. At present, branch specialisation, inter-disciplinary subjects, computer-based Geographic Information System (GIS), and remote sensing are mainly included in the form of technology, and various survey and meteorological instruments, graphs, and diagrams are useful in the study.

Laboratories, engineering applications, and mapping science have been mainly included. In this way, it is the way to incorporate the changing nature of nature and modernity into the subject of geography, in the absence of which the study of geography cannot be completed, and this effort works to capture the significance of the subject and the real complexities in the infinite limits of nature. And for modernization, new techniques and tools have always been adopted in geography.

10.3 TECHNIQUES AND TOOLS IN GEOGRAPHY

10.3.1 Geographical techniques and instruments meaning:

The incorporation of innovative techniques over time in geographical studies, i.e., renewal, is geographical technology, whereas the instruments (meteorological instruments) adopted for study through the scientific method are geographical instruments. Innovative trends generally mean the process of incorporating methodological approaches into the study of the subject as per the time. After 1950, techniques, new ideas, and new processes were incorporated into the subject of geography, due to which the subject became more clarified and the classification of geographical processes started being depicted more easily. In geography, through technical subject research, work was done to convert the traditional form of geography into a scientific method, and geography became a scientific subject studying the earth. Theoretically, determining geography as a fundamental discipline, organising international scientific institutions and world seminars in the study, analysis and discussion of the subject, inclusion of hypotheses, and scientific interpretation of geographical elements have been mainly involved.

10.3.2 Major Techniques of Geography Subject:

With the use of major techniques adopted in the study of geography from ancient times until the present, the subject of geography has acquired such agencies through which pure and various complex descriptions can be done easily. Statistical techniques and photo grammetry have been helpful as major tools in geography. The work of generating interest in multi-disciplinary subject analysis among geographers with real understanding of regional analysis is being done through new techniques. The following points were included as new technologies.

1. Techniques of textual interpretation
2. Incorporation of geographical facts, visual landscapes, and measurements of description
3. Use of photogrammetric techniques in surveys and observation
4. The scientific development of cartography
5. To convert descriptive form into quantitative form through statistical and mathematical techniques.
6. Use of film and slide projectors
7. Incorporation of remote sensing and geographical information systems
8. Analytical study through computer machines
9. Use of field instruments
10. Use of laboratories

The methods and approaches adopted as innovative techniques and trends in the subject of geography are described as follows: For geographical studies, mainly two types of approaches are included: systematic approaches and regional approaches.

Systematic approach: The regional approach is also called the case approach. Who studies the elements of geography, i.e., regions, in different ways? The study and classification of elements of geography done in this way is called systematic geography. Like studying different types of landforms located on the earth's surface in different forms.

Regional approach: Studying the geographical units of the earth's surface on the basis of regions, i.e., climatic characteristics, and the tendency of dividing them into units is called regional approach. The regional approach includes a separate study of different elements of a region and a regional study of regional elements. In regional geography, there are many types of regions that are territorially related to other types of regions, such as climate regions, vegetation regions, wheat regions, industrial regions, pastoral regions, cotton regions, and political regions, which are divided politically by governments.. But only geographically existing regions are given prominence in regional studies. From ancient times to the present, geographers have been incorporating new trends in the study of geography, and the use of new tools has increased, which have been mainly described through the following points:.

1. Travels:

In ancient times, apart from subject experts, many people also took trips for trade, colonies, and the search for economic resources. During the journey, travellers used to leave behind maps of travel routes and some souvenirs. This has been the main material and assistant in the study of geography for geographers. Due to curiosity about geographical areas, Greek, Roman, and Egyptian travellers had undertaken long journeys to discover new countries and gain geographical knowledge. The descriptions of these journeys included data collected by geographers, lists of conditions in places, magnetic observations, lists of plants and animals, mentions of minerals, and major descriptions of humans' economic occupations, social cultures, etc. Apart from Magellan, Columbus, Albuquerque, Vasco di Gama, and Marco Polo, who were major explorers and who worked to put the knowledge of new countries on the world stage,.

2. Techniques of cartography:

Maps and cartography are considered to be the main tools of geographers. The branch of cartography developed as a sub-branch of physical geography has provided the strongest technical basis in the study of geography. The development of cartography in the subject of geography started in the mediaeval period, the details of which can be seen in travel geography, which has proved helpful in understanding the natural and human elements of the surface, simplifying the subject matter, and refining new techniques. Geographers easily included natural environment, social science, and cultural-economic elements in the subject and worked to take the subject area of geography to higher heights. This has helped in displaying topographic and weather maps with certain accuracy, and geographers have the biggest weapon in the study of geography. In the making of maps, natural and human elements were incorporated and displayed according to fixed scales and symbols. This made it easier to identify and establish the features of the surface, and technically, a new path was discovered for the study of geography Went.

3. Relief representation and slope analysis:

In the study of landforms, in ancient times, graphical symbols were used to express topographical features, and they were only two-dimensional, due to which there were difficulties in understanding the actual form. Whereas to represent the actual arrangement of elements of geomorphology, i.e., first, second, and third-order relief, three-dimensional maps are required that accurately depict the physical elements of the surface. But due to a lack of adequate geographical knowledge and technical inclusion, it remained unsuccessful for a long time. As the inclusion of new methods and techniques progressed in the subject of geography, in the same way, for the study of geographical elements, technical methods of relief display like the Hachure's system, mountain shading, tractography method, morphological method, contour lines, mountain shading, trigonometric stations, bedrock, spatial heights, and mathematical methods were incorporated, which have been highly successful in the study of relief and slope analysis of landforms.

4. Regional drawing method:

In presenting the description of geographical elements and other regions or places, drawing makes it easier to prepare the outline of any visible land or new construction. In ancient times, geographers used drawings to make geographical descriptions of their long journeys more interesting and effective. Diagrams are versatile for studies that are used for a specific purpose. In other types of techniques, studying based on any one element is not possible. As Humboldt has clearly written, I travelled, sketched, and described. Making of diagrams: A geographer makes a live depiction of a geographical element by seeing it with his own eyes, which is used as a study tool in the subject of geography.

5. Incorporation of scales:

In the study of geography, the pure inclusion of geographical and cultural elements gives the subject of geography the status of a geosciences subject. The display of objects on a prescribed scale, especially the giant form of the earth, represents physical and political units. The work of bringing maps technically on paper and in books has been the biggest achievement in the field of study of geography from ancient times to the present. Elements of the entire world have become easily understood through maps and globes. Scale in maps is a tool that makes many complex facts related to the Earth understandable.

6. Geological element analysis technology:

Geological analysis of geological elements is considered to be the subject of study for geologists and civil engineers. But since the entire earth is the stage of geography, it becomes necessary for geographers to study the internal structure of the earth, due to which geological study is kept in the subject matter of geography. Which provides information about the structure of the surface as well as the rock landscapes, rock layers, folding, and faulting of that region to the students of geography. This proves that in the subject of geography, geological forms can be easily understood with the help of technology.

7. Photography and aerial photography method:

In the study of elements of geography (natural and cultural), compared to surveys and drawings, studies are done through photography and air photos with greater accuracy, which is in accordance with labour, cost, and scale. With the increasing level of technological development, aircraft surveys and photographs are included in mapping, with the help of which the structure of a land area, geology, water flow, sediment deposition, soil erosion, vegetation, agriculture, human settlements, and means of transportation are assessed. And by photo-surveying physical facts, accurate information is obtained. Apart from this, the gradual study of changes in physical and cultural elements also becomes easier. The practice of photography in the study of geography started with the Second World War of 1939–45, which has proved to be very beneficial for surveyors, administrators, generals, engineers, geographers, and planners.

8. Meteorology:

The study of the process of daily development of climatic elements and their occurrence in a particular place, i.e., meteorology, is the study of weather elements like rain, frost, wind, sunshine, fog, storms, cyclones, and other seasonal elements. . Its use holds an important place in our daily lives because, through weather forecasts, we plan the next day's activities, sea, and atmospheric journeys. Apart from this, the collection of data on weather events over a long period of time is helpful in studying and analysing the stability and variability of climate. Till now, geographical technological development has developed many weather observatories across the world in which the use of various types of meteorological instruments reduces the damages caused by weather-related disasters. Thus, the techniques of meteorology develop as a new branch in the field of geography.

9. Statistical Formulation:

To correctly analyse statistical technical facts and draw conclusions, a person needs subject experience, time, and hard work. The correct information is included in the geographical study, and even the difficult elements can be easily understood by the common man with the help of physical and cultural elements through the statistical method. Instead of complex mathematical calculations because it is not possible to remember mathematical numbers verbally. As the use of statistical methods has technically increased in the field of geography, many types of statistical techniques (diagrams, graphs, climatographs, climograph, cumulative graph, altimetry wind graph, regression, correlation graph, polygraph, compound graph, ogive, and central The calculation of graphs, distribution maps, arithmetic mean, median, mode, and standard deviation has made the descriptive form of geography one with numerical and statistical calculations, which is technically considered to be the effect of the quantitative revolution in geography.

10. Topographic Map:

Topographic maps have the utmost importance in the study of geography. Because geographical information about a place is obtained only by observing the features of topography, which display information about surface structure, relief, drainage system, natural vegetation, human settlements, transportation routes, socio-cultural features, and the physical characteristics of the entire world, Understanding and mapping are tasks of extreme risk. The truth is that it is a study tool for geographers. In the absence of which, not only the study of geography but also the understanding of the concept becomes a difficult task. Due to the inclusion of technology, this work is now becoming micro-level, and in-depth study and analysis of the entire world in a scientific manner is now possible in one place. Till now, all the nations have received its valuable contribution in the military field.

11. Survey:

Survey is the biggest weapon of geographers in the study of geography, which is a microscopic scientific study of the earth's surface, through which the work of bringing the entire earth's landmass from the surface to paper and a globe has been done through survey technology. Today, the whole world has been captured in one fist. Land use surveys, economic surveys, farm management surveys, underground water surveys, real estate surveys, and demographic surveys are mainly included in the study of geography. The work of surveying as a subject matter of geography started at the beginning of geography. In the form of survey instruments, the survey tools used in the study of topography were the zigzag, tape measure, plane table, compass, dumpy level, sextant, clinometer, tachyometer and theodolite. Sound instruments are being used in mapping the floor; thermographs, barographs, rain gauges, and wind measuring instruments are being used in studying atmospheric conditions and seasons; seismographs and geological maps are being used to get information about the interior of the earth.

12. Remote Sensing & Geographic Information System:

Geographic Information System (GIS) is a remote sensing technology that is based on computers, through which this technology works in the analysis, management, conservation, data collection, and representation of geographical elements and resources. . This technology is based on a data database that works on the theory and structural database of geology. The Geographic Information System mainly works on the basis of geographical indicators to manage human resources along with the natural resources of the whole world and to plan for the future. At present, it is easy to accomplish multi-dimensional tasks like all policymakers, along with geographers, environmental management, construction work planning, etc. In which the role of the Global Positioning System as a technical device is currently holding the best place, remote sensing is a system based on artificial satellites that send photographs of the earth's surface while revolving around the earth and also provide information about the topography of the continents present on the earth, or oceans. Provides information on the exact shape of forests, land rocks, mineral resources, etc. At present, remote sensing technology is being used mainly in four areas: telecommunication telephone services, surveys of geographical resources, meteorological forecasts, and television broadcasting. This technology is the newest in the study of geography. In this way, in the study of geography, the subject of geography has become a special type of science by coordinating with all the sciences through techniques

and equipment, which technically includes geo-morphological laboratories, law schools, soil laboratories, meteorological centres, biogeography, and cartography. Which is playing the best role in the planning of geographical resources?

13. Technical Geography:

That branch of geography that studies the study of providing spatial information, analysing, interpreting, understanding, providing new information about communication management, and using various types of tools useful in the subject of geography to prove the concept of technical geography does. Technological geography works in accordance with the theoretical concepts of geographical elements. It focuses on geographers to better understand the use of technology in the subject, the impact of technologies on human behaviour, and to reach out to end users. This sub-branch provides assistance to geographers as well as other subject experts in the study of geographical elements. To understand the theoretical concepts in technical geography, even if a geography teacher has knowledge of the facts of physical geography and human geography, he can easily study the data quantitatively with the help of techniques. At present, this geographical information is available in the form of technology. It is especially used in sub-branches of science, geology, and geo-structure science.

10.4 SUMMARY

In ancient times, geography was considered a religion-based subject, but with the changing trend of the subject of geography, it has attained the status of modern earth science with the inclusion of many techniques and equipment. In the study of geography, technology is the supporting agency that gives a different form to geography among all the sciences. By changing the descriptive form of the subject of geography into a quantitative form and making complex geographical and cultural elements easily useful to humans through experimental testing, studies based on scientific techniques, statistical methods, surveys, and laboratory results provide a strong methodological basis for the progress of the modern form doing. New techniques like systematic and regional approaches, statistical methods, spatial systems, ecological systems, classical studies, determinism, possibilism, stochasticism, neo-determinism, quantitative revolution, ethical revolution, pragmatism, humanism, positivism, welfare geography, models, computer technologies,

The changing nature of geography has done the work of establishing the use of laboratory work, survey equipment, survey results, and cartography for the practical lives of the inhabitants of the surface and the earth's surface.

The main aspect of the study of geography in the form of technology and methods is the mutual relationship between the natural environment and humans, adaptation, transformation, and adjustment of cultural elements with nature and the spatial system. Inter-regional studies emphasise working according to the principle of territorial unity. These techniques work to understand the reality of the world in the context of gaining complete knowledge of the subject. The study elements of geography are different from systematic sciences. This subject generally contributes to the scientific and philosophical background and solution of practical problems. This type of utility emphasises modernization by incorporating the inherent strengths in the subject of geography and, being the science of land, encompasses all types of processes in themselves, in which it is considered necessary to incorporate new techniques and equipment.

10.5 GLOSSARY

New Trends:	Inclusion of new techniques and tools in the study of the subject of geography.
Historical description:	The oldest records of geographical study and geographical literary material.
Hypothesis:	Method adopted for the scientific study of geographical facts.
Study methods:	Methods adopted for simple explanation of geographical elements and making them multi-useful.
Traditional Studies:	Study of geography in the form of traditional literature along with history, economics, and other subjects till the 18th century.

Earth Science:	Another name for the subject of geography, in which geography is called the science that studies the earth's surface.
Supporting agencies:	Survey equipment and study of geography subject adjusted with other techniques.
Branch Specialisation:	Division of the geography subject into other sub-branches.

Geographical Information System: Studying geographical elements through computers.

Remote sensing:	Remote sensing is a method of studying geographical and cultural elements through satellite technology.
Survey:	Micro-observation, inspection, and mapping of physical and cultural elements by humans using various techniques and equipment.
Meteorology:	Meteorology is a sub-branch of physical geography that studies the elements of climate scientifically at a micro level.
Diagram:	The technique of explaining various types of statistical data through diagrams.
Laboratories:	Places for analysing data obtained through geographical surveys, making maps, and analysing other types of geographical elements.
Cartography:	The entire process from survey to map printing is called cartography.
Computer Model:	Models made for the study and construction of complex geographical elements.

Renovation:	Changing the form of geographical elements to make them more useful to humans.
Technical Geography:	The branch of geography that provides spatial information.
Travels:	The evolution of geography, the mediaeval period, which is also known as the great geographical discoveries.
Topographic Maps:	Maps showing natural elements, i.e., landforms.
Statistical representation:	The methods of easily explaining and analysing mathematical data are called statistical representation.
Photography:	Photography is a method adopted as a technique for surveying and displaying geographical elements.
Aircraft photographs:	Photographs taken by aeroplanes to survey surface elements.
Scale:	The scale used to represent the giant Earth on paper.
Field sketch method:	Sketches drawn without scale during geographical surveying or map making.

10.6 ANSWER TO CHECK YOUR PROGRESS

- Technology is the inclusion of modern techniques and new equipment in the subject of geography.
- The incorporation of technology and equipment has separated the subject of geography from the social and human sciences and given it identity as land science.
- The use of scientific procedures, statistical methods, and laboratories is the main technical analysis in the subject of geography.
- Maps are considered the main tools of geographers.

- The use of techniques has served to simplify the actual complexities of the subject of geography.
- The traditional form of geography has been given a scientific form by technology, equipment, and subject research in geography.
- The regional approach is also called the case approach. Question 8: Sketches are pictures made without scale to fulfil a specific purpose.
- The inclusion of measurements in the study of geography is the pure representation of geographical and cultural elements on paper.
- Photography is a method adopted as a technology for surveying and displaying geographical elements.
- Pictures taken by airplanes for surveying surface elements are called aerial photographs.

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10.7 TERMINAL QUESTIONS

(1) Long Answer Question

Q-1: Explain in detail the major techniques and tools of geography.

(2) Short-Answer Questions

Q-1: What do you mean by technology in geography?

Q-2: What are the tools adopted in the study of geography?

Q-3: Explain the importance of the use of technology in the subject of geography.

Q-4: Explain the points mentioned as new technology in the geography subject.

Q-5: What is the importance of measurements in geography?

Q- 6: What do you understand by statistical representation?

Q- 7: What is the meaning of a survey?

Q-8: What is aerial photography?

Q-9: What is the relief representation method?

Q-10: Briefly describe the main approaches to geographical study.

Q-11: What is the regional drawing method?

Q-12: What is technical geography?

Q- 13: What is the use of geographical information systems and remote sensing technology in geography?

Q- 14: What do you understand by a topographic map?

(3) Multiple-Choice Questions

Q-1: Is there a description of the subject of geography?

- **A.** Religious records
- **B.** Historical details
- **C.** Travelogue
- **D.** All of the above

Q- 2: What is meant by techniques and tools in the subject of geography?

A. Study of historical subjects
B. Study of social subjects
C. Study of long journey
D. Adjustment of techniques and methods of modern science

Q- 3: Geography is the main approach to studying the subject.

A. Sequential approach
B. Regional approach
C. Regional approach
D. First, and second

Q- 4: When were the techniques introduced in the subject of geography?

A. 1950
B. 1960
C. 1970
D. 1980

Q-5 Is included in the form of new technologies.

A. Techniques of verbal analysis
B. Incorporation of geographical facts and measurements of visible lands.
C. The scientific development of cartography
D. All of the above

Q- 6: Geographical travellers include

A. Magellan, Columbus
B. Albuquerque, Vasco da Gama,
C. Marco Polo
D. All of the above

Q- 7: What is called the main tool of geographers?

A. Cartography
B. Survey art
C. Scale
D. Map projection

Q- 8: By what other name is the subject of geography known?

A. Physics
B. Geology
C. Earth Science
D. Natural science

Q- 9: When did the practice of photography start in the study of geography?

A. 1939-45
B. 1949-60
C. 1965-70
D. 1980-90

Q- 10: Has the descriptive form of geography been given a numerical form?

A. Geographic Information System Technology
B. Remote sensing technology
C. Statistical methods
D. All of the above

Answer: 1, A, 2, D, 3, D, 4, A 5, D, 6, D. 7, A 8, C 9, A 10, C

UNIT- 11 DIFFERENT BRANCHES OF GEOGRAPHY, ASPECTS OF STUDY AND RELATIONSHIP WITH OTHER SCIENCES

11.1 OBJECTIVES

After reading this unit you should be able to:

- To study various branches of geography in depth.
- To describe the sub-branches of progressive geography that developed in different periods.
- To analyse the relationship between the subject of geography and other sciences.
- To understand various aspects of the study of geography,.

11.2 INTRODUCTION

The subject of geography has always been a progressive and new sub-branch, incorporating new tools and techniques, developing new branches with time, and establishing its relations with other sciences, which include the study of the surface, air, and water spheres. All physical processes are included. The subject of geography has established coordination with all the sciences from its initial development until the present, due to which all the physical elements are being studied easily by geographers. The dynamic trend of the subject of geography has given rise to many branches of social and natural sciences in the form of independent sciences by specialisation of branches to know the use, management, and environmental effects of natural elements and has given rise to many branches of social and natural sciences in reducing natural hazards. Has provided techniques and tools that strengthen aspects of human cultural development at various stages of development in the branch. Thus, in the initial stage of development of the branch of geography, the five sub-branches of geography were developed in a mixed form in the subject of geography, which included sub-branches like mapping, resources, travel, astronomical geography, etc.

Due to the extensive development of the subject of geography and its huge field of study, this subject became interrelated with many subjects, and all types of geographical, economic, and cultural knowledge got included under this subject and became an inter-disciplinary subject, due to which geography gradually changed from its ancestral subject. Their progeny subjects got separated and developed as different sub-disciplines, in which the first branch was physical geography and the second branch was human

geography. The sub-branches developed in the form of physical geography are the branches of natural science (Geo-mathematics, geophysics, astronomy, mixed physics, geomorphology, climatology, hydrology, oceanography, glaciology, soil science, biology, ecology, cartography, and health science). The second major branch Under human geography, the sciences governing human and human economic activities have been included, whose main sub-branches are economic geography, population geography, settlement geography, political geography, military geography, historical geography, social geography, and cultural geography. Which is still active even today as an independent subject. Because in the mediaeval period, due to the change in the interpretation of the natural environment and the relationships between human classes in the study material of the subject of geography, theocratic, geo-cratic, and heterocratic branches were also studied, and in the modern period of the 19th century, almost all the branches had developed till now. The geographic information system, a branch of physical geography, has provided a strong basis for branch specialisation and sub-branch development of the subject of geography by simplifying the complexities of all the sub-branches.

The subject of geography has been understood since ancient times as an inter-disciplinary subject in relation to other sciences, which study geographical elements from the point of view of place, time, and relational aspects, as well as the phenomena of biological and non-biological scenes and the diversity of the earth's surface. It helps in understanding. How can natural and economic elements prove to be more useful for humans, and how can traditional and scientific methods be useful in human-environment interactions and resource development in different ecological forms? Because there are many differences and similarities in the physical and human elements of a region, which establish relationships with other subjects through mutual interdependence, How helpful can the inclusion of sub-disciplines be for humans? As a result of this, geography is related to the physical sciences (Geography and Astronomy, Geography and Mathematics, Geography and Geology, Geography and Climatology, Geography and Soil Science, Geography and Oceanography, Geography and Botany and Animal Science, Plant Science). And in the social sciences (Geography and Anthropology, Geography and Economics, Geography and History, Geography and Military Science, Geography and Political Science, Geography and Statistics, and Mathematical Sciences), it is considered special. Which works as a link between natural and human sciences, thus geography is

included in other sciences in some way or the other and other sciences are included within geography, which is confirmed by the book called Geography in the twentieth century. The book was written by Griffith Taylor and Hetner.

11.3 DIFFERENT BRANCHES OF GEOGRAPHY, ASPECTS OF STUDY AND RELATIONSHIP WITH OTHER SCIENCES

Since the origin of the subject of geography, the specialisation of branches of geography and the development of new sub-branches have started. Which was in a combined form in the initial period, but the huge steps in the advancement of science have developed many sub-branches in the subject of geography. In the initial period, instead of describing the developed branches separately, they are combined in the form of travel geography, mapping geography, and resource geography. Geography and astronomical geography were studied. In the middle decade of the 19th century, after the Second World War, the birth of the ideologies of dualism in geography gave a sharp edge to the division of geography by German geographers; the branches of physical geography as the first branch and human geography as the second branch were born. Was. While geography changed from an ancestral subject to a progeny subject, giving rise to many independent sciences, due to which the subject of geography was given the status of "mother of science," the major sub-branches of geography can be described through the following branches: Has been presented.

11.3.1 Branches of ancient geography- In ancient times, the initial branches of geography were recognised in a combined form, whose major sub-branches are divided into the following five types:.

1. **Travel Geography:** The development of travel geography is considered to be established by the travels undertaken by humans in search of means of subsistence, hunting, pastures, agricultural lands, and minerals. The discovery of resources, trade in goods, curiosity about other geographical areas, invasions, and long journeys to discover new places led to the discovery of new knowledge and geographical areas. In fact, the development of the present form of geography science is considered to have

started with travel. Indian, Aryan, Greek, Egyptian, Arab, and Chinese travellers were prominent. In the 18th and 19th centuries, geographical texts were composed based on the works of German geographers. The birth of new branches in the subject of geography began due to exploratory travels.

2. **Mapping Geography:** In ancient times, when humans moved from one place to another for long exploration journeys and attacks, they started making maps of the visited places to obtain resources on clay tablets, walls, tree barks, and birch leaves. Was. Which was later made into paper after the invention of paper and the development of cartography, to which Arab, Roman, German, and Greek geographers contributed? Was done by.
3. **Resource Geography:** Fulfilment of human biological needs, food procurement, agricultural resource development, hunting, animal herding, collection of forest products, fishing industry, agricultural production, minerals, search for cultivable land, wood cutting, and exploration of minerals. By travelling from one place to another, it has become very important to obtain various types of resources and collect information about geographical elements as per the demands of the future. Because at that time, natural resources were the main basis for human survival. As permanent settlements of humans started to be established, the field of knowledge of resource geography also increased. In the present time, it has become a major branch of human geography and human life management.
4. **Astronomical Geography:** As a result of the close relationship between humans and the Earth and various types of solar activities on the Earth, the curiosity for astronomical knowledge has led to the study of day and night, seasonal changes, seasonal events, processes of the Sun and the Moon, and the position of the constellations. Astronomy begins. The development of astronomical geography was first seen in India, Babylon, Greece, Egypt, Arabia, and China. Which expanded with human culture to other countries over time, till now it has established its independent existence as a major branch of space science.
5. **Mathematical Geography:** Mathematical Geography was developed by Arab and Egyptian geographers for the latitude, longitude, duration of day and night, shape, area, and geometric calculations of the land areas located in different regions of the earth. In this way, along with the ancient branches of the subject of geography, many sub-branches have emerged in the present day. At present, the nature of geography is

becoming broad as well as having multi-disciplinary coordination, due to which many new sub-branches have developed in the subject of geography. The two main branches of geography are physical and human geography.

11.3.2 Physical geography and its sub-branches

The branch of geography that studies the Earth's interior and its surface is known as physical geography. The main objective of this branch is physical geography, the study of physical elements, and the effort to include the effects of the natural environment from the human point of view, which has also been explained by Arthur Holmes. "The study of the physical environment is physical geography, which includes continents, oceans, and the relief and air at the bottom of the oceans are studied." Whereas Immanuel Kant defined the meaning of physical geography in this way: "Physical geography is the first part of the knowledge of the world; it is actually the essential elementary fact through which the objects of the world can be understood. - Perception can be understood. The study of the entire physical environment is called physical geography, which includes the lithosphere, hydrosphere, and atmosphere. The main sub-branches of physical geography are described as follows:.

1. **Geo-Mathematical Geography:** In the geo-mathematical branch of geography, the shape, form, latitude-longitude, and geometry of the earth are studied. This branch was developed by Arab geographers. Apart from this, it calculates the Earth's planetary relationship, distances, factual position, elevation, horizontal angle, and gravitational force, which has been a very successful science in the mathematical and scientific study of celestial bodies and the foundation of geo-mathematical geography, was established by Ptolemy. While the actual development was done by Thales and Eratosthenes.

2. **Topography Science:** In geomorphology, the origin, development of landforms, erosion, deposition, geomorphic cycle, levelling, water-wind, glacier, etc. are analysed in the visible landscapes. Mr. Worcester considered geomorphology to be an explanatory description of the features related to the relief of the earth. He defined geomorphology as "all the reliefs of the earth, whether on land or on the ocean floor, or all the landforms on the ocean floor." Come under science.

3. **Geophysics:** The geophysical branch includes the study of the earth's crust and its interior, earthquake waves, magnetic fields, gravitational fields, mineral deposits underground, the electromagnetic properties of the earth, the ocean floor, and ocean minerals. Is.
4. **Climatology:** Climatology is mainly concerned with the origin of climate, regional variation, and the effect of climate on animals. The study of various events occurring in the atmosphere is done on the basis of regional patterns because human habitation is determined by climate alone. And economic activities are conducted. In meteorology, daily weather activities are studied and analysed accurately by various types of instruments, and weather-related predictions are given.
5. **Oceanography:** This branch is a science focused on the study of various phenomena related to the sea, ocean, and other water, which focus on the relief characteristics of the seabed, seawater temperature, sea salinity, seawater currents, tides, sea depth, and natural It mainly studies the flow of water sources, rivers, reservoirs, underground water, seawater bodies, and marine life ecology. Is included.
6. **Soil Geography:** Under soil geography, the characteristics, physical, chemical, and biological properties of soils are analysed, which has become a separate subject as an independent science. Apart from this, soil geography also explains the properties and regional distribution of soil. The independent branch of soil geography was developed by Russia's famous soil scientist, Dokuchaev.
7. **Biogeography:** Biogeography mainly includes the study of animals and plants, which deeply studies the spatial distribution of natural plants and animals, biodiversity, and biomes of the world. In biogeography, the correlations between animals and plants are included as subject matter. The credit for developing biogeography is given to Aristotle's disciple Theophrastus; apart from this, John Reclus, Lamarck, Buffon, and Humboldt also contributed to the development of biogeography. Biogeography is mainly divided into two sub-branches. Is. 1. Plant Geography 2. Animal Geography
8. **Meteorology:** This is a new branch of climatology that makes meteorology useful for practical life in modern geography. Under meteorology, the daily weather of geographical units, seasonal changes, rainfall, temperature, air pressure, air flow, humidity, and other weather elements are studied.

9. **Glaciology:** In glaciology, glaciers, ice caps located on different parts of the earth, and various ice ages that occurred in the past are studied. In which the origin, size, shape, movement, and glaciated topography of glaciers are studied under this branch.
10. **Ethnography:** This is the branch of geography that studies anthropology, in which the development of human groups, human anatomy, colour, spread of humans on the surface, and description of human species are mainly described.
11. **Mixed Physical Geography:** Mixed Geography includes the study of mixed physical processes such as landscape formation, geochemical methods, temporal frequency, regional variations, etc.
12. **Astronomical Geography:** In astronomical geography, the solar relations of the solar system—the Sun, Moon, and Earth—are studied, which have been described in detail in the ancient branches of geography.
13. **Health Geography:** In health geography, all the geographical elements related to health and their effects on humans are studied.
14. **Ecology:** Ecology is the science that is related to the environment of a place. Which started with the use of the word ecology by German zoologist Prof. E. Haeckel. The study of the mutual relations between the environment and the living community, i.e., the organisms living together, is given a prominent place in ecology. Thus, ecology is the science of mutual relations between living organisms and their environment.
15. **Cartography:** Cartography includes scientific analysis of the entire process, from the survey of physical elements to printing. Cartography is the art that makes many complex facts related to the Earth simple, clear, and understandable. According to Mockhouse, "cartography includes the entire range of mapping processes, from actual survey of the surface to map printing.".

11.3.4 Human Geography and its sub-branches-

Human geography is the study of the interrelationships between humans and their environment, which is the second main branch of geography, in which all human activities and the interrelationships with the environment are studied by considering

humans as the center. Human geography, for its broad nature, establishes relationships with the social sciences. Human geography was started in scientific form by Ratzel in the 19th century, in which more importance is given to human and human economic activities than the physical environment. The differences found in humans and their activities are also mainly determined by the subject matter of human geography. Jean Boonsch said that man lives on earth and is affected by the changing conditions of the atmosphere. Man does not get the same conditions in every part of the land, yet he lives in different conditions and develops himself through the influence of the natural environment. Does. He has clarified that "human geography is the study of all those facts which are influenced by human activities and which can be separated from the events happening on the surface of our planet and kept in a special category." Human geography includes the study of humans up to the point where both the earth and the atmosphere meet.

Human geography is the study of the relationship between humans and geographical conditions, the harmony and reactions of humans with nature, in which all the activities of humans are greatly influenced by their environment and humans automatically keep modifying their environment through their actions as per the need. Thus, the subject matter of the study of human geography includes elements of human economic activities, population, settlement, political, social, and cultural geography, whose sub-divisions are related to each other, and in human geography, the relationship between humans and the environment is included. The relationships between them are also made clear, including which physical element affects humans in which way and how humans adapt to the elements of the environment. The subject areas of human geography can be clarified in such a way that population statistics are needed for population study, economics is needed for economic geography, agricultural science is needed for agricultural geography, settlement geography is needed for the study of human habitation, and sociology is needed for social relations.

Thus, the result of the ideological conflict of human geography is a branch developed along with physical geography and human geography, in which emphasis has been laid on the separate study of various sub-branches of human geography and the specialisation of the branch, where the changes taking place in the dynamics of the earth and humans are understood. Efforts are made to study the relationship between humans

and the changing earth for human progress, which Ellsworth Huntington has explained in this way: "Human geography is the study of the relationship, nature, and distribution of the environment and human activities and properties." Can be defined as". Therefore, for environmental planning, development, and developmental activities in human geography, it is necessary to have knowledge of all the branches of human geography and their knowledge, for which the major sub-branches of human geography are described as follows:.

1. Economic Geography: Economic Geography studies the systems of economic activities of the countries and regions of the whole world. Which is the most important sub-branch of human geography, includes the study of regional differences and spatial distributions and relationships of economic activities as subject matter. In which the natural resources and human resources of a country are evaluated, which is the basis for planning the development of an area. In this, human activities on the earth's surface are studied, the objective of which is economic development. German scholar Gotz has clarified that “in economic geography, the characteristics of different parts of the world are scientifically analysed and have a direct impact on the production of goods." The economic activities of economic geography have been further clarified by R. E. Murphy, who has said that “economic geography studies the similarity and dissimilarity found from one place to another in the methods of human earning a living." The objective of economic geography is mainly the scientific analysis of the interaction between the earth's resources, human economic activities, and their characteristics. Apart from this, economic geography also includes the study of the production, consumption, and localization of goods. Along with the main branch of economic geography, five sub-branches have also been added to economic geography.

I. Agricultural Geography: Agricultural geography is one of the major sub-branches of human geography in which the spatial variations of agriculture and their reasons are explained. This branch is recognised as a geographical science that analyses the spatial distribution of agricultural activities, mutual relationships, and activities caused by other spatial elements. Agricultural geography also includes the study of agricultural production, dairy production, fruit production, and their related industries. Apart from this, this sub-branch also explains the types of agriculture in an area and the reasons responsible for the location of agricultural areas.

II. Manufacturing Geography: Manufacturing geography includes industries manufacturing goods from raw materials that contribute to the national economy through manufacturing. Apart from this, location, classification, and environmental pollution effects of industries are also included in the study subject matter. In the manufacturing industry, valuable goods are produced from raw materials on a large scale, which helps in the development of modern civilization and reduces agricultural dependence.

III. Transport Geography: This is the third major branch of economic geography, under which various types of transport means and transport routes, the development of transport routes, and the problems faced on the routes are mainly studied. Edward Ullman is called the father of transport geography because he propounded the spatial interaction model in his book (Geography as Spatial Interaction). In transport geography, the means of transport are like a bullock cart, bicycle, car, bus, truck, rail, aeroplane, and water. Ships, etc. are included, and the transport means and transport routes of water, land, and air—footpaths, passes, roads, rail, air, and water transport—and modern new transport routes like ropeways, tunnels, and pipelines are studied. Is.

IV. Commercial Geography: Commercial geography is studied as a sub-branch of economic geography, under which trade, the market of raw and manufactured goods, production, and consumption information are described, as are the commercial activities of human beings, i.e., tasks related to livelihood, It is done as a regional study of trade, banking, and capital.

V. Resource Geography: Under resource geography, all the resources of the earth, their characteristics, and local patterns are included, which are available to humans free of charge through nature and are the backbone of the economy of a country. Resource geography, especially, includes natural and man-made resources used to meet human needs. Eratosthenes is considered the founder of resource geography. In this way, with human knowledge, all the things provided by nature become human resources, which are included as study material under the branch of human geography.

2. Population Geography: Under population geography, the population of a state or country, the male-female ratio, population density, distribution, age group,

structure, residence-migration, birth-death rate, and characteristics of the population are mainly included. Population geography is considered to be the latest branch of human geography. It was studied systematically after 1950 and GT. Trivartha is considered to be the father of population geography. Thus, various components related to population are included in population geography, in which the physical, social, and economic properties and population problems of the population are analyzed. American geographer Zelinsky has described the meaning of population geography in this way: "Population geography can be correctly defined as a science that deals with the methods by which the geographical form of different places is formed." 'In this way, human beings have the first place among the earth's resources and the creatures that use them. It is only humans's high intellectual knowledge that has made all the things useful to humans; hence, humans are the supreme product of the earth, which is considered to be the main element of human geography. .

3. Residential Geography: Residential geography is known as settlement geography, which has been divided into two parts: rural and urban geography. This includes the cultural environment inhabited by humans. Human settlements mean the totality of the human community. It can be settlements in urban areas, rural areas, or both, in which social, physical, organisational, cultural, and spiritual elements are studied. Human settlements in the form of cultural landscapes are an important part of the study of human geography. In rural settlements, the economy and land use of rural areas are studied, and in urban geography, the origin of cities, status, functional areas, working relationships of cities, stage of urbanisation, size of cities, hierarchy, etc.

4. Cultural Geography: This branch focuses on the impact of human culture on the environment and physical elements, which establishes the relationship between humans in cultural and ecological concepts. In this way, the cultural patterns, customs, languages, religious beliefs, traditions, etc. of humans living in different areas of the earth are analysed in cultural geography, which is similar to cultural anthropology.

5. Historical Geography: This branch of human geography deals with the historical study of the countries inhabited across the globe since ancient times: agriculture, industry, origin of the economy, growth, gradual history of settlement and destruction of settlements, change in cultural scenes, reconstruction, and development over time.

Shows the geographical changes taking place. In this way, historical events and the impact of those events on humans, the reasons for replacement and change, are studied from a past perspective, and the changes in the nature and pattern of population are included. A scholar named Maitland did remarkable work in historical geography in 1897, which was systematically studied by Kant.

6. Social Geography: The social classes and social characteristics of humans living in different areas of the earth are mainly included in it. Because man is a social animal who studies the events happening in society from a human point of view, that is, based on human communities, social organisations, families, customs, and social practices, Social geography studies the details of cultural systems in different areas of the earth on the basis of social phenomena; currently, it is also being defined as social science.

7. Military Geography: In military geography, the boundaries of different nations, activities of armies like wars, agreements, border disputes, mutual relations between nations, cycles of events, and elements of strategic importance are mentioned. In particular, military activities, manpower, security and protection of geographical resources, etc. are included as subject matter.

8. Political Geography: Under political geography, it is based on the temporal aspects of states, jurisdictions of nations, administrative areas of governments, boundaries of states, resources of nations, colonies, empires, and nations. In political geography, all those natural and economic resources that are related to the state are studied. The geographical expansion and geographical environment of the state and the functions of international relations among nations are mainly studied because they explain the politically organised areas.

11.3.5 Various aspects of geography study: In the study of geography, mainly the physical, i.e., environmental, aspect, which is the aspect of human culture, is studied in the form of human geography and physical geography. Various aspects of geography have been studied in detail in the above sub-branches of geography.

11.3.6 Relationship of geography with other sciences

Geography, being an inter-disciplinary subject, has developed into a joint subject with the natural and human sciences, which conducts a comprehensive analysis of the details of various phenomena on the earth's surface, in which human life and its associated elements are included. It is very important to study. Geography is studied here in the form of specialisation and sub-branches of various branches of geography to fulfil the infinite needs of man, but doing interrelated studies to establish the relationship of one branch with another is also the need of the present and future. It becomes necessary for the creation of new knowledge, for which it is necessary to recognise the relationship between the branches of physical and human geography with science and other subjects.

1. **Geography and Astronomy:** The solar system, the Sun's travels to the south and north direction meteorological events, Earth's revolution and rotation, and phases of the Moon, i.e., the entire subject matter of astronomy, are studied in both astronomy and geography subjects. This reveals the similarity between astronomy and geography.
2. **Geography and Mathematics:** In the subject of geography, the position of the regions, their location, area, shape, and geometrical position are shown through latitude and longitude, which are related to the developmental aspects of human beings. Agriculture, transportation, etc. are shown using the formulas of the subject of mathematics. The location of industries, resources, settlements, and service centres can be easily analysed, which is useful in both the planning and costing of the scheme. Thus, the subjects of geography and mathematics are related to each other.
3. **Geography and Geology:** In the subject of geography, the study of the external form of the surface and the process of formation of landforms is understood. Also, all types of reliefs and ecological relationships are discussed. Natural resources, especially minerals, rocks, earthquakes, etc. The study of volcanoes is the subject area of geology, but they are also studied in geography; hence, geography and geology cannot be separated.
4. **Geography and Meteorology:** Climate has the greatest influence on the activities of human life. According to climate, flora and fauna develop in the physical environment. In what type of climate can humans live an easy life? Which type of climate is useful for humans? All these elements are studied in the subject of geography along with climate science; hence, geography has a very close relationship with weather, climate science, and physics.

5. **Geography and Sociology:** The social and economic systems of humans living in human-inhabited land areas are studied, especially in the subject of geography and sociology. Along with this, social organisation of the human community, family system, division of labour, public policy, customs, and social practices are also considered the study material of geography and sociology; thus, both of these sciences are related to each other.

11.4 SUMMARY

In the form of a branch, geography has been studied jointly rather than as a branch, but in ancient times, due to economic activities done for empire expansion, geographical travel and food procurement, travel geography, and astronomical geography, the branches of resource and mapping geography were developed. In the 19th century, the rapid progress of the development of geography and theism led to the development of branches of geography such as physical geography and human geography. After these two main branches, they were divided into many sub-branches. The main sub-branches of physical geography include geomorphology, hydrology, climatology, biology, geophysics, geo-mathematics, astronomy, meteorology, soil science, ethnography, meteorology, glaciology, ecology, and mapping. Has developed as a science. In which the elements of the physical environment are mainly included, while in the branches developed as human geography, economic activities and cultural sciences of humans are studied. Economic geography, population geography, and settlement geography, as sub-branches, Cultural geography is classified as historical geography, social geography and military geography, whereas in economic geography, the branches of agriculture, transportation, resources, commerce and construction geography are jointly studied.

In the study of aspects of geography, physical and human geography are integrated and studied as sub-branches. Study of various aspects of geography in relation to other sciences in combination with water, climate, biology, geophysics, mathematics, astronomy, weather, soil, and ecology sciences, economics, history, sociology, social, and military geography. It is done in subjects whose subject matter is almost of the same type.

11.5 GLOSSARY

Physical Geography:	The first main branch of the subject of geography, which studies the physical environment,.
Human Geography:	The second main branch of the subject of geography studies the relationships between humans and the environment and economic activities.
Geomorphology:	Geomorphology is a sub-branch of physical geography that describes the origin, formation, and relief characteristics of landforms.
Hydrology:	Hydrology is a sub-branch of physical geography that studies the physical and chemical properties of water present in the water and land systems.
Climatology:	Climatology is a sub-branch of physical geography that studies weather, climate, and atmosphere.
Biology:	Biology is a sub-branch of physical geography that studies flora and fauna.
Geophysics:	Geophysics is a sub-branch of physical geography that studies the Earth's magnetic properties and gravitational forces.
Geometry:	Geography is the branch of physical geography that studies the geometry of areas located in different places on the Earth.
Astronomical science:	Astronomical science is a sub-branch of physical geography that studies the solar system and space science.
Soil Science:	A sub-branch of physical geography that studies the structure, types, and chemical properties of soil located on the surface.

Ethnography:	Ethnography is a sub-branch of physical geography that studies the origin, classification, and biological development of human species.
Meteorology:	A synonymous branch of meteorology in which major seasons are studied as a sub-branch of physical geography.
Glaciology:	Glaciology is a sub-branch of physical geography that studies ice sheets, glaciers, and icebergs present in different landmasses of the Earth.
Ecology:	Ecology is a sub-branch of physical geography that studies an organism and its surrounding environment.
Cartography:	Cartography is the art and science of displaying the two-dimensional form of natural and cultural landscapes on flat paper, which is a sub-branch of physical geography.
Economic Geography:	A sub-branch of human geography that jointly studies human economic activities and the resources that support them, such as agriculture, industry, and transportation geography.
Population Geography:	A sub-branch of human geography that studies population statistically and mathematically.
Settlement Geography:	A sub-branch of human geography that studies urban and rural settlements.
Cultural Geography:	A sub-branch of human geography that studies the social, cultural, and religious activities of humans living in different parts of the earth.

Historical Geography:	A sub-branch of human geography that historically studies events like human settlement, empire expansion, disputes, etc. in different areas.
Social Geography:	A sub-branch of human geography that provides knowledge of various types of social processes as humans are social beings.
Military Geography:	A sub-branch of human geography that studies country boundaries and international relations.

11.6 Answer to Check Your Progress

- Presently, the trend of geography has become an inter-disciplinary subject.
- In ancient times, five sub-branches were jointly included in the subject of geography.
- In the division of geography into branches due to dualism, the first branch was physical geography.
- The second major branch of geography is human geography.
- In the mediaeval period, the subject of geography was divided into theo-cratic, geo-cratic, and neo-cratic branches.
- The development of modern branches of geography is considered to have started in the classical period in the 19th century.
- Biogeography is divided into two sub-branches: plant geography and animal geography.
- The solar system, the sun's summer solstice-winter solstice, and meteorological phenomena are studied in both geography and astronomy.
- Economic geography is the largest sub-branch of human geography, in which economic activities are studied from the human perspective.
- Sub-branches of physical and human geography are included in the study of aspects of geography.

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11.8 TERMINAL QUESTIONS

(1) Long Answer Question

Q-1: Explaining the division of geography, describe the main branches and sub-branches of geography.

Q- 2: What do you mean by physical geography? Describe in detail the major sub-branches of physical geography.

Q-3: While explaining the subject matter of human geography, give a detailed discussion of the sub-branches of human geography.

(2) Short Answer Questions

Q- 1: What are the main branches of geography? Describe it in brief?

Q- 2: Which are the main ancient branches of the study of geography?

Q- 3: What do you understand by astronomical geography?

Q- 4: What is the relationship between geography and geo-mathematics?

Q- 5: Write a short note on the subject matter of economic geography.

Q- 6: What do you mean by travel geography?

Q- 7: What is the relationship between geography and other sciences?

Q- 8: Explain the subject matter of geomorphology.

Q- 9: What is biogeography?

Q- 10: Explain the aspects of the study of population geography.

Q- 11: How is the mutual coordination of geophysics and geography linked?

Q-12: Are social and cultural geography the same? Explain.

(3) Multiple-Choice Questions

Q- 1: Which is included in the main branches of geography?

- **A.** Physical geography and human geography
- **B.** Mapping Geography
- **C.** Biogeography
- **D.** Economic Geography

Q- 2: When did the development of sub-branches of modern geography begin?

- **A.** Mid-19th century
- **B.** After the Second World War
- **C.** After both of the above
- **D.** After the 21st century

Q- 3: Which subject is called the mother of sciences?

- **A.** Geography
- **B.** Physics

C. Life Sciences

D. Anthropology

Q- 4: What is the subject matter of military geography?

A. Nations' borders

B. Activities of armies

C. War agreements

D. All of the above

Q- 5: Which sub-branch is included in the branches of ancient geography?

A. Travel Geography

B. Resource Geography

C. Astronomical Geography

D. All of the above

Q-6: "The entire range of mapping processes, from actual survey of the surface to map printing, is included in cartography." Whose statement is this?

A. Eratsthenes

B. F.J. Mockhouse

C. Ptolemy

D. Kant

Q- 7: Who did the systematic study of historical geography?

A. Kant

B. Ratzel

C. Humboldt

D. Ullman

Q- 8: Population is not included in the study of geography.

A. Population of a state or country

B. Male-female ratio

C. Population density and age group,

D. Relationship between humans and the environment

Q- 9: Who is called the father of transport geography?

A. Edward Ullman
B. Freeman
C. Zimmerman
D. Dokumchaev

Q- 10: "In economic geography, those characteristics of different parts of the world are scientifically analysed that have a direct impact on the production of goods." This statement has been given by which scholar?

A. Gotz
B. Herskowitz
C. William Harvey
D. Arthur Holmes

Q-11: What is studied in ethnography?

A. Anthropology
B. Human Anatomy
C. Human species
D. All of the above

Q-12: Is Egypt not included in the study of physical geography?

A. Physics Processes
B. Geochemical methods
C. Human physical activities
D. Regional differences

Q-13: By which Roman scholar was the foundation of geo-mathematical geography established?

A. Mela
B. Ptolemy

C. Strabo

D. Pliny

Q- 14: In which materials were maps made in ancient times?

A. Clay cakes

B. walls

C. Tree bark and birch leaves

D. All of the above

Answer: **1, A 2, C 3, A 4, D 5, A 6, B 7, A 8, B 9, D 10, A 11, D 12, C 13, B 14, D**

BLOCK 4 - GEOGRAPHY AS APPLIED SCIENCE

UNIT- 12: MODELS IN GEOGRAPHY

12.1 OBJECTIVES

After reading this unit, you will be able to:

- Understanding the meaning, significance and need of models
- Learn about features and types of models.
- Gain knowledge about critical views of models

12.2 INTRODUCTION

Models in geography refer to conceptual frameworks and simplified representations of spatial phenomena designed to analyze, explain, and predict patterns and processes within the Earth's physical and human landscapes. These models serve as invaluable tools for geographers, offering a structured approach to understanding complex spatial relationships and dynamics. The significance of models in geography lies in their ability to organize information, make predictions, and formulate hypotheses, contributing to the development of theories that enhance our comprehension of the world.

One essential model is the Gravity Model, proposed by Henry L. W. Richardson, which predicts the interaction between two locations based on their size and distance, finding applications in economic geography and transportation studies (Richardson, 1973). Walter Christaller's Central Place Theory is another influential model that explains the spatial distribution of human settlements and their economic functions within a hierarchical system (Christaller, 1966). The von Thünen Model, developed by Johann Heinrich von Thünen, contributes to understanding agricultural land use patterns based on market proximity and transportation costs (von Thünen, 1826). Urban geography benefits from models such as the Concentric Zone Model by Ernest Burgess and the Sector Model by Homer Hoyt, offering insights into the spatial organization of cities (Burgess, 1925; Hoyt, 1939).

These models play a crucial role in advancing geographic research by providing a systematic framework for spatial analysis. They assist geographers in making sense of the complexities of spatial patterns and processes, facilitating the interpretation of diverse phenomena across scales. By providing a structured and

theoretical basis for analysis, models contribute to the growth of geographical knowledge and help researchers derive meaningful insights from spatial data.

NEED OF MODELING GEOGRAPHY

The need for modelling in geography arises from the inherent complexity of spatial phenomena and the desire to systematically understand, analyze, and predict the patterns and processes shaping the Earth's surface. Models provide a structured framework for organizing geographic information and relationships, allowing researchers to develop hypotheses, make predictions, and test theories. They serve as powerful tools to simplify reality, making it more manageable for analysis and interpretation. The application of models in geography is diverse, addressing a wide range of spatial issues, from economic interactions and land use patterns to urban development and environmental processes.

Models contribute to the advancement of geographic knowledge by providing a theoretical basis for understanding spatial relationships. They help in identifying key variables, exploring spatial patterns, and gaining insights into the driving forces behind geographic phenomena. The use of models is particularly valuable in decision-making processes, policy formulation, and urban planning, where a predictive understanding of spatial dynamics is essential.

FEATURE OF MODEL

1. **Simplification:**

   Models in geography involve simplifying complex spatial phenomena to make them more understandable and analyzable.

2. **Abstraction:**

   They focus on key elements and relationships, abstracting away unnecessary details to highlight the essential aspects of the geographic system.

3. **Representation:**

   Models serve as representations of real-world spatial patterns and processes, providing a conceptual framework for understanding geographic phenomena.

4. **Predictive Power:**

   A key feature is the ability to make predictions about spatial relationships and

outcomes based on the model's structure and assumptions.

5. **Hypothesis Testing:**

Models allow researchers to formulate hypotheses about spatial patterns and test them against observed data, contributing to the scientific method in geography.

6. **Generalization:**

They enable the generalization of patterns observed in specific locations to broader spatial contexts, enhancing our understanding of spatial regularities.

7. **Quantification:**

Many models involve quantitative elements, allowing for the measurement and analysis of spatial relationships using mathematical or statistical techniques.

8. **Flexibility:**

Models should be flexible, accommodating adjustments and refinements as new data becomes available or as our understanding of geographic processes evolves.

9. **Interdisciplinary Application:**

Models in geography often draw on insights from other disciplines, fostering interdisciplinary approaches to understanding spatial phenomena.

10. **Applicability:**

They find applications in various geographic subfields, such as economic geography (Gravity Model), urban geography (Central Place Theory), and environmental geography.

TYPES OF MODELS

In geography, various types of models are employed to conceptualize and analyze spatial patterns and processes. These models serve as frameworks for understanding the complexities of geographic phenomena.

General Classification of Models

Descriptive Models:

Descriptive models in geography aim to provide a comprehensive representation of spatial patterns and distributions without necessarily delving into the underlying processes that generate those patterns. These models are concerned with portraying the observed characteristics of geographic phenomena and are particularly useful for documenting and summarizing spatial data. For example, a choropleth map

depicting population density across regions is a descriptive model that visually communicates the spatial variation in population distribution. Another instance is a heat map illustrating variations in temperature across a landscape. These models help researchers and policymakers gain a visual understanding of the geographic distribution of certain attributes.

Explanatory Models:

Explanatory models in geography go beyond mere description by aiming to provide insights into the underlying processes that generate observed spatial patterns. These models seek to answer the "why" questions and offer explanations for the distribution of geographic phenomena. For example, the Gravity Model, developed by Henry L. W. Richardson, is an explanatory model used in transportation geography to predict the interaction between two locations based on their size and distance (Richardson, 1973). Another influential explanatory model is Walter Christaller's Central Place Theory, which elucidates the hierarchical distribution of human settlements and their economic functions (Christaller, 1966). These models contribute to a deeper understanding of spatial relationships and the mechanisms that drive them, helping geographers and researchers unravel the complexities of geographic patterns.

Predictive Models:

Forecasting and anticipating spatial patterns and processes. These models leverage existing data, statistical techniques, and assumptions about the relationships between variables to project future scenarios. One prominent application is in climate modelling, where intricate predictive models are employed to anticipate changes in temperature, precipitation, and other climatic factors over time. These models use a combination of historical climate data, atmospheric conditions, and various emission scenarios to simulate potential future climates. Urban growth models are another essential category of predictive models, forecasting the expansion and development of cities based on factors such as population growth, economic trends, and land-use changes. By incorporating spatial and temporal dimensions, predictive models enable researchers and policymakers to simulate potential outcomes, aiding in decision-making processes related to land use planning, resource management, and disaster preparedness. While these models involve uncertainties and assumptions, they provide

valuable insights into potential future spatial patterns, contributing to more informed and proactive strategies in geographical research and planning.

Simulation Models:

Simulation models in geography are computational tools used to replicate and simulate real-world spatial processes and phenomena. These models involve the creation of artificial environments and the application of mathematical algorithms to mimic the behaviour and interactions of various geographic elements. These can range from ecological systems and transportation networks to urban development and land-use changes. Simulation models play a crucial role in understanding complex spatial dynamics, especially in scenarios where real-world experimentation is challenging or impractical. For instance, in urban geography, agent-based models simulate the actions and interactions of individual agents, such as residents or businesses, to forecast urban growth patterns (Batty, 2005). Similarly, ecological models may simulate the dynamics of ecosystems, incorporating factors like climate, vegetation, and wildlife interactions to predict changes over time (Turner et al., 1989). The strength of simulation models lies in their ability to capture the emergent properties of complex systems and provide insights into how various factors contribute to spatial patterns and changes.

Spatial Interaction Models:

Spatial interaction models in geography are analytical tools designed to understand and quantify the movement and exchanges between locations. These models provide insights into the patterns of interaction among different spatial entities, such as regions, cities, or neighbourhoods. One fundamental spatial interaction model is the Gravity Model, initially developed in the field of physics and later adapted for geographic applications by researchers like William Reilly. The Gravity Model estimates the flow of people, goods, or information between two locations based on their mass (population or economic activity) and inversely proportional to the distance between them. This model has applications in transportation planning, trade analysis, and migration studies (Reilly, 1931). Another example is the Radiation Model proposed by Stouffer, which extends the understanding of spatial interaction by considering the influence of intermediate locations in the interaction process.

Spatial interaction models are critical for predicting and understanding the movement of various phenomena across geographic space. They have applications in urban planning, transportation studies, and regional development, providing a quantitative framework for analyzing the dynamics of spatial relationships.

Process-Based Models:

Process-based models in geography are sophisticated tools used to simulate and analyze the underlying mechanisms and dynamics of geographical processes. Unlike purely descriptive models, process-based models aim to represent the actual processes and interactions that drive spatial patterns and changes over time. These models are used to understand the complex relationships within natural and human systems, offering insights into how various factors contribute to observed geographic phenomena. In hydrology, for example, process-based models simulate the movement of water through a watershed, considering factors such as precipitation, land cover, and topography to predict river discharge and runoff. In ecological modelling, these models may simulate the interactions between species, taking into account factors like habitat suitability, competition, and predation to predict changes in biodiversity over time. The strength of process-based models lies in their ability to capture the dynamics of real-world systems, making them valuable tools for predicting and managing environmental changes, land-use planning, and natural resource management.

Static Models:

Static models in geography are representations that capture spatial patterns at a specific point in time, offering a snapshot of the distribution of geographic phenomena without considering temporal changes. These models are particularly useful for understanding the spatial configuration of elements within a system at a given moment. An example of a static model is a land-use map that delineates the current distribution of residential, commercial, and industrial zones within a city. Such a map provides a visual depiction of the spatial arrangement of land uses without addressing how this arrangement might evolve. Static models are valuable for characterizing the existing state of geographic features and are often employed in fields such as urban planning, where a clear understanding of the current spatial organization is essential for making informed decisions about land use and development.

Dynamic Model:

Dynamic models in geography are analytical tools that capture the temporal evolution and changes in spatial patterns over time. These models go beyond static representations and consider the dynamic nature of geographic phenomena, incorporating the element of time into their analyses. Dynamic models are crucial for understanding the temporal dynamics of various processes, making them invaluable in predicting and managing changes in geographical systems. For example, a dynamic urban growth model might simulate how cities evolve and expand over several decades, taking into account factors like population growth, economic development, and land-use policies. Another application is in environmental modelling, where dynamic models can simulate the changing patterns of climate, vegetation, and land cover over time. These models contribute to a more comprehensive understanding of how geographical systems transform, aiding in decision-making, planning, and policy formulation in fields such as urban planning, environmental management, and natural resource planning.

Scale model:

In geography, a scale model refers to a representation of a geographic feature or phenomenon that maintains a proportional relationship with the actual size of the object or area it represents. The concept of scale is crucial in geography as it allows cartographers, researchers, and geographers to shrink the vast and varied Earth into more manageable and comprehensible representations. Scale models can exist in various forms, such as maps, globes, or physical replicas. The choice of scale depends on the specific purpose and context of the representation, whether it's a global map or a detailed model of a particular landscape. For instance, a 1:100,000 scale on a map means that one unit of measurement on the map represents 100,000 of the same units on the Earth's surface. The significance of scale models in geography lies in their ability to communicate spatial information, facilitate analysis, and support decision-making processes. They allow researchers and practitioners to visualize and understand spatial patterns, relationships, and processes at different levels of detail. Moreover, they aid in conveying geographic information to diverse audiences, from policymakers to the general public.

Maps model:

Maps are fundamental models in geography, serving as graphical representations of spatial information and allowing us to understand the Earth's surface and its features. They are a crucial tool for visualization and communication in the field of geography. Maps model the relationships between different geographic elements, such as landforms, political boundaries, and cultural features, in a two-dimensional format. Various types of maps, including topographic maps, thematic maps, and choropleth maps, cater to different purposes and emphasize specific aspects of spatial information. Cartographers use map scales, legends, and symbols to convey spatial relationships accurately. The Mercator projection, one of the most well-known map models, preserves angles but distorts size, highlighting the challenges of representing a three-dimensional Earth on a flat surface (Monmonier, 2004). With advancements in Geographic Information Systems (GIS), digital maps have become prevalent, enabling dynamic and interactive modelling of spatial data. Maps remain a cornerstone of geographic analysis, providing a tangible and accessible means of representing and interpreting the complexities of the Earth's surface.

Mathematical model:

Mathematical models in geography involve the use of quantitative techniques and mathematical expressions to represent and analyze spatial phenomena. These models provide a systematic and rigorous approach to understanding geographic processes and relationships. One common application is in spatial analysis, where mathematical models help quantify and predict spatial patterns. For example, in population geography, demographic transition models use mathematical equations to represent changes in birth rates, death rates, and population growth over time. In economic geography, location-allocation models use mathematical optimization techniques to determine the optimal locations for facilities like factories or warehouses based on factors such as transportation costs and market demand. Mathematical models are also prevalent in hydrology, where equations are used to simulate river flow, rainfall-runoff processes, and groundwater movement. The use of mathematical models in geography enhances precision and objectivity in analyzing spatial phenomena, making them valuable tools for researchers and policymakers in diverse geographic disciplines.

Analogue model:

An analogue model in geography refers to a physical representation or simulation that shares similarities with a real-world geographic process or phenomenon. Unlike mathematical models that use equations and quantitative methods, analogue models use physical materials and scaled-down representations to mimic the characteristics of geographic systems. These models are particularly useful for illustrating complex spatial concepts and making them more accessible to students, researchers, and policymakers. For instance, a sandbox model can simulate topographic features and demonstrate how water flows across different terrains, helping to explain concepts related to watersheds and drainage patterns. Another example is the use of contour models to represent the three-dimensional surface of landscapes, aiding in the visualization of elevation changes. Analogue models offer a tangible and intuitive way to understand geographic processes, fostering a hands-on approach to learning and enhancing spatial comprehension.

Theoretical Model:

A theoretical model in geography refers to a conceptual framework that represents a set of interrelated ideas or principles used to explain and understand spatial patterns, processes, and relationships. Unlike empirical models that are based on observed data, theoretical models are often abstract and provide a way to organize and interpret geographic phenomena. These models help researchers formulate hypotheses, predict outcomes, and derive general principles that contribute to the development of geographic theories. For instance, the Central Place Theory proposed by Walter Christaller is a theoretical model explaining the spatial distribution of human settlements and their economic functions in a hierarchical system. Similarly, Von Thünen's Agricultural Location Theory is a theoretical model that helps understand the spatial arrangement of agricultural activities based on market proximity and transportation costs. The strength of theoretical models lies in their ability to provide a structured and coherent framework for understanding the underlying principles governing spatial dynamics, contributing to the theoretical foundation of the discipline of geography.

CRITICAL VIEWS:

Critical views on models in geography raise important questions about their assumptions, limitations, and potential biases. Critics argue that models, while essential for simplifying complex spatial phenomena, inherently oversimplify reality and may not capture the full complexity of geographical processes. One critical perspective emphasizes that models often involve subjective choices, such as the selection of variables and the formulation of relationships, which can influence outcomes and interpretations. Additionally, there are concerns about the generalizability of models across diverse spatial contexts and the potential for models to reinforce existing biases if they are based on historical data that reflect social, economic, or political inequalities. Critics also highlight the challenge of incorporating human behaviours and societal changes into models, as these factors are dynamic and influenced by cultural and individual nuances. Furthermore, the limitations of data quality and availability can constrain the accuracy of models. Despite these critiques, proponents argue that models, when used judiciously and transparently, remain invaluable for making predictions, generating hypotheses, and advancing our understanding of spatial patterns in geography.

12.3 SUMMARY

In summary, models in geography play a crucial role in simplifying and understanding the complexities of spatial phenomena, providing frameworks for analysis, prediction, and decision-making. However, critical perspectives on these models highlight several challenges and limitations. Critics argue that models may oversimplify reality, making subjective assumptions and choices that can influence outcomes. There are concerns about the generalizability of models across diverse contexts and the potential for reinforcing existing biases. Human behaviours and societal changes, dynamic and influenced by cultural nuances, pose challenges to accurate modelling. Additionally, limitations in data quality and availability can constrain model accuracy. Despite these critiques, proponents assert that models, when used transparently and judiciously, remain valuable tools for advancing geographic knowledge, generating hypotheses, and making predictions. The key lies in acknowledging the inherent limitations and uncertainties associated with models while

recognizing their essential role in enhancing our understanding of spatial patterns and processes in geography.

Models in geography serve as indispensable tools for simplifying, analyzing, and predicting spatial patterns and processes. Ranging from descriptive to predictive and simulation models, they provide frameworks for understanding complex phenomena such as population distribution, urban development, and environmental changes. While models contribute significantly to geographical research, critical perspectives highlight challenges like oversimplification and subjectivity. Nonetheless, models play a crucial role in advancing geographic knowledge, aiding decision-making, and offering valuable insights into the dynamics of spatial relationships and systems.

12.4 GLOSSARY

Descriptive Model: A type of model in geography that focuses on representing and describing the spatial distribution of phenomena without necessarily explaining the underlying processes.

Explanatory Model: A model in geography designed to provide insights into the underlying processes and mechanisms that generate observed spatial patterns.

Predictive Model: A model used to forecast or predict future spatial patterns based on existing data and assumed relationships.

Simulation Model: A model that uses mathematical and computational techniques to imitate real-world spatial processes, allowing researchers to explore and understand complex spatial dynamics.

Spatial Interaction Model: A model that analyzes and predicts the movement and exchanges between locations,

providing insights into spatial relationships and flows.

Process-Based Model: A model that simulates and analyzes the underlying mechanisms and dynamics of geographical processes, aiming to represent real-world systems more accurately.

Static Model: A model that represents spatial patterns at a specific point in time, providing a snapshot of the distribution of geographic phenomena.

Dynamic Model: A model that incorporates the temporal dimension, representing changes and evolutions in spatial patterns over time.

Theoretical Model: A conceptual framework representing a set of interrelated ideas or principles used to explain and understand spatial patterns and relationships.

Mathematical Model: A model in geography that uses mathematical expressions and quantitative techniques to represent and analyze spatial phenomena, providing a systematic approach to understanding geographic processes.

12.5 ANSWER TO CHECK YOUR PROGRESS

- What role do models play in geography, and why are they essential for understanding spatial phenomena?
- How do descriptive models differ from explanatory models, and in what scenarios would each be most useful?
- Can predictive models accurately forecast future spatial patterns, and what challenges might be associated with such predictions?
- In what ways do simulation models contribute to our understanding of complex spatial dynamics, and can they replace real-world observations?

- How do spatial interaction models help us comprehend the movement and exchanges between different locations, and what are their limitations?
- What is the significance of process-based models in geography, and how do they enhance our understanding of underlying mechanisms?
- To what extent do theoretical models contribute to the development of geographic theories, and how do they guide empirical research?
- How do mathematical models aid in quantifying and analyzing spatial phenomena, and what challenges might arise in their application?
- In what ways do static models differ from dynamic models, and when is it more appropriate to use one over the other?
- What are the ethical considerations and potential biases associated with the use of models in geography, and how can these be addressed to ensure robust analyses?

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12.7 TERMINAL QUESTIONS

(A) Long Type Questions

Q. 1. What are the primary types of geographic models, and how do they differ in their approaches to representing geographical phenomena?

Q. 2. How do geographic models help in simulating and predicting natural disasters such as floods, earthquakes, or hurricanes?

Q. 3. Discuss the application of spatial interaction models in understanding human migration patterns and urban development.

Q. 4. Explain the concept of agent-based modelling in geography and provide examples of its use in studying complex systems like transportation networks or ecosystem dynamics.

(B) Short answer type questions

Q. 1. What is the role of Spatial Interaction Models in geographic analysis, and how do they help in understanding spatial phenomena?

Q. 2. Explain the concept of a Process-Based Models model and its significance in modern geography.

Q. 3. How do mathematical models contribute to the study of geographical processes such as population distribution or urban growth?

Q. 4. Describe the use of Dynamic Model.

Q. 5. Discuss the limitations of geographic models and the challenges they pose in accurately representing complex real-world phenomena.

(C) Multiple choice Questions

Q.1. What is the primary purpose of a descriptive model in geography?

a) Predict future spatial patterns

b) Provide insights into underlying processes
c) Represent and describe spatial distributions
d) Simulate complex spatial dynamics

Answer: c.

Q. 2. Which model is specifically designed to forecast future spatial patterns based on existing data?

a) Descriptive Model
b) Explanatory Model
c) Predictive Model
d) Simulation Model

Answer: c.

Q.3. What type of model uses mathematical and computational techniques to imitate real-world spatial processes?

a) Static Model
b) Theoretical Model
c) Simulation Model
d) Spatial Interaction Model

Answer: c.

Q.4. Which model analyzes and predicts the movement and exchanges between locations?

a) Process-Based Model
b) Predictive Model
c) Spatial Interaction Model
d) Theoretical Model

Answer: c.

Q.5. A model that represents spatial patterns at a specific point in time is known as:

a) Dynamic Model
b) Descriptive Model

c) Static Model
d) Process-Based Model

Answer: c.

Q.6. which model provides insights into the underlying processes and mechanisms that generate observed spatial patterns?

a) Descriptive Model
b) Explanatory Model
c) Predictive Model
d) Simulation Model

Answer: b

Q. 7. What does a theoretical model in geography primarily represent?

a) Spatial distributions
b) Underlying processes and mechanisms
c) Future spatial patterns
d) Real-world spatial processes

Answer: b

Q. 8. Which model uses quantitative techniques and mathematical expressions to represent and analyze spatial phenomena?

a) Theoretical Model
b) Mathematical Model
c) Simulation Model
d) Predictive Model

Answer: b

Q. 9. What dimension does a dynamic model incorporate that a static model does not?

a) Temporal
b) Spatial
c) Theoretical
d) Mathematical

Answer: a

Q. 10. What type of model focuses on simulating and analyzing the underlying mechanisms and dynamics of geographical processes?

a) Descriptive Model
b) Predictive Model
c) Process-Based Model
d) Explanatory Model

Answer: c

UNIT-13: LATEST TECHNOLOGY AND GEOGRAPHY

13.1 OBJECTIVES

After reading this unit, you will be able to:

- Understanding the meaning, significance and need of GIS applications and its Significance.
- Learn about features and types of Remote Sensing and its Significance.
- Gain knowledge about critical views of Unmanned Aerial Vehicles (UAVs) and Drones.

13.2 INTRODUCTION

The field of geography is experiencing a profound transformation driven by rapid advancements in technology. From Geographic Information Systems (GIS) to Remote Sensing, Unmanned Aerial Vehicles (UAVs), and beyond, these technological innovations are revolutionizing how we study, understand, and interact with the world around us. This unit provides an in-depth exploration of the latest technologies shaping geography, offering insights into their capabilities, applications, and future potential. Geography, once confined to maps and physical fieldwork, has evolved into a multidisciplinary science fuelled by data, computation, and visualization. With the advent of Geographic Information Systems (GIS), researchers gained the ability to integrate, analyze, and visualize spatial data with unprecedented precision and efficiency.

GIS has become a cornerstone technology in various fields, from urban planning and environmental management to disaster response and epidemiology, enabling researchers and practitioners to make informed decisions based on spatial relationships and patterns. Simultaneously, advancements in Remote Sensing have expanded our capacity to observe and monitor the Earth's surface from afar. Satellites equipped with high-resolution sensors capture detailed imagery across the electromagnetic spectrum, providing insights into land cover changes, vegetation dynamics, and environmental phenomena. Moreover, emerging sensor technologies such as hyper spectral and LIDAR offer new opportunities for three-dimensional

mapping and environmental monitoring, enhancing our understanding of complex landscapes and ecosystems.

The proliferation of Unmanned Aerial Vehicles (UAVs) or drones has further democratized aerial data collection, empowering researchers, conservationists, and disaster responders with agile and cost-effective tools for mapping and monitoring. Drones can access remote or hazardous environments, capture high-resolution imagery, and generate detailed terrain models, revolutionizing applications in agriculture, infrastructure inspection, and natural resource management.

Global Positioning System (GPS) and Global Navigation Satellite System (GNSS) technologies have revolutionized navigation and geo-location, enabling precise positioning anywhere on Earth. Integrating GPS/GNSS with other sensors and technologies has opened new avenues for location-based services, augmented reality applications, and asset tracking, transforming how we interact with our surroundings and navigate complex urban environments.

13.3 GEOGRAPHIC INFORMATION SYSTEMS (GIS)

Geographic Information Systems (GIS) have emerged as a transformative technology in the field of geography, revolutionizing the way spatial data is collected, analyzed, and visualized. By integrating various data sources, including satellite imagery, digital maps, and demographic statistics, GIS enables researchers, planners, and policymakers to gain deeper insights into spatial relationships and patterns. With GIS, users can perform sophisticated spatial analysis, such as overlaying multiple layers of information to identify spatial correlations, conducting proximity analysis to determine optimal locations, and modelling spatial processes to predict future trends. Moreover, GIS facilitates the creation of visually compelling maps and interactive visualizations, enhancing communication and decision-making across diverse sectors, including urban planning, environmental management, transportation, and public health. As GIS technology continues to evolve, with advancements such as cloud-based platforms and real-time data integration, its

potential to address complex spatial challenges and inform evidence-based decision-making becomes increasingly apparent.

Definition and basics of GIS technology

Geographic Information Systems (GIS) technology is a powerful tool used to capture, store, manipulate, analyze, manage, and present spatial or geographic data. At its core, GIS technology combines hardware, software, and data to enable users to understand and interpret complex relationships and patterns in geographic space.

The fundamental components of GIS technology include:

I. Data: GIS relies on various types of spatial data, including maps, satellite imagery, aerial photographs, and digital elevation models (DEMs). These datasets are typically organized into layers representing different geographic features such as roads, rivers, land use, population density, and environmental characteristics.

II. Software: GIS software provides the tools and functionality to visualize, query, analyze, and manipulate spatial data. It allows users to create, edit, and manage geographic datasets, perform spatial analysis operations such as buffering, overlay, and interpolation, and generate maps and reports.

III. Hardware: GIS technology requires hardware components such as computers, servers, GPS devices, and peripherals for data input and output. Advances in computing technology have led to the development of powerful desktop, web-based, and mobile GIS applications that can handle large volumes of spatial data and perform complex analyses in real time.

IV. Methods: GIS technology employs a range of analytical methods and techniques to extract meaningful insights from spatial data. These methods include spatial statistics, network analysis, interpolation, geo-coding, and spatial modelling, among others.

Applications: GIS technology has diverse applications across various industries and sectors, including urban planning, natural resource management, environmental monitoring, agriculture, transportation, public health, emergency

response, and telecommunications. It provides decision-makers with valuable spatial information and tools to support informed decision-making, planning, and policy development.

Evolution of GIS and its current capabilities

The evolution of Geographic Information Systems (GIS) has been a remarkable journey, transforming from rudimentary mapping tools to sophisticated platforms capable of analyzing complex spatial data. In the early stages of its development during the 1960s and 1970s, GIS primarily focused on storing and visualizing geographic information using computer-based systems like the Canada Geographic Information System (CGIS) and the Harvard Laboratory for Computer Graphics and Spatial Analysis. These systems laid the groundwork for subsequent advancements by introducing basic concepts of spatial data handling and analysis (Good child, 2010).

Throughout the 1980s and 1990s, GIS technology underwent significant growth with the emergence of commercial software packages such as ESRI's ArcGIS and Intergraph's Geo-Media. This period saw the development of core GIS concepts, including spatial data modelling, raster and vector data formats, and spatial analysis techniques (Longley et al., 2015). GIS became more accessible to a wider audience, empowering users across various disciplines to explore spatial relationships and patterns in their data.

The integration of remote sensing data marked a major milestone in the evolution of GIS technology during the 1990s and 2000s. Advancements in satellite imagery and aerial photography enabled GIS users to incorporate high-resolution spatial data into their analyses, facilitating detailed mapping and monitoring of the Earth's surface (Campbell, 2002). This integration expanded the scope of GIS applications, allowing for more comprehensive spatial analyses in fields such as environmental science, natural resource management, and urban planning.

In recent years, GIS technology has continued to evolve rapidly, driven by advancements in computing power, data acquisition techniques, and analytical methods. Cloud-based GIS platforms, such as Arc-GIS Online and Google Earth

Engine, have revolutionized the way spatial data is accessed, shared, and analyzed (Kemp, 2015). These platforms provide users with the flexibility to collaborate on projects, deploy GIS solutions, and access large-scale datasets from anywhere with an internet connection.

Moreover, GIS technology has embraced real-time data integration and sensor networks, enabling applications such as real-time environmental monitoring, smart city management, and precision agriculture (Huang et al., 2020). Advanced spatial analysis techniques, including spatial statistics, network analysis, 3D visualization, and machine learning, have further enhanced the capabilities of GIS technology, allowing users to extract deeper insights from spatial data and solve complex spatial problems more effectively (Kitchin & Mc-Ardle, 2016).

Applications of GIS in various sectors such as urban planning, environmental management, and disaster response

Geographic Information Systems (GIS) play a pivotal role in various sectors, offering versatile applications that significantly contribute to urban planning, environmental management, and disaster response efforts. In urban planning, GIS technology facilitates the analysis of spatial data to inform decision-making processes related to land use, transportation, and infrastructure development. Planners can utilize GIS to assess the impact of proposed developments, identify suitable locations for new facilities, and optimize transportation networks to enhance efficiency and sustainability. Additionally, GIS enables the visualization of urban growth patterns, helping authorities to address issues such as urban sprawl, gentrification, and equitable access to resources and services.

In environmental management, GIS is indispensable for monitoring and preserving natural resources, ecosystems, and biodiversity. Environmental agencies utilize GIS to track changes in land cover, assess habitat suitability, and monitor wildlife populations. By integrating remote sensing data and spatial analysis techniques, GIS helps researchers and policymakers identify areas of environmental concern, prioritize conservation efforts, and develop strategies for mitigating environmental degradation. Furthermore, GIS supports environmental impact

assessments, enabling stakeholders to evaluate the potential consequences of proposed projects on sensitive ecosystems and endangered species.

GIS technology also plays a critical role in disaster response and emergency management by facilitating the coordination of resources, decision-making, and communication during crises. Emergency responders utilize GIS to assess the extent of damage caused by natural disasters such as hurricanes, earthquakes, and wildfires, enabling them to prioritize rescue and relief efforts effectively. GIS-based models and simulations help authorities predict the path of hazardous events, assess vulnerability, and plan evacuation routes to minimize the impact on affected communities. Additionally, GIS supports post-disaster recovery efforts by enabling the rapid assessment of infrastructure damage, allocation of resources, and coordination of reconstruction activities.

Emerging trends in GIS, including cloud-based platforms and real-time data integration

Emerging trends in Geographic Information Systems (GIS) are reshaping the way spatial data is managed, analyzed, and shared. One prominent trend is the adoption of cloud-based GIS platforms, which offer scalable and flexible solutions for accessing, storing, and processing geospatial data. Cloud-based GIS platforms, such as Arc-GIS Online and Google Earth Engine, enable users to leverage vast computing resources and infrastructure to perform complex spatial analyses, collaborate on projects, and share geospatial information in real time. These platforms facilitate seamless integration with other cloud services and applications, empowering organizations to harness the power of GIS technology without the need for extensive hardware investments or specialized expertise.

Another emerging trend in GIS is the integration of real-time data streams and sensor networks, enabling dynamic and responsive spatial analysis and decision-making. With advancements in sensor technology and Internet of Things (IoT) devices, GIS users can now access and analyze real-time data on environmental conditions, infrastructure performance, and human activity. This real-time data integration enables applications such as smart city management, precision

agriculture, and emergency response, where timely and accurate information is critical for effective decision-making. By combining real-time data streams with spatial analysis techniques, GIS enables organizations to gain valuable insights into dynamic spatial processes and trends, driving innovation and efficiency across various industries and sectors.

13.4 REMOTE SENSING

Remote sensing is a technology that involves the acquisition and interpretation of information about an object or phenomenon without direct physical contact. It utilizes sensors mounted on satellites, aircraft, drones, or ground-based platforms to capture electromagnetic radiation emitted or reflected by the Earth's surface. Remote sensing enables the observation and analysis of a wide range of natural and human-made features, including land cover, vegetation, soil moisture, atmospheric conditions, and urban infrastructure. By collecting data across different wavelengths of the electromagnetic spectrum, remote sensing techniques provide valuable insights into spatial patterns, environmental changes, and processes occurring on the Earth's surface. Remote sensing has diverse applications in fields such as environmental monitoring, agriculture, forestry, urban planning, disaster management, and climate science, where it serves as a powerful tool for mapping, analyzing, and managing spatial information to support informed decision-making and sustainable development.

Remote sensing is a sophisticated technology that enables the observation and study of Earth's surface without direct physical contact. It relies on the use of sensors and instruments mounted on platforms such as satellites, aircraft, drones, or ground-based devices to capture electromagnetic radiation emitted or reflected by objects and features on the Earth's surface. This captured radiation contains valuable information about the composition, structure, and dynamics of the Earth's surface and atmosphere.

At its core, remote sensing operates based on fundamental principles of physics and electromagnetic radiation. These principles dictate how electromagnetic energy interacts with different materials and substances on Earth's surface. When

electromagnetic radiation, such as sunlight, interacts with an object or surface, it undergoes various processes, including absorption, reflection, transmission, and scattering. Different materials have unique spectral signatures, meaning they absorb, reflect, or transmit radiation at specific wavelengths. By analyzing these interactions and spectral signatures, remote sensing systems can discern information about the properties and characteristics of objects and features on the Earth's surface.

There are two primary modes of remote sensing: passive and active. Passive remote sensing relies on naturally occurring electromagnetic radiation, such as sunlight, to illuminate the Earth's surface. Sensors detect and measure the radiation reflected or emitted by objects and features, allowing for the extraction of valuable information about the Earth's surface. Active remote sensing, on the other hand, involves the emission of electromagnetic radiation by sensors, which is then directed towards the Earth's surface. The sensors measure the radiation that is reflected or scattered back to the sensor, providing information about surface properties such as topography, vegetation density, and surface roughness.

Remote sensing data can be acquired across different regions of the electromagnetic spectrum, ranging from visible light and infrared to microwave and radio waves. Each part of the spectrum provides unique information about different aspects of the Earth's surface and atmosphere. For example, visible and near-infrared wavelengths are useful for mapping vegetation health and land cover, while thermal infrared wavelengths can detect variations in surface temperature. Microwave wavelengths penetrate through clouds and vegetation, making them valuable for applications such as soil moisture estimation and ocean surface monitoring.

The acquired remote sensing data undergoes processing to remove noise, correct for atmospheric effects, and enhance the quality of the imagery. Subsequently, the data is analyzed and interpreted to extract meaningful information about the Earth's surface and atmosphere. This information can be used for a wide range of applications across various disciplines, including environmental monitoring, natural resource management, agriculture, forestry, urban planning, disaster response, climate science, and more.

Advances in satellite technology and sensor resolution

Advances in satellite technology and sensor resolution have significantly enhanced the capabilities of remote sensing, enabling more detailed and precise observation of the Earth's surface and atmosphere. These advancements have been driven by improvements in sensor design, data processing techniques, and satellite platforms, leading to higher spatial, spectral, and temporal resolution imagery.

One notable advancement is the development of high-resolution optical sensors capable of capturing imagery with unprecedented detail. These sensors utilize advanced optics, detectors, and electronics to achieve spatial resolutions of a few meters or even sub-meter levels, allowing for the identification and analysis of small-scale features such as buildings, roads, vegetation, and individual objects. High-resolution optical imagery is invaluable for applications such as urban planning, infrastructure development, land cover classification, and environmental monitoring, where detailed spatial information is crucial for decision-making.

Applications of remote sensing in land cover mapping, vegetation monitoring, and climate studies

Remote sensing plays a crucial role in various applications related to land cover mapping, vegetation monitoring, and climate studies, providing valuable insights into the Earth's surface and atmosphere. In land cover mapping, remote sensing technologies, such as satellite imagery and aerial photography, enable the identification and classification of different land cover types, including forests, agriculture, urban areas, water bodies, and barren land. By analyzing spectral signatures and spatial patterns in remotely sensed data, researchers and land managers can create accurate and up-to-date maps of land cover distribution and change over time. These maps are essential for land use planning, natural resource management, environmental monitoring, and biodiversity conservation efforts.

Vegetation monitoring is another critical application of remote sensing, where satellite imagery and other sensors are used to assess various aspects of vegetation health, dynamics, and productivity. Remote sensing data can provide information about vegetation cover, biomass, canopy structure, and physiological

parameters such as leaf area index and chlorophyll content. By monitoring changes in vegetation over time, researchers can track deforestation, forest degradation, desertification, and other land degradation processes. Additionally, remote sensing-based vegetation monitoring supports applications such as agricultural crop yield estimation, drought monitoring, forest fire risk assessment, and ecosystem carbon accounting.

Climate studies benefit significantly from remote sensing technologies, which provide essential data for understanding and monitoring climatic variables and processes on regional and global scales. Remote sensing data are used to measure key climate indicators such as temperature, precipitation, humidity, solar radiation, and cloud cover. These data help researchers analyze climate patterns, trends, and variability, assess the impacts of climate change on ecosystems and human communities, and develop climate models for forecasting future climate scenarios. Remote sensing-based climate studies contribute to a better understanding of the Earth's climate system, informing adaptation and mitigation strategies to address climate change impacts.

13.5 UNMANNED AERIAL VEHICLES (UAVS) OR DRONES

Unmanned Aerial Vehicles (UAVs), commonly known as drones, have emerged as versatile and powerful tools with diverse applications across various fields. These aircraft operated remotely or autonomously, have revolutionized industries such as agriculture, environmental monitoring, disaster response, infrastructure inspection, filmmaking, and aerial photography.

One of the key advantages of UAVs is their ability to access and survey remote or hazardous areas that are otherwise difficult or dangerous to reach. Equipped with cameras, sensors, and other payload options, drones can capture high-resolution imagery and data from different altitudes and angles, providing valuable insights for decision-making and analysis. In agriculture, for example, drones are used for precision farming tasks such as crop monitoring, soil analysis, and irrigation management. By collecting and analyzing data on plant health, growth patterns, and

nutrient levels, farmers can optimize their agricultural practices, increase yields, and reduce resource inputs.

Furthermore, UAVs play a crucial role in environmental monitoring and conservation efforts. They can be deployed to assess and monitor ecosystems, wildlife populations, and habitat changes over time. Conservationists use drones to track animal movements, survey biodiversity, and detect illegal activities such as poaching and deforestation. Additionally, drones equipped with thermal cameras and infrared sensors can detect heat signatures and anomalies, aiding in search and rescue operations and disaster response scenarios.

In the realm of infrastructure inspection and maintenance, drones offer a cost-effective and efficient solution for assessing the condition of bridges, buildings, power lines, and other critical infrastructure assets. By conducting aerial inspections, drones can identify structural defects, corrosion, and other issues before they escalate into safety hazards or costly repairs. Moreover, drones equipped with LiDAR (Light Detection and Ranging) technology can generate highly accurate 3D models of terrain and structures, facilitating urban planning, construction planning, and land surveying tasks.

Uses of drones in geographic research, including aerial mapping, environmental monitoring, and infrastructure inspection

Drones, also known as Unmanned Aerial Vehicles (UAVs), have become indispensable tools in geographic research, offering a wide range of applications in aerial mapping, environmental monitoring, and infrastructure inspection. Aerial mapping is one of the primary uses of drones in geographic research. Equipped with high-resolution cameras, LIDAR sensors, and GPS technology, drones can capture detailed imagery and terrain data with exceptional accuracy and precision.

These data can be used to create orthomosaic maps, digital surface models (DSMs), and 3D point clouds of landscapes and terrain features. Aerial mapping with drones enables researchers to produce up-to-date and detailed maps of remote or inaccessible areas, facilitating tasks such as land surveying, urban planning, natural resource management, and disaster response.

Environmental monitoring is another key application of drones in geographic research. Drones equipped with multispectral, thermal, and hyper spectral sensors can collect data on vegetation health, land cover change, water quality, and air pollution. By analyzing these data, researchers can assess the impact of human activities, climate change, and natural phenomena on ecosystems and biodiversity. Drones are particularly useful for monitoring fragile or sensitive environments, such as wetlands, forests, and coral reefs, where traditional monitoring methods may be impractical or disruptive to the ecosystem.

Infrastructure inspection is another area where drones excel in geographic research. Drones equipped with high-resolution cameras, LiDAR scanners, and infrared sensors can conduct detailed inspections of bridges, buildings, roads, railways, and other critical infrastructure assets. These inspections can identify structural defects, corrosion, wear and tear, and other issues before they escalate into safety hazards or costly repairs. Drones enable researchers to inspect infrastructure from different angles and perspectives, capturing comprehensive visual data for analysis and decision-making.

Benefits and challenges of UAV technology in geography

Benefits:

1. **Remote Sensing:** UAVs equipped with cameras, sensors, and other instruments can capture high-resolution imagery and data from inaccessible or hazardous locations, providing valuable insights for geographic research and analysis.
2. **Cost-effectiveness:** Compared to traditional aerial surveying methods such as manned aircraft or satellite imaging, UAVs offer a more cost-effective solution for collecting spatial data over small to medium-sized areas.
3. **Flexibility and Versatility:** UAVs can be deployed quickly and easily in various geographic environments, allowing researchers to adapt their data collection strategies to specific research objectives and study areas.
4. **Temporal Resolution:** UAVs provide researchers with the ability to collect data at high temporal resolutions, enabling them to monitor changes in the landscape, environment, and infrastructure over time with greater frequency and detail.

5. **Precision and Accuracy:** UAVs equipped with GPS and other positioning technologies can collect data with high precision and accuracy, allowing researchers to create detailed maps, models, and analyses of geographic features and phenomena.

Challenges:

1. **Regulatory Compliance:** The use of UAVs in geographic research is subject to regulations and guidelines set forth by aviation authorities and government agencies, which vary by country and jurisdiction. Researchers must ensure compliance with these regulations to operate UAVs legally and safely.
2. **Data Quality and Interpretation:** While UAVs can capture high-resolution imagery and data, the quality and accuracy of the data collected depend on factors such as sensor calibration, flight conditions, and data processing techniques. Researchers must carefully assess and validate UAV-derived data to ensure its reliability and suitability for analysis.
3. **Privacy and Ethics:** The use of UAVs for aerial surveillance and data collection raises concerns about privacy, consent, and data security. Researchers must adhere to ethical guidelines and obtain necessary permissions when conducting UAV-based research, especially in sensitive or private areas.
4. **Safety Risks:** UAV operations pose safety risks to both operators and bystanders, particularly in crowded or urban environments. Researchers must implement safety protocols and precautions to minimize the risk of accidents and injuries during UAV flights.
5. **Limited Payload Capacity:** Most UAVs have limited payload capacities, which may restrict the types of sensors and instruments that can be carried onboard. Researchers must carefully select and optimize UAV payloads to meet the requirements of their research objectives while adhering to weight and size limitations.

14.6 SUMMARY

The latest technology in geography encompasses a diverse array of innovations that are reshaping how we collect, analyze, and visualize spatial data.

One of the most significant advancements is the continued evolution of Geographic Information Systems (GIS). GIS has transitioned from being primarily used for simple mapping tasks to becoming a sophisticated platforms capable of integrating multiple data sources, including satellite imagery, aerial photography, and real-time sensor data. These systems enable geospatial analysis at various scales, from local to global, facilitating decision-making processes in fields such as urban planning, environmental management, and disaster response. Moreover, the advent of cloud-based GIS platforms has democratized access to spatial data and analysis tools, allowing researchers, policymakers, and practitioners to collaborate and share information more effectively.

Remote sensing technology has also undergone rapid development, with advancements in sensor resolution, spectral bands, and data processing techniques. High-resolution satellite imagery and aerial photography provide detailed views of the Earth's surface, enabling researchers to monitor land cover changes, assess environmental health, and detect natural disasters with unprecedented accuracy. The integration of multispectral, hyperspectral, and LiDAR sensors allows for more comprehensive data collection and analysis, supporting a wide range of applications, from agriculture and forestry to climate studies and biodiversity conservation. Furthermore, the increasing availability of open-access remote sensing data sets and tools empowers users to conduct their analyses and derive valuable insights into spatial patterns and processes.

In addition to GIS and remote sensing, unmanned aerial vehicles (UAVs) or drones have emerged as versatile tools for geographic research and applications. Drones equipped with high-resolution cameras, LIDAR scanners, and other sensors can capture aerial imagery and data with exceptional detail and precision. These capabilities make drones valuable assets for tasks such as aerial mapping, environmental monitoring, infrastructure inspection, and disaster response. The flexibility and manoeuvrability of drones allow researchers to access hard-to-reach or hazardous areas, collecting data that would be difficult or expensive to obtain using traditional methods. Despite their potential benefits, challenges remain in ensuring the safe and responsible use of drones, including regulatory compliance, privacy

concerns, and operational risks. Nonetheless, the ongoing advancements in drone technology hold promise for further enhancing our understanding of the Earth's surface and environment.

13.7 GLOSSARY

Geographic Information Systems (GIS): Computer-based systems used to capture, store, analyze, and present spatial data, enabling users to visualize and interpret geographic information.

Remote Sensing: The process of acquiring information about the Earth's surface and atmosphere using sensors mounted on satellites, aircraft, drones, or ground-based platforms, without direct physical contact.

Unmanned Aerial Vehicle (UAV): Also known as drones, UAVs are aircraft operated remotely or autonomously, equipped with cameras, sensors, and other instruments for collecting aerial imagery and data.

Spatial Data: Information that describes the location, shape, size, and attributes of geographic features and phenomena, often represented in digital formats for analysis and visualization.

Satellite Imagery: Images of the Earth's surface captured by satellites equipped with optical or radar sensors, providing valuable data for mapping, monitoring, and analysis purposes.

LiDAR (Light Detection and Ranging): Remote sensing technology that uses laser pulses to measure distances to the Earth's surface, producing detailed elevation models and 3D point clouds of terrain and features.

Cloud-Based GIS:	Geographic Information Systems (GIS) platforms and services that are hosted in the cloud, enabling users to access, store, analyze, and share spatial data and tools over the internet.
Spatial Analysis:	The process of examining spatial patterns, relationships, and trends within geographic data to derive meaningful insights and inform decision-making processes.
Open-Source GIS:	Geographic Information Systems (GIS) software and tools that are freely available for use, modification, and distribution, often developed and maintained by a community of contributors.

13.8 ANSWER TO THE CHECK YOUR PROGRESS

- How has Geographic Information Systems (GIS) evolved, and what role does it play in modern geographic research and applications?
- What are some of the key advancements in remote sensing technology, and how are they transforming environmental monitoring, land cover mapping, and disaster response efforts?
- Discuss the applications of LIDAR technology in geography, including its role in creating high-resolution terrain models and analyzing landscape features.
- How do drones contribute to geographic research and applications, and what are some of the challenges associated with their use in fields such as infrastructure inspection, environmental monitoring, and aerial mapping?
- Explain the concept of hyper spectral imaging and its significance in monitoring vegetation health, land cover changes, and environmental phenomena.
- How are cloud-based GIS platforms revolutionizing access to spatial data and collaboration among researchers, policymakers, and practitioners in the field of geography?

- Describe the benefits of integrating multispectral sensors into remote sensing platforms, and provide examples of how these sensors are used to monitor natural resources, agricultural productivity, and environmental health.
- Discuss the ethical and regulatory considerations surrounding the use of drones in geography, including issues related to privacy, safety, and airspace management.
- Explore the potential applications of augmented reality (AR) and virtual reality (VR) technologies in geography, including their use in immersive data visualization, geospatial simulation, and field-based training.
- What are some emerging trends and future directions in geographic technology, and how do they promise to advance our understanding of the Earth's surface, environment, and human interactions with the landscape?

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13.10 TERMINAL QUESTIONS

(A) Long answer type questions

Q.1. What is GIS (Geographic Information System), and how does it work? Explain how GIS technology helps us organize, analyze, and visualize geographic data

for various applications such as urban planning, environmental monitoring, and disaster management.

Q.2. What is remote sensing, and how do scientists use it to study the Earth' s surface? Describe the different types of remote sensing technologies, including satellite imagery and aerial photography, and provide examples of how they are used to monitor changes in land cover, detect natural disasters, and assess environmental health.

Q.3. What are UAVs (Unmanned Aerial Vehicles) or drones, and how are they transforming geographic research and data collection? Discuss the advantages of using drones for aerial surveys, mapping, and monitoring tasks, and provide examples of industries and fields benefiting from drone technology, such as agriculture, construction, and conservation.

(B) Sort answer type questions

Q.1. How does GIS help us map and analyze geographic data using computers?

Q.2. What is remote sensing, and how does it use satellites to gather information about the Earth's surface?

Q.3. What are drones, and how are they used to take pictures and collect data from the sky?

Q.4. How do GIS and remote sensing work together to study things like climate change and urban growth?

Q.5. Can drones help farmers monitor crops and make decisions about irrigation and fertilization?

(C) Multiple choice questions

Q.1. What is the primary purpose of Geographic Information Systems (GIS) technology?

a) To track celestial bodies

b) To analyze and visualize spatial data

c) To monitor underwater ecosystems

d) To forecast weather patterns

Answer: b) To analyze and visualize spatial data

Q.2. Which technology allows researchers to capture detailed imagery and data of the Earth's surface from aerial platforms?

a) Remote Sensing

b) Augmented Reality

c) Virtual Reality

d) Quantum Computing

Answer: a) Remote Sensing

Q.3. What is the primary function of LIDAR technology in geographic research?

a) To measure atmospheric pressure

b) To track wildlife migration patterns

c) To create high-resolution 3D models of terrain

d) To analyze ocean currents

Answer: c) To create high-resolution 3D models of terrain

Q.4. What is a common application of drones in geography?

a) Monitoring radioactivity levels in space

b) Conducting underwater archaeology surveys

c) Inspecting infrastructure such as bridges and power lines

d) Forecasting volcanic eruptions

Answer: c) Inspecting infrastructure such as bridges and power lines

Q.5. Which technology is used to collect and analyze data on vegetation health and land cover changes?

a) GPS tracking

b) Augmented Reality

c) Hyper spectral Imaging

d) Quantum Computing

Answer: c) Hyper spectral Imaging

Q.6. What is the primary advantage of cloud-based GIS platforms?

a) They require specialized hardware for operation
b) They provide limited access to spatial data
c) They allow for collaboration and data sharing
d) They have high operating costs

Answer: c) They allow for collaboration and data sharing

Q.7. Which technology allows for the capture of highly accurate 3D models of terrain and structures?

a) Virtual Reality
b) Augmented Reality
c) LiDAR
d) Quantum Computing

Answer: c) LiDAR

Q.8. What is a key benefit of open-access remote sensing data sets?

a) They are expensive to acquire
b) They are difficult to interpret
c) They enable researchers to conduct their analyses
d) They provide limited spatial coverage

Answer: c) They enable researchers to conduct their analyses

Q.9. What is one of the main challenges associated with the use of drones in geography?

a) Limited payload capacity
b) High cost of operation
c) Limited availability of aerial imagery
d) Incompatibility with GIS software

Answer: a) Limited payload capacity

Q.10. What is the primary purpose of integrating multispectral sensors into remote sensing platforms?

a) To capture images in 3D

b) To monitor changes in vegetation health

c) To measure atmospheric pressure

d) To track ocean currents

Answer: b) To monitor changes in vegetation health

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