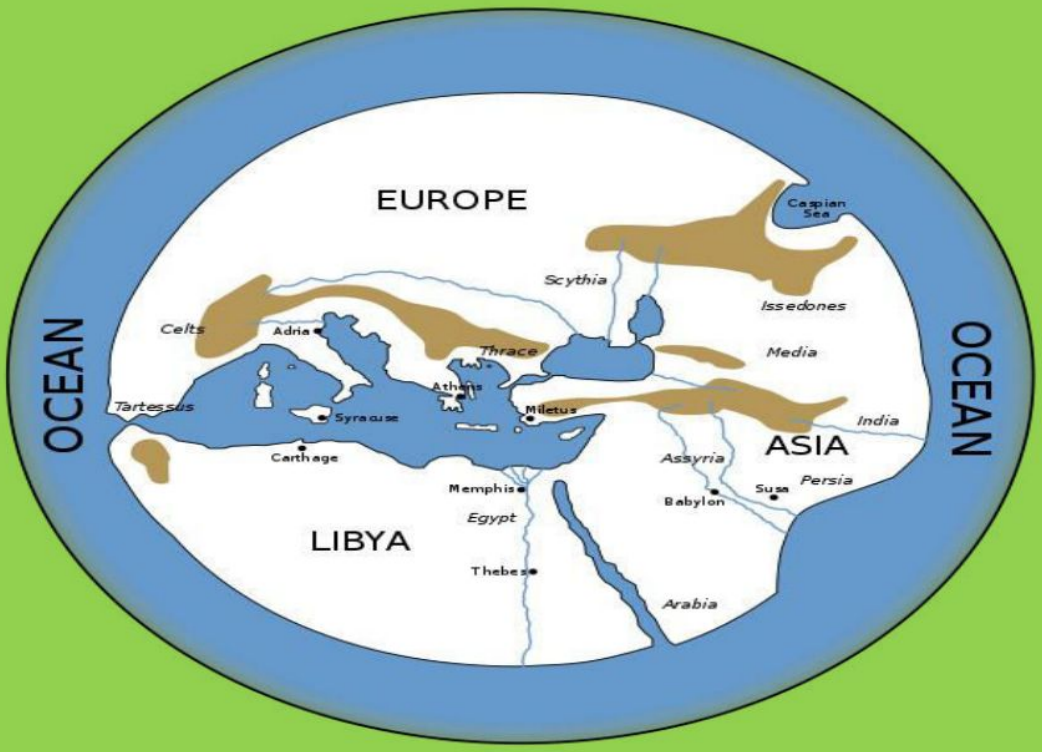
B.A./B.Sc.GE-301

GEOGRAPHICAL THOUGHT AND EVOLUTION

B.A. /B.Sc. III YEAR



DEPARTMENT OF GEOGRAPHY

AND NATURAL RESOURCE MANAGEMENT

SCHOOL OF EARTH AND ENVIRONMENT SCIENCES

UTTARAKHAND OPEN UNIVERSITY

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

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BLOCK 1 : HISTORY OF GEOGRAPHICAL THOUGHT IN ANCIENT PERIOD

UNIT 1 : GEOGRAPHICAL THOUGHTS OF GREEK AND ROMAN

1.1 OBJECTIVES

Main objective of this unit is to understand the progress of sciences, especially geography, during the ancient classical period. The Greek and Roman thinkers attributed greatly to the progress of human knowledge in various fields including geographical studies. In this unit, we will learn about various contributions made by Greek and Roman scholars and how these contributions led to the advancements in geography. Firstly, we need to understand various developments taking place in Greece and later in Rome during this period, including the socio-economic, cultural and political conditions. After this, we would attempt to understand the scholarly advancements, specifically dealing with the area of geographical studies.

1.2 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).

1.3 MEANING AND DEFINITION OF ANCIENT CLASSICAL PERIOD (ABOUT 1200 B.C. - 500 A.D)

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 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. This is not to say that other civilisations outside of Greece did not pursue the study of earth as human habitat, although many accounts of history of geographical knowledge written by Europeans give that impression. It is evident that much attention was given to geographical studies in ancient China. Just like Europeans tried to reach 'Far East', Chinese explorers tried to 'discover' Europe. But Chinese scholarship did not form a major part of the stream of western thought. The Greeks borrowed knowledge form other much older civilizations that they were in contact with including Egypt, Sumeria, Babylonia, Assyria and Phoenicia. The Greek scholars provided a framework of concepts and a model, or paradigm, of scholarly method that guided western thinking for many centuries (James and Martin 2005, p. 14). Many of the basic procedures of scholarship still in use were first developed by the Greeks.

The Greeks were indebted to the world's earliest scholars in many ways. Egypt has been called the cradle of science due to the very early development of methods of observation, measurement and generalisation in that country. The Egyptian priests developed a sound working knowledge of mathematics, astronomy and geometry for the practical purposes of public administration. They developed ways to measure land areas in order to collect taxes and to identify field boundaries obliterated by the Nile floods. They came up with ways to fix a north-south line so that their monuments and public buildings could be properly oriented. They invented the art of writing and manufactured something to write on- 'papyrus' which was made from the reeds that grew in the marshy Nile Delta. The civilization of Mesopotamia also contributed to human scholarship. The world's earliest mathematicians, who lived in Sumeria, had grasped the basic principles of algebra. However, the modern algebraic symbols we use were not invented until the sixteenth century. They also had enough knowledge of algebraic methods to be able to find the square root of any number.

The people of Egypt and Mesopotamia also developed a kind of mathematics based on multiples of six and sixty- a sexagesimal system. Both Egyptians and Sumerians at first believed that there were 360 days in a year. The Egyptians discovered their error and compensated for it by declaring a 5-day holiday period each year. The Sumerians divided the year into twelve months each with 30 and divided the circle of the zodiac into 360 parts. The idea that there are 360 degrees in a circle is a very ancient one. The priests of these early civilizations also collected a large number of observations regarding the position and movement of celestial bodies. The Babylonians and Assyrians sought to understand the meaning of all these observations. They developed the earliest concepts of astrology based on the ideas regarding the influence of the moon and the stars on human affairs.

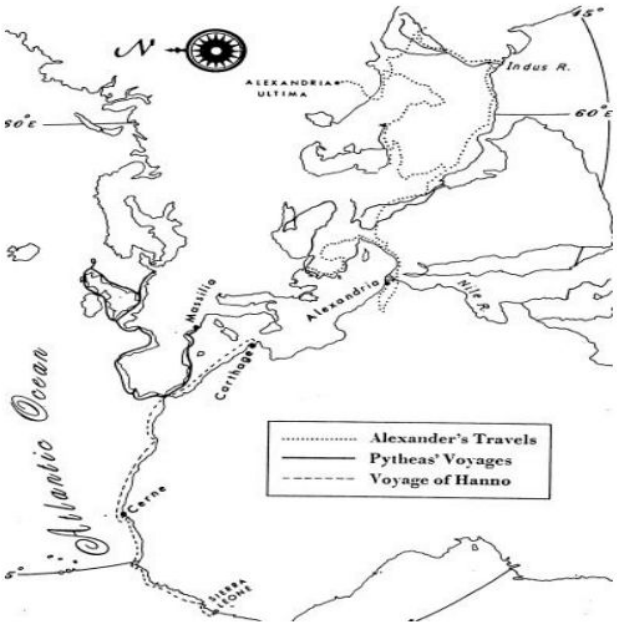
The Phoenicians, whose homeland was in modern Lebanon, were among the earliest merchant explorers and navigators. Their voyages went far beyond the limits of the known world, but as merchants, they were not very keen on reporting their discoveries. The Phoenicians

made and sold bronze. They made regular voyages to the Scilly Islands off the coast of Great Britain to find tin. They also sold cedar logs from the mountains of Lebanon. They established trading posts all around the shores of the Mediterranean including the city of Carthage (near present day Tunis). The Phoenicians developed the world's first phonetic alphabet which was made up entirely of consonants. The Greeks added the short vowels to the Phoenician alphabet.

1.3.1 CONTRIBUTION OF GREEKS (HOMER, HECATAEUS, HERODOTUS, PLATO, ARISTOTLE, PYTHAGORAS)

The Greek scholars provided a framework of concepts and a model, or paradigm of scholarly method that guided Western thinking for many centuries. Some of the Greek concepts continued to be so overwhelming and overbearing in western world that western thinking could not move forward until the influence of Plato and Aristotle were overcome. Many of the basic concepts and paradigms in contemporary sciences, including geography were established by Greek scholars and continue to reflect strong inclination towards the tradition of ancient Greek scholarship. As discussed in the previous section, Greeks borrowed many concepts and ideas from other ancient civilizations. Yet, organising all this scientific knowledge in the form of concepts and paradigms was essentially achieved by various Greek scholars. Among the ancient Greek scholars, we can trace two distinct traditions of geographical studies: (i) the mathematical tradition and (ii) the literary tradition. The Greek scholars produced topographical descriptions of places in the known world, discussing both natural conditions and the culture and the way of life of the people living there (Holt-Jensen 1981, p. 9).

Figure 1.1: Greek explorations 470-310 BC.



Source: James and Martin (2005), "All Possible Worlds: A History of Geographical Ideas".

The location of Greece, situated on both sides of the Aegean Sea, was very conducive to geographical studies. The great diversity in the topography and physical features of Greece provided great impetus to the growth and development of geographical concepts. The Greeks, surrounded by such diverse physical features, were able to make tremendous advancements in the fields of geomorphology, climatology and oceanography. They witnessed many rivers disappearing in the limestone regions and reappearing from the subterranean course, experienced many earthquakes and tremors and observed many active volcanoes and hot springs in the region. Greek scholars tried to explain these natural processes with scientific reasoning. Between 5th and 3rd century BC, the Greek colonies were established in different parts of the Mediterranean Sea and Black Sea. Miletus, owing to its location, became the main centre of geographical enquiry during 5th century BC. The early expeditions of Hanno (Figure 1.1) along the western coast of Libya and that of Alexander towards the east provided knowledge of the distant places and its people (Husain 2004, p. 31). The establishment of the famous library museum at Alexandria further paved the way for the development of scientific discoveries. It was in Alexandria that Eratosthenes and Hipparchus made their observations about the size, shape and circumference of the earth.

Homer

Homer was credited with being the father of geography by Greek geographers, although his existence is not known for certain. He was the composer of the epic poem- Iliad, which describes episodes of the Trojan War sometimes between 1280 and 1180 BC. The Iliad is considered to be the earliest major literary work of Greek history and was probably put together during the 9th century BC. A second great epic poem: the Odyssey was written perhaps a century later and is also credited to a man named Homer (probably not the same Homer). Iliad primarily consists of historical accounts. Odyssey is a geographical account of the fringes of the known world that records the efforts of Odysseus to return home to Ithaca after the fall of troy. Many historical geographers attempted to identify the places described in the Odyssey. Many offered plausible evidence to suggest that the poet was indeed describing the strait of Messina or an island off the coast of Africa or other well known localities. There is a passage describing a land of continuous sunshine where a shepherd going out with his flock at daybreak would meet another returning with his flock in the evening. Later, in the poem, Odysseus comes across a land of continuous darkness shrouded by mist. It can be deduced that somehow the information regarding the long summer days and the continuous winter darkness of the far north reached Greece and it was woven with other geographical ideas to form an adventure story.

The Greek sailors in the 8th century BC referred to the winds and associated weather types in order to identify directions at sea. “In Homer’s time, 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” (Bunbury 1883, p. 36; quoted in James and Martin 2005, p. 16). Later in the 2nd century BC, the Athenians built a tower identifying eight wind directions with sculpture illustrating the weather types associated with each (ibid).

Homer did not use Europe and Asia as the names of landmasses. "At some later time, Europe was applied to the shore of the Aegean sea toward the setting sun and Asia was applied to the shore toward the rising sun" (ibid).

Thales, Anaximander and Hecataeus

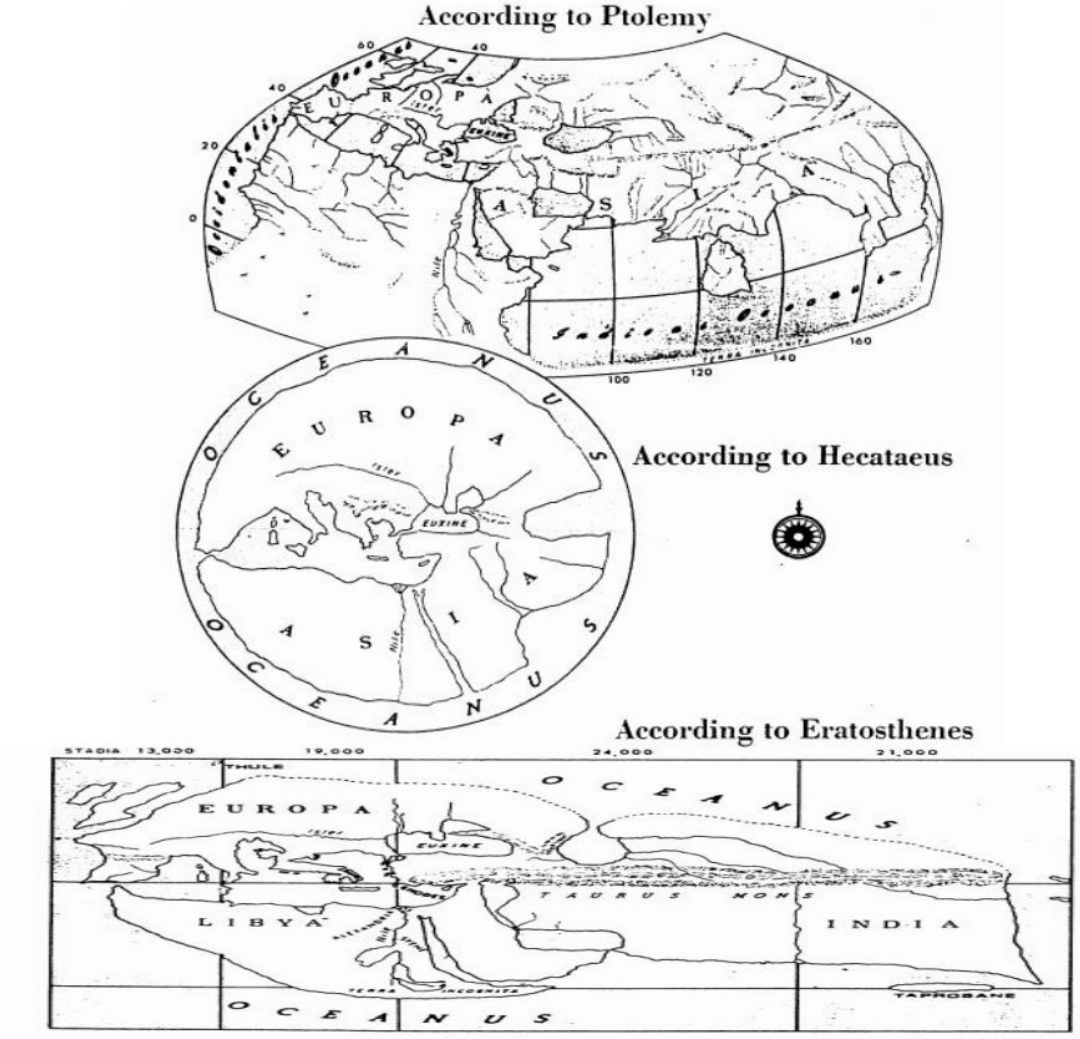
The town of Miletus in Ionia on the eastern side of the Aegean Sea near the mouth of the Meander River was one of the earliest centres of Greek learning. Miletus became a major centre of commerce and attracted Phoenician and Greek ships form all around the Mediterranean Sea and the Black Sea. The sailors and merchants brought new found information about places beyond the margins of Greek horizons. Miletus not only experienced a flow of geographical information but also had a group of scholars engaged in the speculation regarding this information. It also got reports of Egyptian geometry, Sumerian algebra and Assyrian astronomy.

Among all the Greek scholars, Thales was the first one to be concerned about the measurement and location of things on the surface of the earth. Thales, who lived in the 7^{th} and 6^{th} centuries BC, was a businessman and an inventor credited with a great variety of innovations. Thales, on a trip to Egypt, observed the priests at work measuring angles and base lines and computing areas. Based on these observations, came up with 6 geometric propositions that are credited too him: i) the circle is divided into two equal parts by its diameter; ii) the angles at either end of the base of an isosceles triangle are equal; iii) when two equal parallel linen are crossed diagonally by a straight line, the opposite angles are equal; iv) the angle in a semicircle is a right angle; v) the sides of similar triangles are proportional; and vi) two triangles are congruent if they have two angles and a side respectively equal (Sarton 1952/11964, p. 171; quoted in ibid, p.18). Thales also made contributions in astronomy and reported about the magnetism of lodestone. He also attempted to explain the universe in terms of new observations rather than the traditional explanations in terms of deities or astrological influences. He concluded that the universe is made of water in various forms and visualised the earth as a disc floating in water.

Anaximander was a younger cotemporary of Thales in Miletus. He is believed to be the scholar who introduced a Babylonian instrument called gnomon into the Greek society. This was simply a pole set vertically above a flat surface which was used to measure varying positions of the sun with the help of the length and direction of the shadow cast by the vertical pole. This is now called a sundial. Use of gnomon made various observations possible such as: establishing noon time when the shadow was shortest. The noon shadow also provided an exact north-south line or meridian. The noon shadow varied from season to season, being shortest at the summer solstice and longest at the winter solstice. Anaximander is also credited by Greek historians to be the first scholar ever to draw a map of the world to scale. The Sumerians had drawn maps of some of their cities as early as 2700 BC; but these maps did not show distance and directions to scale. Anaximander's map had Greece in the centre and the other known parts of Europe and Asia were plotted around it. The map was circular and surrounded by ocean in all directions. Anaximander also provided his own explanation for the rising and setting of sun. There were scholars who were trying to understand how the sun could set in the west and yet get back to the

east by the next morning. Anaximander suggested that somewhere to the north, there must be some very high mountains behind which the sun made the trip back again to the east. The shadow cast by the mountains would result in night time. He was also one of the earliest philosophers to provide with an example of how a word can be used to symbolize something that is unknown and not observed. He did not reject Thales' idea that water is the prime substance that made up all the observable features of the earth, but he used the word 'apeiron' to symbolise the prime substance. Thales and Anaximander are recognised to be the originators of the mathematical tradition in the study of geography. Hecataeus, on the other hand, is considered to be the originator of the literary tradition. Hecataeus was born at about the time of the deaths of Thales and Anaximander and died around 475 BC. He was the first to collect and classify information brought to Miletus from both the known world and the world beyond the Greek horizons.

Figure 1.2: The world according to Ptolemy; Hecataeus and Eratosthenes.



Source: James and Martin (2005), "All Possible Worlds: A History of Geographical Ideas".

Hecataeus was the first Greek writer of prose who is credited with two prose works. One of these works is the *Ges Periodos*, or the Description of the Earth, only fragments of which survived. One of the surviving fragments contains a subtitle with the first known record of a "new geography", where he says that he has written these things because they are true. With this work, he set the tone for writing geography which persisted for some 2500 years. Hecataeus divided his work into two parts and each dealt with one of the regions of the earth. One book dealt with Europe and the other with rest of the world- Asia and Libya. He followed the tradition set forth by his predecessors of separating Europe from Asia along the Hellespont, the Euxine, the Caucasus Mountains and the Caspian Sea, which he thought was connected with the surrounding ocean.

Hecataeus was not a theorist. He was of the belief that discussions of whether water or aperion should be accepted as the prime substance or whether there even was such a prime substance were futile. He felt that before trying to understand the universe, we should first try to accumulate knowledge about the world around us in usable form. These contrasts in the approaches of these scholars of Miletus reflect the dichotomy that still exists today which is the dichotomy of those who seek to formulate generalizations and those who seek to study unique things.

Herodotus

Herodotus is chiefly identified as a historian and often considered the father of history. His great work is a history of the Greek struggle with the barbarians and ends with the revolt of the Ionians against the Persian and with the Greek capture of the Hellespont (480-479 BC). But his history includes numerous digressions to describe the places that he had visited and the people whose customs he had observed and recorded. It should be noted that during his time, there were no separate professions and no one identified as historians, geographers, astronomers etc. Herodotus is usually described as the first great historian and his work was the first masterpiece of Greek Prose. However, a large part of his work could be easily identified as geographical in nature. In fact, he is credited with the very old idea that all history must be treated geographically and all geography must be treated historically. Essentially, geography provides the physical settings in relations to which historical events take on meaning. "Herodotus provided some excellent examples of what we would call today historical geography- that is, the re-creation of past geographies and the tracing of geographical change through time" (James and Martin 2005, p. 21). He is also considered the father of ethnography due to the vivid portrayals of the culture traits of people strange to the Greeks.

Herodotus' geographical writings were based on his personal observations during his many years of travel. Towards the west, he knew the Mediterranean shores as far as southern Italy, where he resided during the latter part of his life. He travelled through the straits into the Euxine, reaching the mouth of the Ister and travelling for several days northward across the Russian steppes along the valley of Don. He also went eastward over much of the territory of the

Persian Empire, visiting Susa and Babylon. Toward the south, he visited Egypt and went up the Nile as far as the first cataract near Elephantine (Aswan). He rejected the tradition of diving Asia (the eastern side of the Mediterranean) from Libya (the southern side) along the Nile River, as done by Hecataeus. He insisted that the Nile valley has been built by the mud brought from Ethiopia. This mud was dark coloured and easily worked with the plough, unlike the light coloured clays of Syria and the red sands of Libya. He also insisted that Egypt was occupied by Egyptians and they are not divided into Asians and Libyans along the river. This can be taken as one of the earliest discussions of regional boundaries.

Herodotus was also well aware of some of the physical processes at work on the earth. He used the methods of historical geography to support the hypothesis that the Nile mud, deposited in the Mediterranean, had built the delta. He reconstructed many of the ancient shorelines to show that many former seaports were now far inland. He provided several proofs of observations to explain the process of delta-building- notably in the alluvial plains of the Meander River at Miletus. He also pointed out that winds blow from colder to warmer places. In the 5th century BC, it was indeed significant accomplishment to explain the formation of deltas or to understand the connection between temperatures and wind directions.

Plato and Aristotle

Two great Greek philosophers: Plato (428-348 BC) and Aristotle (384-322 BC), both made important contributions to the development of geographical ideas. "Plato was a master of deductive reasoning and insisted that the observable things on earth were poor copies of *ideas* or perfect predictions from which observable things had degenerated or were in the process of degenerating" (Popper 1945/1962, pp. 18-34; quoted in James and Martin 2005, p. 25). Plato attempted to provide proof for his deductive reasoning with his observations of Attica in Greece. He pointed out that at one point; Attica possessed a very productive soil which was capable of supporting its inhabitants comfortably. There were forests on the mountains that provided feed for animals and also help the rainwater from pouring down the slopes during heavy rains. By his time, the same place experienced loss of the healthy soil and the rainwater through runoff. Plato argued from the general theory to the particular situation in Attica and used this example to explain the degeneration of things from their original perfect state. If Plato had argued from the particular to general, he might have realized that human beings make changes in the land they occupy and the resultant soil erosion and land destruction are part of human history. The idea of human beings as agents of change on the face of the earth was not formulated for thousands of years after Plato.

Earth was mostly considered as a flat disc but some philosophers began to think of the earth as a ball which was based on purely theoretical grounds. All the Greek thinkers accepted the idea that symmetry of form was one of the attributes of perfection and the completely symmetrical form was a sphere. They argued that the earth, which was created in its perfect form to be the home of mankind, must be spherical. It was Pythagoras who may have been the earliest

philosopher to this view and worked out some of the mathematical laws for the circular motions of celestial bodies. His pupil, Parmenides, applied these to observations made from the surface of the round earth. But it was Plato, who came a century after Parmenides, seems to have been the first philosopher to announce the concept of a round earth located in the centre of the universe with the celestial bodies in circular motions around it. However, it cannot be determined for certain if this was Plato's original idea or he borrowed it from Socrates.

Aristotle joined Plato's academy near Athens at the age of seventeen. He remained in the academy until Plato's death at which time Aristotle was thirty eight. He spent the next twelve years of his life travelling widely throughout Greece and around the shores of the Aegean. He became convinced that the best way to build a theory was to observe facts and the best way to test a theory was to confront it with observations. "Whereas Plato built theory by intuition and reasoned from the general to the particular, Aristotle built theory by reasoning from the particular to the general. These two ways of thinking are known respectively as deduction and induction" (James and Martin 2005, p. 26).

Aristotle pointed out that observations made through the senses cannot provide explanations. He said that our senses can tell us that fire is hot but cannot explain why it is hot. Aristotle formulated the fundamental principles of scientific explanation that is of answering the question: "what makes this thing the way it is?" One way is to describe its nature to tell its essential characteristics. A second way is to specify the kind of matter, the substance of which it is composed. A third way is to tell what caused the process through which the thing became as it is. And a fourth way, which is complementary to the third, is to tell the purpose the thing fulfils (James and Martin 2005, p. 26). In opposition to Plato, Aristotle assumed that things were in the process of physical change leading to a final perfect stage. His model for scientific explanation constituted the world's first paradigm for the guidance of scholars.

Aristotle followed Empedocles (490-430 BC) with regard to the basic substance that made up all material things on earth. Empedocles had improved upon the single-substance idea of Thales and postulated the existence of four basic elements: ***Earth, Water, Fire and Air***. He opined that all material objects on the earth are made up of these four basic elements in varying proportions. Aristotle added a fifth element too this list: aether or ether, which was not found on earth but was the material that made up the celestial bodies. Aristotle pointed out that there has to some kind of process of change which created all the material objects on earth and in the heavens. The philosophers of his time postulated that there has to be empty space to begin with and recognised two kinds of space: the earth space and celestial space. Aristotle, modifying the ideas of Empedocles, developed the theory of natural places which basically meant that everything had its natural place in the universe and if removed from this place would seek to return. Earth space was the natural place of earth and water and if raised from the surface of the earth, the substances and things composed of them would fall back to the surface. On the other hand, air and fire had their natural places in the celestial space and thus tend to rise. Aether had

its natural place in the celestial bodies far beyond the earth. Aristotle agreed in part with the teaching of Plato, derived from Pythagoras and Parmenides, that all things are patterned after numbers. He accepts that the basic regularities of the universe are those of geometry and mathematics. But he pointed out that mathematics can be used to explain the process of change that make things as they are but it cannot explain the purposes or ideal state. He is also considered as one of the first teleologist as he believed everything was changing in accordance with a pre-existing pattern or plan. Aristotle accepted Plato's concept of a spherical earth and began to seek an explanation of it and to test the concept with observations. He tried to explain it with the theory of natural places. As Sarton (19522/1964) puts it (i.e. Aristotle's ideas), "when the solid matter of which the earth is made falls toward a central point, it must form a ball" (quoted in James and Martin 2005, p. 27). Aristotle was the first scholar to recognise the significance of the observed fact that when the shadow of the earth crosses the moon during an eclipse, the edge of the shadow is circular. He also recognised that the height of various stars above the horizon increases as one travels toward the north which could only occur if the observer were travelling over the curved surface of a sphere. However, he failed to realize the significance of observing a ship disappearing beyond the horizon- hull first, which would have presented additional proof for the theory.

Aristotelian concepts held so much influence over scholarly works that many of his erroneous concepts were blindly followed for many generations. One such concept was the varying habitability of the earth with differences of latitude. It was believed that habitability was a function of distance from the equator. If the earth was a sphere and the sun is circulating it, the parts of the earth where the sun is most directly overhead must be much hotter than places far away from the sun. Considering their observations of very high temperatures in Libya, the Greeks believed that places closer to the equator must be way too hot to sustain any life. They also reasoned that people in Libya had dark skin due to the hot temperatures and any life form near the equator would be burned in the extreme temperatures. Aristotle assumed that places near to the equator, or the Torrid Zone, were uninhabitable. Similarly the places far away from the equator, or the Frigid Zone, were constantly frozen and were also uninhabitable. It was only the temperate zone that formed the inhabited part of the world. These erroneous concepts were widely accepted for a long period of time.

Pythagoras

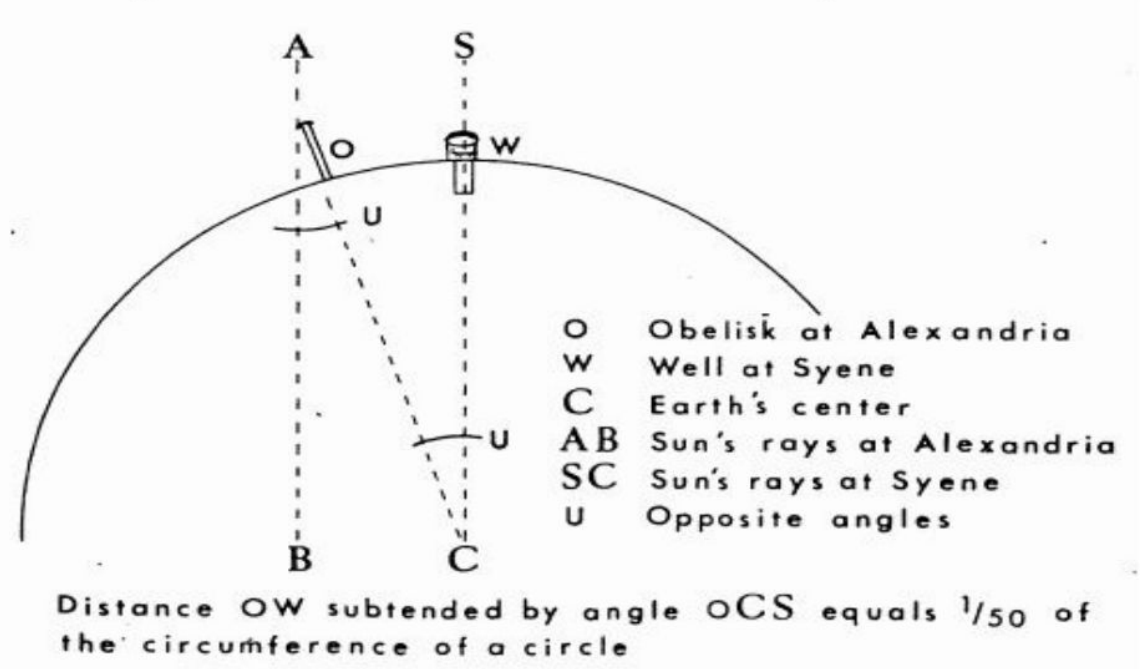
Pythagoras was one of the Greek mathematicians, who firstly introduced that for right-angled triangles, the sum of the squares of the 2 shorter sides equals the square of the longest side of the triangle. Pythagoras is said to have been a disciple of Anaximander and to have imbibed the cosmological concerns of the Ionians, including the idea that the cosmos is constructed of spheres, the importance of the infinite, and that air or aether is the *arche* of everything.

Eratosthenes

Eratosthenes is often identified as the 'father of geography' as among other contributions, he was the first to coin the word. As pointed out earlier, many major geographical contributions were not recognised separately as geographical. However, Eratosthenes set a stamp on the study of the earth as the home of man. He was born in the Greek colony of Cyrene in Libya. In Cyrene and later in Athens he received a broad education including philosophy and rhetoric as well as mathematics and philosophy. He accepted an invitation from the king of Egypt to become the royal tutor around 244 BC and was also named as 'alpha fellow' at the museum in Alexandria.

Eratosthenes is perhaps most famous for his calculation of the circumference of the earth. He was able to do this as he was the first scholar who recognised the significance of two separate observations of the position of the Sun at the time of the summer solstice. One observation came from near Syene (Aswan), on an island in the Nile, where there was a deep well and at the bottom of the well at the summer solstice, the image of the Sun was reflected in the water. This meant that on that date, the Sun was directly overhead. The second observation was made outside the museum of Alexandria where there was a tall obelisk. Eratosthenes used the obelisk as a gnomon and measured the length of the shadow at the solstice. He was thus able to measure the angle between the vertical obelisk and rays of the Sun. He then applied the well-known theorem of Thales which states that when a diagonal line crosses two parallel lines, the opposite angles are equal. The parallel rays of the Sun provided the parallel lines (figure 1.2).

Figure 1.3: Calculation of the earth's circumference by Eratosthenes



Source: James and Martin (2005), "All Possible World: A History of Geographical Ideas".

The rays of the Sun at Syene were vertical and could be extended to the centre of the earth (SC). Similarly, the obelisk at Alexandria was vertical and could be extended to the centre of the earth (OC). Then the angle between the sun's rays and the vertical obelisk at Alexandria (BOC) must be the same as the opposite angle at the centre of the earth (OCS). Eratosthenes measured that the angle OCS subtended one-fiftieth of the whole circumference. The only thing necessary after that was to ascertain the distance between Syene and Alexandria, which the Egyptians told to be around 500 miles and multiply this distance with 50. Therefore, Eratosthenes measured the circumference of the earth to be 25,000 miles which is much closer to the actual 24,860 miles.

Eratosthenes wrote a book describing the ***Ekumene***, i.e. ***the inhabited earth***, in which he accepted the major divisions of Europe, Asia, Libya and the five zones: i) torrid ii) temperate and two frigid zones. He improved the Aristotelian concepts of these zones by providing mathematical boundaries. He thought that the Torrid Zone was 48 degrees in total: 24 degrees in north and 24 degrees in the south. The Frigid Zones extended twenty four degrees from each pole. The temperate zones were between the polar and tropic circles. He accepted the reports from Pytheas and extended the ekumene from Thule (near the Arctic Circle) to Taprobane (Ceylon) in the Indian Ocean. He also reported that the ekumene extended from the Atlantic Ocean to the Bay of Bengal, which he assumed to be the eastern limit of inhabitable land. He also prepared a world map (figure 1.1). He used the meridian of Alexandria as the prime meridian, extending southward through Syene and northward through Rhodes and Byzantium; and he used the latitude of the Pillars of Hercules which he thought also passed through Rhodes (James and Martin 2005, p. 33).

1.3.2 CONTRIBUTION OF ROMANS (STRABO, PTOLEMY)

Much of the Greek traditions in geography were carried forward into ancient Roman scholarship. The Romans produced very little of their own in the field of geography. A very large part of what scholars think they know about ancient geography came from Strabo. Most of the books written by earlier scholars have either disappeared entirely or survived only in fragments. Much of the history of geographical ideas of ancient Greece and Rome had to be pieced together from surviving cross-references. But Strabo's monumental work on geography was found almost intact with only few minor parts missing. Fortunately, the first part of Strabo's writing is a review of the works of other geographers since the time of Homer. Strabo was born in Amasia (today central Turkey) about the year 64 BC. He died in AD 20. He travelled widely in the Greek world, lived for several years in Rome and also worked in the library at Alexandria. However, he did not travel further west than Italy and no further east than the borders of Armenia. He also sailed on the Black Sea and made a trip up the Nile as far as Philae in 24 BC. He wrote two major works after he returned to Amasia. One work is the historical account from the fall of Carthage to the death of Caesar which only survived in fragments. It is believed that if this work had survived, Strabo would have been known as a historian rather than a geographer. His other work- Geography, almost all of the seventeen books did survive.

Strabo's Geography is compiled from the writings of his predecessors. He fiercely defended Homer's knowledge of geography but discarded Herodotus as 'fable-monger'. He also discarded Hanno's voyage along the western side of Africa and Pytheas' exploration of northwest Europe. He accepted Aristotle's zones of habitability as defined by Eratosthenes. He asserted that the limit of possible human life toward the equator is a latitude 12°30′ N, but did not give any explanations. He also placed the northern limit of the habitable earth only 400 miles north of the Black Sea. He was of the opinion that no one who lives north of the Alps in Europe can be civilised because it is necessary to huddle around fires just to keep alive. He also accepted the calculation of the earth's circumference made by Posidonius. All these ideas accepted by Strabo were erroneous. However, he did give a correct explanation of the floods of Nile, attributing then to the heavy summer rains in Ethiopia.

It should be kept in mind that Strabo wrote for a specific group of readers: the educated statesman and the military commanders. The purpose of his works was to provide a text full of information for the Roman administrator and military commanders. His work is also considered as the world's first administrator's handbook. He criticised geographers who tried to copy Aristotle in search for explanations. Rather, he wanted to provide an accurate description of the parts of the ekumene. Rest of the earth did not matter to him at all. He recognized that geographers need to have a sound mathematical basis for which he depended on Hipparchus and Posidonius. Major part of his work is devoted to detailed descriptions of the various parts of the known world. After two books of introductory material and discussion over sources, Strabo devoted eight books to Europe, six books to Asia and one book was on what can be called Africa. However, he did not put any efforts into determining the regional boundaries and accepted the ideas of Herodotus that Libya begins west of the Nile Valley. It should be noted that Strabo's Geography was lost for many centuries and was recovered only by the 6th century AD. After its discovery, it remained a classic for many centuries thereafter.

Ancient geography came to an end with the monumental work of Ptolemy who lived in the second century after Christ. Not much is known about the life of Ptolemy, except that he worked at the library in Alexandria between 127 AD and 150 AD. He authored the great work on classical astronomy '**the *Almagest***' which long remained the standard reference work on the movements of celestial bodies. His concept of the universe agreed with that of Aristotle: the earth is a sphere that remained stationary in the centre while the celestial bodies moved around it in circular courses. This remained the accepted concept until the time of Copernicus in the 17th century.

After completing *Almagest,* Ptolemy undertook the preparation of a *Guide to Geography*. Marinus of Tyre, his teacher, had already started collecting data regarding place locations which was to be the basis for the revision of maps of the known world. By this time, in the 2nd century AD, much new information was collected by Roman merchants and armies. Ptolemy took forward the work of Marinus. He adopted the grid of latitude and longitude lines developed by Hipparchus which was based on the division of the circle into 360 degrees. This way, every place on earth could be given a precise location in mathematical terms. Ptolemy's guide contains some

six volumes of tables and forms the world's first geographical gazetteer which became the basis of the revised world map. The problem with his work was that it became a monumental collection of errors. Latitudes in those days could not be determined precisely and most voyages failed to make use of the few instruments available. Ptolemy also accepted the smaller estimate of the earth's circumference and increased the error in the eastward extension of the land area.

The *Guide to Geography* consisted of eight volumes. The first was a discussion of map projections together with a few corrections of the data from Marinus based on actual astronomical observations that he had carried out himself. Second book of him through seven contained tables of latitude and longitude. The eighth book contained maps of different parts of the world based on the gazetteer. He repeated the commonly accepted idea that parts near the equator were uninhabitable because of heat. He also erroneously indicated in his maps that Indian Ocean was enclosed by land on the south, an idea probably borrowed from Hipparchus. With the death of Ptolemy the geographic horizons that had been widened by the Greeks closed in again. Many centuries would pass before scholars begin to pay attention to the study of earth as the home of humankind.

1.4 CONCLUSION

It can be concluded that the ancient classical period was a period of great advancements in scholarly pursuits in various disciplines. In fact, ancient scholars such as Plato, Aristotle and Ptolemy had such immense influence on western thinking that it was impossible to move past their views and theories for many centuries. Voyages and new discoveries during this era led to new understanding of the world unknown. Greeks gathered knowledge from all the other ancient civilizations and developed them further through theorisations and/or observations. Greece soon became the centre of scientific advancements. Greek scholars speculated about all possible subjects- ranging from the workings of the universe to the physical features found on the surface of the earth. Their works laid the foundation for almost all the disciplines that we pursue today.

1.5 SUMMARY

The Greeks contributed immensely in the advancements of human knowledge. They extended the horizon of geography from the Aegean Sea to Spain and Gaul, the Russian Steppes in Central Asia and the Indus River in the east and Ethiopia in the south. They put the discipline of geography on a sound footing through their remarkable contributions in the field of mathematical, physical, historical and regional geography. Mathematical geography developed by Thales (around 580 BC), Anaximander (around 611 BC) and Aristotle (384-322 BC) reached its zenith with Eratosthenes (276-194 BC). The earth was proved to be a sphere and its circumference was computed to be very close to the actual measure. Scholars made significant improvements in developing longitudes and latitudes and maps were plotted on this grid. Scholars speculated and devised various theories regarding weather patterns, tides, volcanoes and various physical features. However, these theories developed at a slower pace. It is not

possible to imagine the modern developments in the sciences without the foundation established by these ancient scholars.

1.6 GLOSSARY

Teleology: A theory that events can only be accounted for as stages in the movement towards a pre-oriented end: the end may be determined by those involved in the event, as with various forms of planning or it may be extremely defined as in many religions.

Terra Incognita: The concept of Terra Incognita was propounded by Ptolemy. He opined that there should be a huge landmass in the southern hemisphere which was not discovered during his time. During the 'great age of discovery', several explorers attempted to discover this 'unknown land'.

1.7 ANSWER TO CHECK YOUR PROGRESS

1. What do we understand from the ancient classical period?
2. What were the major scientific advancements during the ancient classical period?
3. What were the major contributions of various Greek scholars in the field of geography?
4. What were the major contributions of Roman scholars in the field of geography?

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1.10 TERMINAL QUESTIONS

1. What were the major advancements in geographical studies during ancient classical period?
2. Give a brief account of the most influential geographers during classical period in Greece and Rome.
3. What were the effects of various geographical studies conducted by Greek and Roman scholars on the development of the discipline?

UNIT 2 : DARK AGE

2.1 OBJECTIVES

Main objective of this unit, as the title suggests, is to understand the middle or medieval period, also referred to as dark ages. You would recall from the previous unit that the Greek and Roman thinkers attributed greatly to the progress of human knowledge in various fields including geographical studies. Now we will move forward to the middle ages, starting after the fall of Roman Empire to the beginning of Renaissance. The major area of focus is Europe and various developments (and/or regression) taking place there. First of all, we need to understand the changes sweeping across Europe during those years, including its socio-economic, cultural and political conditions. After this, we would attempt to understand the condition of scholarly advancements, specifically dealing with the area of geographical studies.

2.2 INTRODUCTION

Middle Ages (frequently referred as Dark Ages) is the period in European History from the collapse of Roman civilization in the 476 CE to the period of the Renaissance (variously interpreted as beginning in the 13th, 14th or 15th century, depending on the region of Europe and on other factors). The phrase "Middle Ages" tells us more about the Renaissance that followed it than it does about the era itself. The term and its conventional meaning were introduced by Italian humanists who were engaged in a revival of Classical learning and culture. They came up with the notion of a thousand-year period of darkness and ignorance that separated them from the ancient Greek and Roman world. Starting around the 14th century, European thinkers, writers and artists began to look back and celebrate the art and culture of ancient Greece and Rome. Accordingly, they dismissed the period after the fall of Rome as a "Middle" or even "Dark" age in which no scientific accomplishments had been made in any field.

"The people of the middle Ages had squandered the advancements of their predecessors and mired themselves instead in what 18th-century English historian Edward Gibbon called 'barbarism and religion'." This began as a period of decline in almost every sense: populations fell, there was continual political and social upheaval, there was de-urbanization, little commerce, little wealth, and life became rather primitive with a constant struggle to survive. This way of thinking about the era in the "middle" of the fall of Rome and the rise of the Renaissance prevailed until relatively recently. However, today's scholars note that the era was as complex and vibrant as any other.

POLITICAL AND ECONOMIC INSTABILITY

After the collapse of the Roman Empire, the West suffered continual invasion and warfare. One invader after another established hegemony. With no political stability there was little commerce and trade. There was de-urbanization and a return to a patchwork of rural settlements. The economy became more of a hard-scrabble agricultural economy. There were no strong urban centres, no wealthy private or royal patrons for science and culture. The sack of Rome by Alaric the Visigoth in 410 CE had enormous impact on the political structure and social climate of the Western world, for the Roman Empire had provided the basis of social cohesion for most of Europe. Although the Germanic tribes that forcibly migrated into southern and western Europe in the 5th century were ultimately converted to Christianity but they retained many of their customs and ways of life. The changes in forms of social organization they introduced rendered

centralized government and cultural unity impossible. Many of the improvements in the quality of life introduced during the Roman Empire, such as a relatively efficient agriculture, extensive road networks, water-supply systems, and shipping routes, decayed substantially, as did artistic and scholarly endeavours.

This decline persisted throughout the period of time sometimes called the Dark Ages (also called Late Antiquity or the Early Middle Ages), from the fall of Rome to about the year 1000, with a brief hiatus during the flowering of the Carolingian court established by Charlemagne. Apart from that, no large kingdom or other political structure arose in Europe to provide stability. The only force capable of providing a basis for social unity was the Roman Catholic Church. The Middle Ages, therefore present the confusing and often contradictory picture of a society attempting to structure itself politically on a spiritual basis. This attempt came to a definitive end with the rise of artistic, commercial, and other activities anchored firmly in the secular world in the period just preceding the Renaissance.

THE CATHOLIC CHURCH

After the fall of Rome, no single state or government united the people who lived on the European continent. Instead, the Catholic Church became the most powerful institution of the medieval period. Kings, queens and other leaders derived much of their power from their alliances with and protection of the Church. In 800 CE, for example, Pope Leo III named the Frankish king Charlemagne the "Emperor of the Romans"–the first since that empire's fall more than 300 years before. Over time, Charlemagne's realm became the Holy Roman Empire, one of several political entities in Europe whose interests tended to align with those of the Church. The idea arose of Europe as one large church-state, called Christendom. Christendom was thought to consist of two distinct groups of functionaries: the sacerdotium, or ecclesiastical hierarchy, and the imperium, or secular leaders. In theory, these two groups complemented each other, attending to people's spiritual and temporal needs, respectively. Supreme authority was wielded by the Pope in the first of these areas and by the emperor in the second. In practice, the two institutions were constantly sparring, disagreeing, or openly warring with each other. The emperors often tried to regulate church activities by claiming the right to appoint church officials and to intervene in doctrinal matters. The church, in turn, not only owned cities and armies but often attempted to regulate affairs of state. Ordinary people across Europe had to "tithe" 10 percent of their earnings each year to the Church; at the same time, the Church was mostly exempt from taxation. These policies helped it to amass a great deal of money and power.

THE RISE OF ISLAM

Meanwhile, the Islamic world was growing larger and more powerful. After the Prophet Muhammad's death in 632 CE, Muslim armies conquered large parts of the Middle East, uniting them under the rule of a single caliph. At its height, the medieval Islamic world was more than three times bigger than all of Christendom. Under the caliphs, great cities such as Cairo, Baghdad and Damascus fostered a vibrant intellectual and cultural life. Poets, scientists and philosophers wrote thousands of books (on paper, a Chinese invention that had made its way into the Islamic world by the 8th century). Scholars translated Greek, Iranian and Indian texts into Arabic. Inventors devised technologies like the pinhole camera, soap, windmills, surgical instruments, an early flying machine and the system of numerals that we use today. And

religious scholars and mystics translated, interpreted and taught the Quran and other scriptural texts to people across the Middle East.

THE CRUSADES

Toward the end of the 11th century, the Catholic Church began to authorize military expeditions, or Crusades, to expel Muslim "infidels" from the Holy Land. Crusaders, who wore red crosses on their coats to advertise their status, believed that their service would guarantee the remission of their sins and ensure that they could spend all eternity in Heaven. (They also received more worldly rewards, such as papal protection of their property and forgiveness of some kinds of loan payments.) The Crusades began in 1095, when Pope Urban summoned a Christian army to fight its way to Jerusalem and continued on and off until the end of the 15th century. No one "won" the Crusades; in fact, many thousands of people from both sides lost their lives. They did make ordinary Catholics across Christendom feel like they had a common purpose and they inspired waves of religious enthusiasm among people who might otherwise have felt alienated from the official Church. They also exposed Crusaders to Islamic literature, science and technology– exposure that would have a lasting effect on European intellectual life.

ART AND ARCHITECTURE

Another way to show devotion to the Church was to build grand cathedrals and other ecclesiastical structures such as monasteries. Cathedrals were the largest buildings in medieval Europe and they could be found at the centre of towns and cities across the continent. Between the 10th and 13th centuries, most European cathedrals were built in the Romanesque style. Romanesque cathedrals are solid and substantial: they have rounded masonry arches and barrel vaults supporting the roof, thick stone walls and few windows. (Examples of Romanesque architecture include the Porto Cathedral in Portugal and the Speyer Cathedral in present-day Germany.)

Around 1200, church builders began to embrace a new architectural style known as the Gothic. Gothic structures, such as the Abbey Church of Saint-Denis in France and the rebuilt Canterbury Cathedral in England have huge stained-glass windows, pointed vaults and arches (a technology developed in the Islamic world) and spires and flying buttresses. In contrast to heavy Romanesque buildings, Gothic architecture seems to be almost weightless. Medieval religious art took other forms as well. Frescoes and mosaics decorated church interiors and artists painted devotional images of the Virgin Mary, Jesus and the saints.

Also before the invention of the printing press in the 15th century, even books were works of art. Craftsmen in monasteries (and later in universities) created illuminated manuscripts: handmade sacred and secular books with coloured illustrations, gold and silver lettering and other adornments. In the 12th century, urban booksellers began to market smaller illuminated manuscripts, like books of hours, Psalters and other prayer books to wealthy individuals.

ECONOMICS AND SOCIETY

In medieval Europe, rural life was governed by system scholars call "feudalism." In a feudal society, the king granted large pieces of land called fiefs to noblemen and bishops. Landless peasants known as serfs did most of the work on the fiefs: they planted and harvested crops and

gave most of the produce to the landowner. In exchange for their labour, they were allowed to live on the land. They were also promised protection in case of enemy invasion. During the 11th century, however, feudal life began to change. Agricultural innovations such as the heavy plough and three-field crop rotation made farming more efficient and productive so fewer farm workers were needed. During the 12th century the cultivation of beans made a balanced diet available to all social classes for the first time in history. The expanded and improved food supply led to the growth of population, a factor that eventually led to the breakup of the old feudal structures. As a result more and more people were drawn to towns and cities. Towns began to flourish, travel and communication became faster, safer and easier and merchant classes began to develop. Meanwhile, the Crusades had expanded trade routes to the East and given Europeans a taste for imported goods such as wine, olive oil and luxurious textiles. As the commercial economy developed, port cities in particular thrived. During the 12th century a cultural and economic revival took place and many historians trace the origins of the Renaissance to this time. The balance of economic power slowly began to shift from the region of the eastern Mediterranean to Western Europe. By 1300, there were some 15 cities in Europe with a population of more than 50,000. In these cities, a new era was born: the Renaissance which was a time of great intellectual and economic change. It had its roots in the world of the **Middle Ages**.

The 13th century was the apex of medieval civilization. Many different kinds of social units proliferated including guilds, associations, civic councils and monastic chapters each eager to obtain some measure of autonomy. The crucial legal concept of representation developed resulting in the political assembly, whose members had *plena potestas*—full power—to make decisions binding upon the communities that had selected them. Intellectual life dominated by the Roman Catholic Church, culminated in the philosophical method of Scholasticism, whose preeminent exponent St Thomas Aquinas, achieved the syntheses of Aristotle and the Church Fathers through his writings. The breakup of feudal structures, the strengthening of city-states in Italy and the emergence of national monarchies in Spain, France and England as well as such cultural developments as the rise of secular education, culminated in the birth of a self-consciously new age with a new spirit, one that looked all the way back to Classical learning for its inspiration and that came to be known as the Renaissance.

2.3 GEOGRAPHY DURING DARK AGE

In general, the medieval times especially in Europe were a dark period for the development of science and geographical ideas. Scholars made sterile copies of the works of the ancients and rejected anything which did not conform to the dogmas of the Church. Such an environment stifled any development of critical scientific analysis. Concepts of the world which had been developed during ancient times were reshaped to conform to the teachings of the Church. However, the tradition of geographical scholarship flourished in the Muslim and Chinese world during these times. Many Muslim and Chinese scholars undertook various journeys during medieval ages that made significant contributions to the development of geographical knowledge. In contrast, the journeys undertaken by Europeans during this period made no significant contributions to the development of geographical concepts, models or paradigms. Around 1000 CE, the Norse people(People of North) sailed across the Atlantic to Greenland and North America but the sagas of these voyages and journeys were only passed on by word of

mouth and written down long afterwards in isolated Iceland. Some of these discoveries took a long time getting back to the rest of the world.

SCHOLARLY PURSUITS IN THE CHRISTIAN WORLD

Perhaps the strongest cultural institution in the middle Ages was the Church. What culture there was in the middle Ages tended to be dominated by Christianity. The Church provided a cultural context that transcended national boundaries. With the rise of monasteries, beginning in the 4th C, there was an institution that could provide support for education and scholarship. In the early Middle Ages the principal focus of any intellectual pursuit was chiefly in study of the Bible. Understanding and developing Christian doctrine was another area of great interest. As the Church matured this was extended to the writing of the Church Fathers (e.g. Augustine) and matters of church law and governance. It was the Church that provided the major support for education and scholarship. Christian monasticism developed in the 4th C, and spread rapidly across Europe. The daily life of a monk was devoted to worship, study of the Scriptures, contemplation and manual labour (*cf*. the Benedictine Rule ca. 550 CE). As a result monasteries developed libraries, scriptoria and eventually schools. There is mixed evidence on how much secular learning was included in the monastic schools but there were at least some places e.g. Ireland, where secular material was part of the curriculum, such as mathematics and the calendar. Noteworthy medieval natural philosophers: Isidore of Seville (6th C) and the Venerable Bede (8th C), both of whom wrote treatises entitled ***On the Nature of Things*.**

With the Christian re-conquest of Spain in the Crusades in the 11th C, scholars in the West gradually became aware of the rich cultural legacy in the Islamic world. However, there were no texts in Latin for learning Arabic so best course was to go to an Arabic-speaking country. Another problem: Medieval Latin did not have the required technical terms. The 12th century became a major period of translation from Arabic to Latin. By 1200 the West had major parts of the Greek and Islamic works available in Latin. It was the institutions of the Church that made this possible. Latin translations of the Greek and Islamic texts spread rapidly throughout European institutions. This flood of ancient wisdom produced enormous intellectual excitement to try to assimilate and organize it all. But it also raised significant challenges to the traditional Christian world view and doctrine. Thus reconciliation of Christianity with Greek philosophy became the major intellectual enterprise among European scholars.

GEOGRAPHY IN THE CHRISTIAN WORLD

Early Medieval Period: In the early medieval period, the European scholars could work only with Latin documents and few of them mastered the Arabic language in the latter part of this period. The Greek materials remained largely unknown. Geography in the Christian world was confined to the process of translation of the earlier geographical ideas of the classical age. Two medieval scholars– Martianus Capelle and Ambrosius Theodosius Macrobius provided translation of Plato as early as the fifth century. The medieval Christians came to know about the concept of spherical earth through the accounts of these scholars. In 1138, Plato of Tivoli translated the works of Ptolemy that dealt with the effect of the positions of the celestial bodies on human affairs. In 1175, Gerard of Cremona translated Ptolemy's 'Almagest' into Latin. Ptolemy's geocentric model of the universe remained the accepted model of universe for many centuries and this model was propagated by the Church as well. Ptolemy's works became more

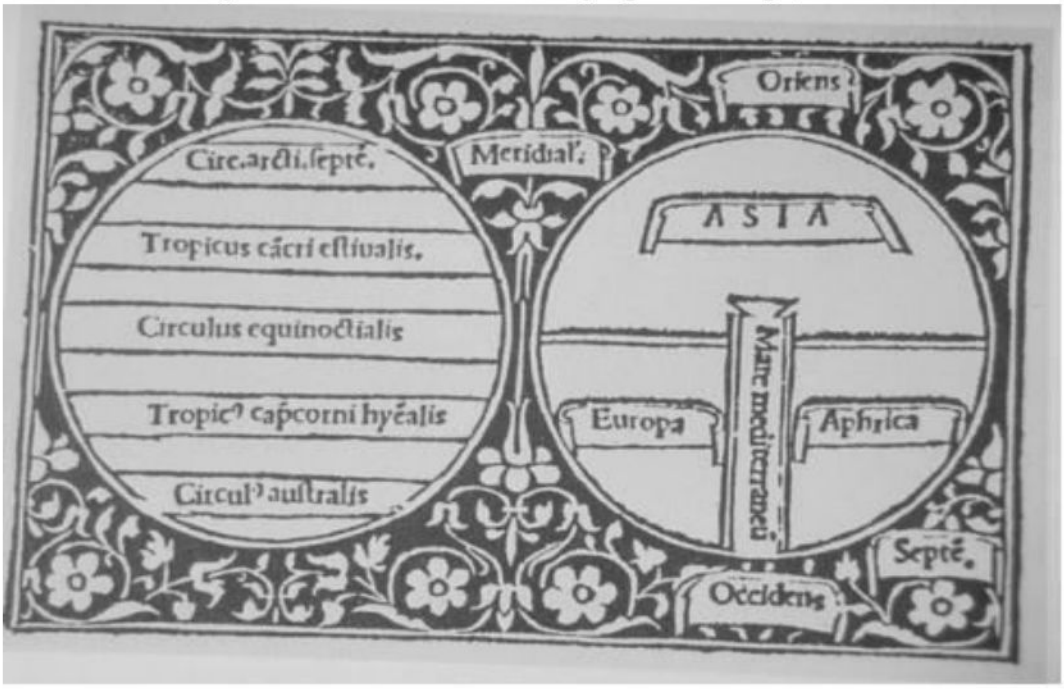
popular during the medieval period and many of his ideas were accepted as the standard of scholarly knowledge.

Albert Magnus was a proponent of Aristotelianism at the University of Paris. He established the study of nature as a legitimate science within the Christian tradition. Magnus, for the first time, translated the geographic ideas of Aristotle from Arabic in the twelfth century. He emphasised the Greek concept of equating habitability with latitudes. He produced the first major attempt to interpret Aristotle's philosophy in Europe. He wrote commentaries and/or paraphrases on virtually all of Aristotle's works.

Geographical and Astronomical Notions: Some of the popular notions regarding world geography as well as astronomy during the middle ages are provided below:

- The medieval Christian world witnessed the gradual deterioration of mapping as the period lost the viability of showing alignments and boundaries with precision and accuracy.
- Everyone understood that the Earth is a sphere, and the ancient estimates of its diameter of about 15,000 km were generally accepted (actual diameter is about 13,000 km.).
- The globe was divided into 5 climatic zones: the Arctic and Antarctic, the temperate zones and a torrid zone along the equator, which was generally thought to be so hot it was uninhabitable.
- Maps were not intended to be geometric representations with correct scale and one of the most common world maps was a "T-O map" with a *T* inside an *O*. The inhabited world was shown by a circular figure bounded by the ocean. The stem of the *T* represented the Mediterranean; top of the *T* represented the Aegean and Black seas on one hand and the Nile River and Red Sea on the other. Three divisions- Europe, Asia, Africa were accepted as standard. Asia was above the *T* while Europe and Africa were in the lower left and right. The centre of the inhabited world was just above the centre of the *T* was Jerusalem.
- Earth's rotation: John Buridan (Paris, ca. 1330) noted that in astronomy only relative motion is measured and so a rotating Earth would not affect any astronomical calculations. Therefore, he said that astronomical measurements cannot answer this question. However, since an arrow shot straight up returns to its starting point rather than falling behind its starting point due to the rotation of the Earth, this proves that the Earth is not rotating.
- Relative Motion: Nicole Oresme (Paris, ca. 1350) also noted that one sees only relative motion in astronomy. He refuted Buridan's objection, noting that on a moving ship the arrow would come back to its starting point also. Here is a first awareness of relative motion and velocity components. He then went on to argue that it is also easier to rotate the Earth than all the heavens. He finally chose faith over reason citing Psalm 92: "God has established the world which shall not be moved".

Figure 2.1: Climate and Geographical Maps, 1503



Ptolemaic Theory & Aristotelian Cosmology: Translations of Ptolemy's Almagest were available by the end of the 12th century. Teachers in universities soon produced their own accounts of Ptolemaic theory e.g. Johannes de Sacrobosco in mid-1200s wrote *The Sphere*, which was an elementary astronomy textbook. *Theorica planetarum* was another more comprehensive text with full explanation of epicycles, deferents eccentrics and the equant; and this was widely used. A number of scholars objected to the Ptolemaic constructions and the way they violated Aristotle's principles of motion and they tried unsuccessfully to find ways to harmonize Ptolemy with Aristotle. Astronomy in the West didn't make much progress in the Middle Ages. Effort was largely confined to re-learning and mastering what the Greeks up through Ptolemy's Almagest had accomplished. There was progress in making new measurements of the heavens and obtaining better values of phenomena such as precession (the 26,000 year wobble of the Earth's axis) and calculating new astronomical tables with improved accuracy. There began to be some questioning of Ptolemy's use of non-Aristotelian motion in his constructions but it did not go anywhere.

Polo Brothers, Marco Polo and their Voyages: The Polo brothers and Marco Polo (who was the son of one of the Polo brothers) did make valuable contributions to the Christian world about the Asian landmass. The Polo brothers visited China and stayed there from 1260 and 1269. They went across the great voyages; the Polo brothers touched the shores of Java and Sumatra and then continued to Ceylon and Southern India. They moved along the west coast to the ancient port of Hormuz on the Persian Gulf. They finally returned to Venice in 1295. They brought with them loads of information about the land and people of central Asia as well as China (which was considered the eastern limit of habitable part) the nature of the coastline and the people living there. Their accounts discredited the Ptolemaic view that beyond Sera and Sine (China), there lay the unknown land (Terra Incognita). Marco Polo went to the expedition to the east with his father and uncle and provided with the descriptions of life in the China and of the various dangers

encountered on the route to and from China. He also provided reports about Japan and the island of Madagascar. While in Madagascar, he found ample evidence that the assumed Torrid Zone was actually inhabited. His observations discredited Aristotle's ideas about the uninhabitability of torrid zones near equator. It should be mentioned here that even though Alebrto Magnus had made the geographical ideas of Aristotle available to the Christian world in the 12th century. It is disputed whether Marco Polo himself was aware about Aristotle's theorisations. Marco Polo's book was thought to be a great record of geographic expedition filled with much information and stories.

Late Medieval Period: Towards the latter part of the medieval period, few scholars started to feel the need to confront the authority (of the established scholarly knowledge) with reason and explanation. William of Corches portrayed a universe governed by the law. He also presented some remarkably logical ideas about the heating of the atmosphere from below and the formation of clouds by the cooling of the air (Kimble 1938, p.79). Robert Grosseteste, the Bishop of Lincoln contradicted the concept of a torrid zone that was uninhabitable with the help of available Arabic reports of an inhabited east coast of Africa extending at least as far as 20°S. In early 15th century Cardinal Pierre d' Ailly published a book- "**Tractatus *de Imago Mundi***", which represented a summary and review of the period. In 1414, he used the Latin translation of Ptolemy's ***Geography*** and accepted the smaller estimate of the earth's circumference. He was among the first to insist that India could be approached by sailing west which influenced Columbus's attempted route (Adhikari 2010, p. 43). He contradicted Ptolemy's contention of an enclosed Indian Ocean and offered different opinions concerning the habitability of the equatorial Torrid Zone. Pope Pius II (Aeneas Silvius) wrote a book sometimes between 1458-64 on Europe and Asia in which he tried to show that ekumene was also extended across the torrid zone and the Indian Ocean was not enclosed in the south (Adhikari 2010, p. 43).

The late 14th century witnessed a gradual recovery from the state of deterioration in the field of mapping as was the situation in the early period of the medieval Christian world. There were notable improvements in the art of map making. The ***Portolano charts*** became standard equipment for the sea captains. These charts were covered by a network of overlapping lines radiating from several centres in different parts of the chart. The radiating lines conform to the eight or sixteen principal directions of the compass, each corresponding to a wind direction. Sailors laid out compass courses along these lines. With the lines to indicate direction from key points the coastlines, especially around the Mediterranean could be drawn with considerable accuracy. The famous ***Catalan Map of the World*** made in 1375 incorporated the material for numerous ***Portolano charts***. It also included the west coast of Africa, south of Cape Bojador which had not been reached by European sailors. It also showed east and south-east Asia as based on the reports of Marco Polo. "This was the first map ever to give a proper outline of Ceylon and the Indian peninsula" (Kimble 1938, p. 193).

The late 14th century also witnessed a notable improvement in the art of navigation. The instrument astrolabe which was invented by Hipparchus had been improved and came into common use as an aid to navigation by making it possible to fix the altitude of the polestar more accurately. The map-makers were a vital necessity in the field of navigation and thus most of the map-makers were working for the merchants and sailors though there were differences of opinion regarding the land beyond equator.

2.4 CONCLUSION

It can be concluded that the middle ages in the history of Europe is a period of ignorance and backwardness resulting from the instability of socio-economic and political structures. Any kind of scholarly pursuits were rare and education limited to religious teachings. However, the contact with Arab people reintroduced Aristotle and Ptolemy as well as various Arab scholars to Europeans. This led to re-theorisations of Aristotelian and Ptolemaic ideas. Geography in the Christian world of the medieval period appears to have very much relied upon Ptolemy's works and ideas but very little attempts were made to revive the Greek tradition in geography. Christian scholars of the period had different interpretations of Ptolemy's works and their opinions differed on various aspects of Ptolemy's geographic ideas. Voyages and new discoveries during the later middles age led to the emergence of new ideas about the world. Major advancements in the area of geography came from these voyages with respect to improvements in map-making and navigational charts. Discovery of previously unknown areas led to a better understanding of various parts of the world. Even though, these advancements were very limited but it laid the foundation of the era of Renaissance.

2.5 SUMMARY

After the above discussion, it can be argued that the middle ages were a period of deterioration and ignorance in European history. The great achievements of Greek and Roman scholars were largely forgotten or lost. The society was in constant turmoil with continuous invasions and political unrest. The church became the supreme authority and unified the whole Europe on the basis of religion. Education was under the control of Church and the pursuit of knowledge was limited to the study of bible or other religious doctrines. However, we also find few significant developments during middles ages. The Arab world made unprecedented progress during this era and they became the major source for the ancient classical works of Greeks and Romans. Europeans came across these works through Arabs during the crusades and started to translate these works. Aristotle and Ptolemy became quite popular among scholars who tried to synthesise their ideas with that of the Christian beliefs. Consequently, the works of Aristotle and Ptolemy became available for further studies. Geography and astronomy became the areas of interest and many attempts were made to standardise this knowledge (sometimes limited and/or wrong). But this situation started to change during the late middle ages, when explorers like Polo brothers and Marco Polo provided with new information about the unknown world. This time period also witnessed many developments in cartography and navigational maps and equipments. All in all, these changes were vital for the subsequent progressive era in European history.

2.6 GLOSSARY

1. Dark Age: Dark Age is the term of historical per iodisation traditionally meaning to middle Ages in European history from the collapse of Roman civilization in the 476 CE to the period of the Renaissance. It emphasizes the demographic, cultural and economic deterioration that occurred in Western Europe.

2. Renaissance: The Renaissance is a period in Europe from the 14th century to the 17th century, regarded as the cultural bridge between the middle ages ad modern history. It was an era of great cultural, artistic and educational accomplishments and reforms.

3. De-urbanisation: De-urbanisation or Counter-urbanisation is a demographic and social process whereby people move from the urban areas to rural areas. During Dark Age, previous urban centres and cities turned into smaller rural settlements and the urban population declined significantly.

4. Feudalism: Feudalism was the medieval model of government predating the birth of the modern nation state. Feudal society is a military hierarchy in which a ruler or lord offers mounted fighters a fief (medieval beneficium), a unit of land to control in exchange for a military service.

5. Portolan Charts: Portolan or Portulan Charts are navigational maps based on compass directions and estimated distances observed by the pilots at sea. They were first made in the 13th century in Italy, and later in Spain and Portugal, with later 15th and 16th century charts noted for their cartographic accuracy.

2.7 ANSWER TO CHECK YOUR PROGRESS

1. Which era in European history in called the Dark Age?
2. What were the circumstances that led to Dark Age in Europe?
3. What were the socio-economic and political conditions prevailing in Europe during Dark Age?
4. What was the condition of educational pursuits during Dark Age?

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2.10 TERMINAL QUESTIONS

1. What was the condition of geographical studies during Dark Age?
2. What were the significant advancements in the field of geography during Dark Age?
3. Give a brief account of the most influential scholars of Dark Age?
4. What were the effects of various voyages on geographical advancements during Dark Age?

UNIT 3 : ARAB GEOGRAPHICAL THOUGHT

3.1 OBJECTIVES

After reading this unit you will be able to:

- To know development of Geography as a discipline.
- To know Arabs were the first to show their interest in Geography because of their special surroundings.
- They gave pictorial form to their conception of the universe on the basis of faith.
- Arabs considered the earth as the centre of the universe, round which revolved the seven planets.
- Their outlook was purely theoretical.
- They have importance to knowledge and the study of natural phenomena.
- The greatest contribution to geography was dictionary of the world.
- They made outstanding contributions in the fields of mathematical, physical and regional geography.
- Their achievements in climatology, oceanography, geomorphology, linear measurement, determination of cardinal points, limits of habitable world, sprawl of continents and oceans are highly appreciable.

3.2 INTRODUCTION

In this unit students will understand about the Arab scholars and their contribution to the development of Geography.

3.3 CONTRIBUTION OF ARAB GEOGRAPHERS (AL-MASUDI, AL-BARUNI, AL-IDRISI, IBN-BATTUTA)

Basic concept

Geography is a field of learning. It is one of the oldest earth science and its roots date back in the works of the early Greek Scholars. The word 'Geography' was first used by the Greek scholar Eratosthenes in the third century B.C. The Greeks were indebted to the world's earliest scholars in many ways. Egypt has been called the cradle of science because of the very early development of methods of measurement and generalization in that century. At first the word 'Geography' included all aspects dealing with descriptions of earth and its parts. It consists of two Greek word 'Geo (the earth) and graphies (to write) literal meaning is to describe about the earth surfaces. In other words "Geography is largely the study of the interaction of all physical and human phenomena and landscapes created by such interactions". It is about how, where and why human and natural activities occur and how these activities are interconnected.

Geography has been defined differently through different periods of its history. The earliest records illustrate the interests of scholars in understanding the physical domain of the earth by making maps and astronomical measurements by two distinct traditions. One was the mathematical tradition which was focused on fixing the location of places on the earth surface, and the other was gathering geographic information through travels and field work. According to them, the purpose of geography was to provide a description of the physical features and conditions in different parts of the world.

Approach

Evolution of geographical thought aims at explaining the nature and evolution of the subject. It throws light on the development of geography as a subject. It attempts to enrich knowledge and illustrate basic concepts as well as philosophical and methodological foundations which are building blocks of geographic knowledge. Effort, however, has been made to develop the concepts in a graded and sequential manner and deeper the interest in the subject.

Geography as a discipline of study has undergone many changes through its long history beginning from the contribution of Greek Geographers. It has grown into a modern science and its methods and techniques acquired sophistication and precision of the scientific energy. The scope of the subject enlarged to encompass a great variety of themes ranging from primitive man-nature relation to the present day world. The discipline of geography could be divided into several well identified periods of developments but they could not so treated as a water light compartments as there is always significant overlapping.

The purpose of this unit writing is to understand the contributions made by geographers belonging to ancient period particularly, Arab geographical thought and appreciate their concern in making it scientifically sound. Besides, it is also intended to understand the thematic and issue based concern on the part of the geographers around. For greater details and minute treatment of the various aspects or units of the discipline of geography one could refer to the standard books and writings of several geographers as well as articles and papers appeared in the various professional journals.

Rise of Arab School

During the medieval period many changes took place all over the world. The political map was altered with the decline of old kingdoms and empires and the rise of the new ones. However, more important changes were the changes in social and economic life. These changes were very marked in Western Europe. Medieval periods commonly referred to the middle ages of geographical period. This is a very long period of development in the history of geographical thought beginning from the end of Roman Empire (5th century A.D.) to the beginning of Industrial Revolution (1750). It also marks the commencement of geographic development. This development may be studied under sub-phases: Dark Age (500-100 A.D); Rise of Arab School of Thought (800-1400 A.D.); and Age of Discovery (1400-1750).

The Arab civilization became the most advanced during medieval period. In the early years of the 7th century, prophet Mohammad founded Islam. This now religion, within a very

short period of time, not only united the warring tribes but also led to the establishment of a big empire and the building of a civilization, which in many respects was the finest civilization of the time. Before the death of Prophet Mohammad in 632 A.D. All Arabia had accepted the new religion and became a new unified state. From Arabia, Islam spread very fast to many other parts of the world. The Arabs had also come to India wherever the Arabs went, their religion went with them. The Arab empire was the largest that the world had so far seen. In the pre-Islamic period of their history, the Arabs were illiterate and unfamiliar with the art of writing. They were excellent fighters. The people of neighboring countries, tired of oppressive rule and fascinated by the simplicity of the teaching of Islam, welcomed the invaders, United by Islam, the Arabs started on their quest for knowledge. They sought knowledge wherever they could find it. In fact the Arab civilization was far superior to that of Europe.

In the medieval period Muslim geographer preferred to formulate their concepts as generalizations of empirically observed facts and insisted on the importance of direct observation. Unlike their counterparts in the Christian world, they made valuable contributions to geographical knowledge, though some Muslim scholars make logical deductions from exciting theories and their conclusions conformed to near realities. They would be long remembered for some of their concepts, models and paradigms which still govern the method of geographical teachings.

It would be appropriate to here a brief outline of the driving force which seemed to have enriched and widened the Muslim geographic horizon. The geographical writings of the period were based on a much greater variety of sources than those of Christian scholars. The spread of the Muslims in the medieval period was one major event that enlarges with widened the geographic horizon of the religion of Islam. Islam became the “renound entre” of the Muslim world because it commonly held together the Arabic speaking people of Arabia who were previously grouped in small isolated wondering tribes and had no feeling of unity.

The followers of Islam embarked on conquest are of the world outside Arabia. In 762 A.D. the Muslim founded new city of Baghdad and for more than a century it was the centre of intellectual world. With the patronage of Caliph Harun-al-Rashid an academy entitled ‘Baitul-Hikma’ was established. At this academy, scholars from all over the world were invited to teach and assist the Arab academicians and to help them in the translation of the Greek, Latin, Persian and Sanskrit works into Arabic. Materials pertaining to geographical ideas were collected from all available sources and the translators were paid the weight of their books in Gold (Ahmed, 1947, 5). The Indian scholars were invited to learn Indian mathematic and memorials. The Arabs studied he works of Aryabhat and Surya-Sidhant the Sanskrit treatise containing the principles of trigonometry. On the basis of their observations, explorations and studies they developed their own concepts and theories with great vigor and speed and produced innumerable books on the various aspects of geography and allied sciences. A flood of new ideas from varied sources began to spread throughout the Muslim world to far off lands from the shores of Atlantic to the

Pacific and Indian Ocean. Eventually the innovations were carried forward into Christian Europe as a result of Latin translations from Arabic.

Among other innovations was the use of the decimal system in arithmetic which was brought into Baghdad from the Hindus, who learnt it from the Chinese. It is equally important to note that the Muslim geographers/scholars showed a genuine fascination for Greek traditions and concepts rather than for the Roman heritage. They preferred to adopt the Greek concepts about the shape and size of the earth and conceived of the earth as being located at the centre of the universe with the celestial bodies in circular motion around it.

The Muslim in medieval Arabia had access not only to translations from Greek but also to the reports and accounts of their own travelers. As a result, they had much more accurate knowledge about he world than their counterparts. One of the earliest Muslim travelers who travelled through some of the most remote regions of Africa and Asia. He sailed along the east African coast to a point some 20^0 south of the equator. To his surprise, he found people in large numbers living in those latitudes. This observation made him discard the Greek view that the equatorial torrid parts were uninhabited. In spite of this observation, the Greek concept of the habitable zone persisted for a longer period and appeared in different forms.

Starting from eight century (8^{th} century) the renewal study of Greek works revived much of the forgotten knowledge of the past ages. But the classical spirit in Christendom, the development in Muslim world stands out in sharp relief. Many factors contributed to stimulate Muslim interest in geography.

- The large extend of Arabic Empire which stretched over so many different areas from the Atlantic to the borders of China.
- The excellent system of roads, a legacy of Rome.
- The desert routes which encouraged movement and facilitated the pilgrimages to Mecca demanded by the faith.
- Trade, which naturally arose out of the diversity within the Empire and was further stimulated by the high rank of traders in Muslim society.
- The conquest of Syria, Persia and Bactria where the Greek culture still flourished and gave to the Muslims a rich fruits of Greek learning and
- The cultural and economic ties with the Indian sub-continent.

The Arab geography significantly enough, did not develop until after the founding of Abbasid Dynasty (766 A.D). In fact Greek science was the starting point of the studies of the Arab geographers. The works of Aristotle and Ptolemy were translated and studied most assiduously. It is not surprising; therefore, that mathematical geography received the maximum attendance of the Arab scholars. The very clear atmosphere of the desert and semi-desert region, by favoring astronomical observations may share some of the responsibility for this bias.

Accurate calculations of latitude and longitude were made and there were several attempts to measure the size of the earth. Such calculations did not bring about any marked improvement in cartography, which they should have done. Despite geography on the other hand attained high standards during this period. A brief account of the works of various important scholars of this period is as follows:

Arab Geographers

Al-Masudi (888-956) - Al-Masudi was an import scholar of Baghdad, born in Baghdad towards the end of ninth century and died in 956 A.D. He was a geographer, a historian, a world traveler and a profit writer. He travelled extensively through several centuries in Asia and Africa and prepared a very good description of the monsoon. His concept regarding the monsoon seemed to have been formulated as a generalization of empirically observed facts of the climate he witnessed during his voyage along the east African coast. They describe the evaporation of moisture from the water surfaces and the condensation of the moisture in the form of clouds. He has a conception of the sphericity of the earth and believed that the surface of the earth must be curved. He provided description about the effect of environment on the mode of life and attitudes of people and held on opinion on environmental determinism (Hussain, 1988, 91). Besides his work in Geography, he contributed to cosmology, meteorology, oceanography, astrology and study of landforms. He wrote on diverse themes and his important works include Kitab-Muraj-al-Dhahab, Kitab-al-Tanshwal-Ishraf, Kitab-Akhbar-Al-Zoman and Kitab-al-Aust.

In the field of study of landforms he appreciated the role of process of erosion and adjustment of streams to structure in the evolution of landforms. He tried to resolve the controversy of the source of the Nile. His contribution to regional geography has also been noteworthy and he divided the world into seven regions on the basis of languages.

Al-Biruni (973-1039 A.D.) - Al-Biruni was born in the present day Republic of Uzbekistan, he was Tezik by race and a Persian by culture. His full name was Abu-Rayhan Mohammad Ibn Ahmad al Biruni. He was a well educated and well-read man of his time. He studied the Greek work through Arabic Translations and also well-versed in Persian, Turkish, Syriac and Sanskrit. Besides having read a lot of ancient literature, he was a great traveler also. He was the most learned man of his age. His main interests included Astronomy, Mathematics, Chronology, Physics, Medicines, History and Astronomy was his chief field of interest.

Al-Biruni visited India and studied Indian culture after 1017 A.D. later, he settle in Ghazni in Afghanistan and wrote his works in the form of books. He was a prolific writer and his more important books include Kitab-al-Hind(1930), Al-Qulaum-Masude and Ahal-Al-Saydna. In geography, he also wrote on cartography, geodesy and surveying. Al-Biruni took keen interest in the study of time and date and studied calendar of different nations and enquired into the differences in day and time in different regions. He also emphasized that the moon did not go around the earth in a perfect circle and discussed the lunar month on a syndic basis. He attempted to measure the longest and the shortest distance of the moon and the seen from the earth. He also

studied the relationship of tides with phases of moon. He showed interest in paleontology and geomorphology. He compared the fossils discovered in the places of Arabia, Jurjan and Khwariyan along the Caspian sea. On the basis of his studies he suggested the occurrence of sea at these places in the earlier time. He had an adequate knowledge of various gulfs, bays and smaller seas and provided detailed information about the sources of Ice sea in the North-east of Europe, the sea of warring, i.e. probably the Baltic, the kilns sea (red sea) and the sea of china and mentioned the fact that in the east of the seas were named after the islands or the countries.

The great geographer Al-Biruni has also much of the information about the sources of the rivers except Indus is based on hearsay. He was the first to provide correct information about the sources of Indus and also explained phenomenon of floods in its basis. He has provided an accurate account of the seasons of India describing the nature of monsoon. He also studied Indian culture and Hindu belief and has written on subjects like the origin of caste system in Hindu society.

Al-Biruni wrote extensively and accurately about the geography of India. His estimate of India's extent from the forts of lower Kashmir to the Deccan peninsula is amazingly close to the real dimensions of the subcontinent. He had a definite idea of its Peninsular form. The mountains of Himavant and meru (Pannir) surrounded it in the north. He said that the Eastern and Western Ghats controlled the distribution of rainfall in Peninsular India. He also provided valuable information about North-Western India, particularly, Kashmir. He said that Kashmir lay on a flat fertile plateau, surrounded by inaccessible mountains. The access to the Kashmir was through the Jhelum gorge.

In brief, Al-Biruni excelled in philosophy, religion, cosmology, astronomy, geography, geodesy, stratography, geomorphology, mathematics, science, medicine and several languages. He also contributed appreciably in the field of chronology, computation of fears and dates. He had a clear concept of the ideal historian. His correct view and reasoning led him so thing that the institution of varna (caste), based on inediquadity was the main obstacle in a rapport between the Hindus and Muslims. The condition of Indian learning, language, script and centers of learning was also brought out. The gigantic labor scientific reasoning and untiring efforts made Al-Biruni on of the most outstanding geographers of medieval period.

Al-Idrisi (1099-1180) - Al-Idrisi was one of the leading scholar of the 12th century. His full name was Abu-Abd-Allah Muhammad. He was born at Ceuta (Southern Spain). He got his education at the university of Card'ova in Spain. He was a historian, politician and geographers and also the master of several languages as Persian, Arabian, Latin, Greek and Spanish. He approached geography through a direct experience through travels. Accounts of his travels indicate that he travelled over a great part of world including Spain, France, England, Sicily, morocco, Asia Minor and interior part of Africa.

Idrisi's major contribution lies in medicinal plants as presented in his several books, especially **Kitab-Al-Jamili-Sifat-Ashtata al Nabatat**. He studied and revived all the literature

on the subject of medical plants. A large number of new drugs plants together with their evaluation became available to the medical practitioners. He has given the names of drugs in six languages: Syria, Greek, Persian, Hindi, Latin and Berber.

In 1154, he completed his famous book amusements of him who desires to travel around the world. The most important of Al-Idrisi to geography was his world map. He plotted the various geographical features based upon the text and not text on the maps. Although this map was based on a rough, rectangular projection but represents correctly the idea of Ptolemy Indian ocean and the idea of the Caspian sea as a gift of the world ocean. He also makes correction of the courses of rivers, including the Danube and the Nile, and the alignment of several major mountain ranges with precision. He had shown that the Greek division of the world into five climatic zones did not correspond to reality and suggested a more sophisticated world climatic system (Holt-Jonson, 1981, 11).

In addition to the above, he made original contributions to geography, especially related to economic, physical and cultural aspects. His well known work Roger's book practically a geographical encyclopedia of the time containing information not only on Asia and Africa but also western countries. His work was translated into Latin and remains popular both in the east and west for several countries.

Ibn-Battuta (1304-1368 A.D) - One of the great Muslim travelers of the medieval Arab world was Ibn Battuta, whose real name was Abdullah Muhammad surnamed Ibn Battuta. He was born at Tangier in 1304. He was of Negro origin and was not an Arab. He was from a family that produced a number of Muslim judges (Qazis). He received the traditional education in his native town tangier. He visited Egypt, Syria and Hejaz for education and received a number of degrees and diplomas. He had great interest in travelling in to distant lands and left home at the age of 21 (1925) to make pilgrimage to Mecca where he proposed to complete his studies of the contemporary Muslim law. But his interests focused on the land and people of North Africa and Egypt which he passed through to search Mecca. He was so fascinated by nature that he decided to give up his study of law and switched over to travelling across the then Muslim territory. He went to many parts of Africa never before visited by any person. He sailed along the Red sea, visited Ethiopia and then moved southward along the coast of East Africa. Where he learnt of an Arab trading post of Safala in Mozambique and more than 20^0 south of equator.

From Mozambique, Ibn-Battuta again sailed for Mecca and after a brief stop at Mecca, he again left for Journey to Baghdad and Persia and the land around the Black sea. He crossed the Asiatic mountain through Afghanistan and moved into India. He was the court of the Mongol emperor in Delhi for served fears and had the opportunity to travel widely in India. The Sultan of Delhi appointed him as ambassador to China but certain reasons he could not reach China on time and during this time he visited Maldives, Sri-Lanka, Eastern part of India, Sumatra, and eventually he went to China for a shorter period. Ibn-Battuta left for Moroccao through Egypt in

1350. In all he spent 28 years in travel and crossed a distance of more than 75000 miles which in the fourteenth century was a world record.

Although Ibn-Battuta has described the physical conditions of various regions that he visited. He has his primary interest in people, his description of house types and building materials in desert is very interesting and informative. His writings include many facts of anthropological interest. His book Rihla provides an insight into the soils, agriculture, economy and political history of the then Muslim world. Unfortunately his book, written in Arabic, made little impact on the Christian world as no attempt was made to translate it into Latin. He is still considered a most reliable source for the geography of his period and an authority on the cultural and social history of Islam.

Contribution to Geographical Thought

The Arabs made outstanding contributions in the field of Mathematics, physical and regional geography. They also contributed to climatology, oceanography, geomorphology, linear measurements, determination of cardinal points, limits of habitable world, sprawl of continents and oceans are highly appreciable. Mathematical and astronomical geography received the most attention of Arab geographers. They were influenced by the works of Aristotle and Ptolemy and their physical environment. The very clear atmospheres of the desert and semi-desert region and by favoring astronomical observation led them to contribute much for mathematical geography. The Arab interest in astronomy was a tradition one and was born of their environment and practical needs of travel and commerce and religious purposes.

Influenced by the Greek tradition, Arabs considered the earth as a centre of the universe around which revolved the '7' planets, each with separate sphere. Most of the Arab geographers believed in the sphere city of the earth. The first organized attempt at the measurement of the earth's circumference was made Al-Mamun' surveys in the plains of Syrian Desert. The method of measurement they adopted was simple but tedious and based on many observations. The circumference thus worked out to be 29,400 miles. The radius of the earth according to Al-Battane and Al-Targhani was 3250 m. Arab geographers doubted the idea that earth was stationary in the centre of the universe and hinted at the daily rotation but became acceptable only after the findings of Galileo and Kelper.

Many Arab geographers worked for the determination of geographical latitudes. Ibn-Yunus first called the attention to the error resulting in the reckoning of latitude. Ibnal-Haithen devoted a separate work to the exact calculation of latitudes wherein he recommended the taking of a bright-fixed star for the precise determination of the latitude of the pole. Al-Birsuni came out with a more scientific and original suggestion in his masterpiece, 'Qanum al-masudi'- about applying the method of circumpolar stars to the Sun. Arabs used prime-meridian which was plotted by Ptolemy for the calculation of time and longitudes. In the determination of longitudes, Arabs either began in the farthest west like the Greeks or counted through 180^0 to the east. The common practice of Arab geographers in determining longitude by the observation of the

eclipses of the moon was worked out by Ibn-Yunus. In the Arabic astronomic works there occur rules for determining positions and tables of the latitudes and longitudes of places throughout the world.

Besides astronomy, the Arabs contributed in several subfields of the discipline of geography. In physical geography, Arab geographers borrowed from the Greeks the division of the globe into 5 zones- each represented particular temperature conditions. These are-torrid zone-between tropic, two frigid zones-near the poles, two temperate. According to Arabs only a quarter of the earth was inhabited and the rest was filled with water or either by excessive of heat or excessive cold. About climate, Arabs made significant contributions-Al-Balkhi prepared first climatic Atlas of the world-named-Kitab-Al-Ashkal. Al-Masudi gave a good description of Indian monsoon, in fact, the word 'Mausem' came from Arabic. They were the first to identify the seasonal nature of monsoons. Al-Maqdist offered a new division of the world into 14 climatic regions. He recognized that climate varies not only by latitude but also by position of east and west. He also presented the idea that most of the world's land area was in the northern hemisphere and the open ocean in the southern hemisphere.

Arab geographers also made important observations regarding the processes shaping the world's landforms and Ibn-Sina observed the work of agent's denudation and weathering processes. Fundamental work concerning tides was the treatise of Abu Muashar, from which one learned about the tidal laws. He gave a full description of the various characteristics of the tides together with copious speculations regarding their causes. Arabs proved that the tides are caused because of the gravitational pull of the Sun and the Moon. Al-Masudi recorded spring & neap tides.

The making of maps and charts became an early interest of Arab geographers. It arose primarily out of the necessity of locating places and defining areas. Al-Khawarizni was among the early map-makers. His work '***Kitab surata Ard***' was written in explanation of the maps. Al-Masui's map gives a clean view of the known world which separates Africa from south-east-Asia. Al-Maqdisi made a discourse on map making. One common idea that of an endciveling ocean persisted for a long time because whichever direction the Arab traders, navigators and conqueror's penetrated there seemed to be a large oceanic expanse from areas of Atlantic to Indian and Pacific ocean. They resected the **Ptolemy** idea of land locked Indian ocean, Al-Idrisi or Edrisi. He also corrected ideas about certain river cones like Danube and Niger. He also suggested a sophisticated climatic system.

Beyond the realm of physical geography, the Arabs also enriched several other subfields. The observations on human life in relation to the environment often brought out by Arab geographers of this period and rudimentary understanding of human geography had taken birth in spite of traditional astrological bias. Geographers like Ibn-Rustan, Masudi, Maqdish, Al-Biruni etc. took up the subject of human characteristics and capabilities in relation to regional and local geographical factors. Such as Al-Masudi and Ibn-Sina explained progress intelligence and virility in life to the living climatic conditions. The role of environment in both physical and

cultural sense was emphased. Ibn-Khaldun in his 'Universal History' interpreted geographic and human factors influence on society. While describing the effect of environment on the mode of life and attitudes of people, Al-Madudi says, 'The powers of the earth vary in their influence on man' on account of three causes water, topography and natural vegetation.

Arabs made contributions in the form of route books, books of countries, dictionaries, diaries and travel books. Ibn-Khurdadhibin provided an excellent summary of the maritime trade routes of the world and descriptions of China, Korea & Japan. His work became a prototype as well as a source for succeeding books in this series. Other notable route books were written by al-Manwar, Sarakhsi etc. The treatise of Ibn-Hawqal is called '***A Book of Routes and Realms***' in which he gave an account of Arab and European countries Arabs produced Books of countries, geographical dictionaries and gazetteers. Yaqubi wrote '***Kitab-Al-Buldan***' which had a wide range of topographic and economic details. The greatest Arab contribution to geography was the Dictionary-cum-Gazetteer of Yaqut deals with the geography of the world.

Travel literature of Arabs is a great source of geographical information. Geographical accounts of far-off lands and the observation of strange phenomena kindled interest in people and places. Ibn-Battuta, Al-Masudi, Al-Biruni, Ibn-Khaldun etc. contributed to his travel literature. The travel accounts of Ibn-Battuta are unmatched for their details and critical appreciation. His travels were more extensive than those of Morcopolo and contain more geographical information. Al-Masudi wrote at length of the Makran coast, Sind and the northern Pakistan and the rest of the sub-continent, southeast Asia and other areas. His 'Meadows of Gold and Mines of precious stones' is the great historic-geographical encyclopedia. Al-Biruni wrote 'remarkable study of India' Kitab-Al-Hind, where he wrote about geography of the country and commented on river morphology, geology, tides, oceans, weather etc. his monumental work-'Al-Aanumal-Masudi' known in the west as canon Masudican. Ibn-Battuta (Abdullah Muhammad) from Tangier (1304) was a great name in Arab geography who travelled widely and written records and monographs of great value. Places and areas visited by him are down south equator upto Mozambique (Sofala) across Sahara, Egypt, Ethiopia, Iraq, Mediterranean coasts, Central Asia, Black and Caspian Sea areas, India, China, Southeast Asia and some Indian ocean islands. In 1353 he finally settled at Fez and wrote his long travelogue of places and areas which he visited. Ibn-Khaldun was another great Arab Geographer, who came from Algeria and Tunisia belt and wrote extensively between 1382 and 1405. His well-known work is Muqaddimah (Introduction of History) and it imbibes the politico-geographical thinking of the late fourteenth century Arab world. He devoted his writings on the question of territoriality and the relationship between the nomads (Bedouins) and the urban folks. He extensively dealt with the security problem of sedentary society as against the highly mobile and dynamic nomadic societies. He also wrote on the life cycles of states in the case of tribal Africa and Asia. The final dissipative stage comes very soon in such societies on account of the fact that the war decay and the collapse set in. He developed a focus in relation to the climatic determination but that may not be scientifically sound and sophisticated. Thus Arab geographers contributed much to the evolution

of geographical thought. The ideas of Arab astronomy, cosmography and geography were incorporated in European learning. Morcopolo had used many geographical names in their Persian forms and seen navigation charts in the Indian Ocean. Cincent of Beauvias who compiled an Encylopedia, Roger Bacon's 'Opus Maous' and 'Albert were much influenced by Arab geographic thought.

Arab attainments in physiographic and physical geography were of high standard. Interesting light was thrown on the understanding of the processes of denudation, earthquakes, orogeny etc. The importance the Arabs attached to geographical knowledge and the richness of geography literature is the characteristic feature. Al-Maqdist in his book- ' Best of divisions for the knowledge of climates' said that 'Geography is a subject which pleases the king as well as the beggar.' Arabs intellectual curiosity and integrity led them to contribute to geographical thought. In fact, once the Prophet said, "go up to China for seeking knowledge". Thus they have much importance to knowledge and the study of natural phenomena.

3.4 CONCLUSION

The contribution of the Arab Geographers is often considered very small by most of the European and American scholars. It is argued that since they had access to all the great works of the Greek and Roman scholars and had they built upon this soil base, they could have made a significant contribution to the development of geography. Though most of them had studied Ptolemy's work, they made little effort to advance it further. It is pointed out that since most of them were travelers they indulged in writing to astound and surprise people. It is often pointed out that the development of the real science among the Arabs was hampered by the over refined state of the language and one of the story telling which caused the mingling of oriental fancy with geographical and historical facts. They could contribute significantly to the development of cartography but most of their maps were inaccurate and general they were based on text rather than the text being based on maps. However, their contribution in keeping the past knowledge alive and hand it down to the following generations cannot be undermined. Moreover they started the tradition of travelling geographer and their contribution in the direction of approaching geography through travel is also noteworthy. Therefore, much of the criticism of the Arab geographers at the hands of the Europeans is not justified.

3.5 SUMMARY

The Medieval period witnessed remarkable progress in geographical concepts, models and paradigms. New data were collected by direct observation but the lack of close contacts among different people, in large part resulting from the barrier of language meant that geographic knowledge gained by one group was differed only slowly to the other. Geography in the Christian world was basically confined to the translation of the earlier Greek and Roman works, and deductions were made purely on theoretical grounds. But the geographical explorations and Voyages of the European definitely widened and broadened their geographical outlook. In spite

of that the same old Greek concept ending habitability with latitude persisted in the Christian perception. The Christians made cartographic innovations that helped them to obtain maximum benefits from expeditious and Voyages.

On the other hand, the Muslim geographical writings were based on much wider variety of sonless than were those of Christians. But the earlier Muslim scholars had a fascination towards the works of Ptolemy and his wrong notion about an enclosed Indian ocean which persisted until the mid 20^0 century, when that erroneous idea was discarded. However, the Muslim geographers made valuable contributions to climatology and geomorphology and some of the notions still hold relevance. Muslim scholars also travelled wide in the Arab world and collected facts from observations which also discarded the Greek concept of habitability. Muslim geographers are identified as having drawn attention especially to man-environment relations vis-à-vis environmental determinism.

3.6 GLOSSARY

1. Cartography: the art and science of map-making.
2. Chorology: the study of areal differentiation of the earth surface.
3. Cultural Landscape: Landscape developed by man.
4. Ecology: The study of interrelations between organism and their biotic and a biotic environment.
5. Environmental Determinism: The doctrine that human activities are controlled by environment.
6. Geography: As the study of earth's surface as the space within which the human population lives or as the study of earth as the home of people.
7. Morphology: the science of forms (Landforms).
8. Paradigm: The working assumptions procedures and finding routinely accepted by a group of scholars, which together define a stable pattern of scientific activity.
9. Region: a differentiated segment of earth surface or homogeneity in area.
10. Regional Geography: the study of the geography of regions.
11. Resource: a concept employed to denote sources of human satisfaction, wealth or strength.
12. Social geography: the study of social relations in space and the spatial structures that underpin those relations.
13. Thematic map: a map that depicts statistical variations of objects in space.
14. Time geography: an approach in contextual theory originally developed by Hager stand and his associates in the University of Lund, which conceives of time and space as providers of 'room' for collateral processes.

3.7 ANSWER TO CHECK YOUR PROGRESS

1. What is Geography?

2. Trace development of geography as a discipline?
3. Maps are essential tool of geographer, how?

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3.10 TERMINAL QUESTIONS

1. Give the facts which encourage Arabic scholar to develop the geography?
2. Name important scholars who contributed Muslim geography?
3. Give the major contributions of Arab geographers in medieval period.

BLOCK 2 : HISTORY OF GEOGRAPHICAL THOUGHT IN MODERN PERIOD

UNIT 4 : FRENCH AND GERMAN GEOGRAPHICAL THOUGHT

4.1 OBJECTIVES

At the end of the unit the students will know about the contribution of French and German Geographers in the field of geography. The main objectives of this unit are:

- To understand the historical development of geographical thought in France and Germany.
- To throw light on their contributions, so that the contributions made by some of the important geographers of these countries is brought forward in the development of geography.

4.2 INTRODUCTION

The philosophical foundation to the subject of geography was given by Immanuel Kant, while Alexander Von Humbolt (1769-1859) and Carl Ritter (1779-1859) developed the subject as an independent branch of knowledge. From the middle of the 19th century up to the contemporary period, there occurred many philosophical changes in the definition, concepts and approaches of the discipline. The major concepts and methodologies were, however, developed by the Germans followed by the French, British, and American and Soviet scientists. Presently, a brief account of French and German schools of geography has been given.

4.3 CONTRIBUTIONS OF FRENCH GEOGRAPHERS (VIDAL DE LABLACHE, JEAN BRUNHES, ALBERT DEMANGEON)

THE FRENCH SCHOOL OF THOUGHT :

The geographical ideas and concepts, which originated with Ratzel and his disciples, spread in the neighbouring countries. Alexander Von Hombolt, who wrote & published his 30 volumes in Paris, created intellectual fervor in French scholars. In the middle of the 19th century, in France as in Germany, geography was taught by historians, geologists, military personnel and engineers. Even the chair of geography in the Sorbonne (Paris) was occupied by a historian who was attached to the Faculty of Letters. Phillippe Bauche (1752) was the first French scholar, who criticized the prevalent method of representation of population, economic and other data in administrative units. He felt that the right method of representation of

geographical data is in the frame of natural region. According to him, a river basin was the best kind of natural region. Subsequently, Baron Coquebert (Director of French Statistical office, 1796) proposed a division of the national territory into natural regions with a brief description of each of them. This effort created interest in regional divisions in France. But this approach was contradicted by Omalius d'Halloy in 1833 who prepared a geological map of France to establish the relationship between landforms and soils and the underlying rocks. About this time (1870) there occurred a major breakthrough in the expansion of geographical knowledge. Soon several geographical societies were established in the various universities of France. The real take-off in the field of geography in France, however, started during the period of Vidal de La blache.

CONTRIBUTIONS OF FRENCH GEOGRAPHERS

(a) Vidal de Lablache (1848-1918):

- **Birth and early career:** Vidal de Lablache (1848-1918) is known as the founder of Human Geography. He was a scholar of classical languages. His interest in geography developed in 1865, when he was studying archaeology at Athens. Later he taught geography at the University of Nancy (1872-1877) and then joined Ecole as professor of Geography.
- **Work and contributions:** In 1891, he founded a new professional periodical for the publication of best geographical writings. The periodical was called "Annales de geographie". In 1894, Vidal published the first edition of the "Atlas Generale Vidal-Lablache". From 1896 to the time of his death (1918), he was professor of Geography at the University of Sorbonne. In 1899, he laid stress upon the relationship between man and his immediate surroundings which could be best studied in small homogeneous areas (pays).
- **Critique of Environmental Determinism:** Vidal was a strong opponent and critic of environmental deterministic approach. He advocated the concept of "possiblism" as postulated by Febvre. His basic approach towards the study of man and environment-the two major components of geographical study was the nature sets limits and offers possibilities for human settlements but the way man reacts or adjusts to these conditions

depends on his own traditional way of living. Vidal's book "Tableau de la Geographie de la France" was a good addition to the literature of geography.

- Vidal opposed to the idea of drainage basin as a unit of study. While criticizing the idea of taking drainage basin as the unit of study, he felt that such a unit will create many complications in understanding the reality of a region. For example the central Massif of France is a well demarcated natural region in toto but if it is divided into drainage basin units, then the culture, institutions, tradition and attitudes of people can not be properly understood. In the opinion of Vidal, the relatively small regions are the ideal units of study and to train geographers in geographical studies. The tradition of micro-region study still persists in France.
- Vidal's monumental work "Human Geography" was posthumously published in 1921 as he died in 1918. The partially completed work was given final shape by Emmanuel de Martonne, Son-in-law of Vidal de La Blache.
- According to Vidal, it is unreasonable to draw boundaries between natural and cultural phenomena; they should be regarded as united and inseparable. The animal and plant life of France during the 19^{th} century for example was quite different from what it would have been had the country not inhabited by man for centuries. It thus becomes impossible to study the natural landscape as something separate from the cultural landscape. The relationship between man and nature becomes so intimate that it is not possible to distinguish the influence of man on nature and that of nature on man. The area over which an intimate relationship between man and nature has developed through centuries constitutes a region. Vidal therefore, argued for regional geography as the core of geography.

Conclusion:

- In the late part of his life, Vidal reached the conclusion that with the industrial development the best in French life is vanishing. For future, he suggested that we should study the economic interplay between a region and the city centre which dominates it rather than the inter play of natural and cultural elements. As a result of Vidal's efforts by 1921, there were 16 departments of geography in France, one in each of 16 universities. Interestingly enough, all chairs of geography were occupied by the pupils of Vidal. Thus he is rightly considered as the **"Father of Human Geography".**

(b) Jean Brunches:

- **Birth and Early life:** Born in 1869, Jean Brunches was a disciple of Vidal de Lablache. After studying history and geography, he prepared himself for the conceptual framework of human geography. On the lines of his master, he tried to identify the scope and method of human geography.
- **Work and Contributions:** His main work "Geographic Humaine: essai de classification positive was published in 1910. He limited human geography to :
  - **(1)** Unproductive occupation of soil
  - **(2)** Things connected with the conquest of plant and animal world
  - **(3)** The destructive economy- "robber economy" or violent attack on nature which may result in poverty.
- In his method of geographical study, he emphasized two principles:
  - **(1)** Principle of activity
  - **(2)** Principle of interaction
- **Principle of Activity:** Jean Brunches was of the opinion that the physical and cultural phenomena are in a state of perpetual change and they must be studied in the temporal change, instead of taking them as static in time scale. He held the view that "everything is growing or diminishing", "expanding or shrinking and nothing is "stable and static". For example, the heights of mountain peaks, sea level, ice sheets, glaciers, size of valley, deltas, volcanoes and forests are continuously changing in their shape, size and attitude. So, in order to understand the interrelationship of physical and cultural components of a meso or micro unit, the principle of activity is to be kept in mind to arrive at a just synthesis.
- **Principle of Interaction:** This idea was borrowed by Jean Brunhes from Vidal de La blache, who advocated the principle of terrestrial whole. Brunhes assumed that geographical phenomena are closely interrelated with one another and must be studied in all their numerous combinations or by keeping in mind their permutations and combinations. The idea of terrestrial whole or terrestrial unity was a fundamental concept which later on inspired "regional synthesis". All the physical and human forces

are thus closely bound together because of the endless interrelations of the conditions they bring out.

- In support of his principle of interactions, Brunhes examined the relationship between animals and cultivated plants and determined with what forms of soil exploitation with what kinds of cultivation and with what type of economic organization, these animals are generally associated. In brief, our efforts are based fundamentally on the great geographical principle of interaction for man is like plants and animals and therefore, the concept of interaction should dominate every complete study of geographical facts. The forces of physical nature are bound together in their consequences in relations and in the consequence of these relations.

(c) Elisée Réclus (1830-1905):

- Reclus was the first and foremost an uncompromised idealist. When only 20 years old he went to Berlin to study theology but began to attend lectures of Carl Ritter which awakened his interest in Geography. Reclus travelled extensively in North and South America, more in order to observe than to do research. In 1857, he returned to France and befriended the leading anarchist, Milkhail Bakunin (1814-76). From that time onwards, Reclus belonged to the inner circle of the secret anarchist association Fratenite International. Reclus was a social anarchist. He got recognition as a leading French geographer with a work of systematic physical geography called "La Terre" (1866-7). He is best remembered for his 19 volume regional geography "Nouvelle Geographic Universelle" (1875-94).
- In the end part of his life he wrote "L'Honne et la Terre" (Mostly published posthumously in 1905-8), which may be described as social geography. He was mainly interested in human aspect of geography. He was keenly interested in the conservation of nature and natural beauty and discussed man-nature interrelationship in a very scientific way.

(d) Emmanuel de Martonne (1873-1955):

- Emmanuel de Martonne was a pupil and son-in-law of Vidal de Lablache. He was specialized in physical geography and his special area of concentration was Central

Europe. He had received training in geology, geo-physics and biology. He was interested in studying the problem of glacial erosion of the Alps. The most popular works of Martonne include "Traite de Geogrpahic Physique and La France Physique". He inspired many French geographers to work in the field of physical geography.

(e) Albert Demangeon (1872-1940):

- **Birth and Early life:** Albert Demangeon (1872-1940) was also one of the outstanding pupil of Vidal de Labalche. He started his career as a school teacher and while teaching at Picaddy, he produced a monography entitled "La Picardee et les regions veisines". This dissertation was highly appreciated and he was appointed in the University of Life where he remained until 1911. He concentrated mainly on Human Geography.
- **Work and Contributions:** Demangeon devoted most of his time in editing Annals and contributed to these journal as many as 31 articles and 89 notes. He made valuable contribution to the spatial variations of farmsteads, which he pursued throughout his life. He wrote on transport geography, population and international economics. He also made a classification of lands and prepared land use maps. He advised to work on major population groups of the Far East, the relations of the whites and the Negroes, irrigation in arid countries and the growth of great cities.
- Demangeon was a teacher of innumerable qualities and possessed great vision. He was a modest person of polite nature. His contribution to the Vidalian tradition is widely acknowledged. After the weakening of the Vidalian tradition, geography was studied with a new approach during the inter-war period. With the introduction of new tools and techniques, stress was laid on analytical study. This trend was more visible in the field of agricultural geography. The French scholars also adopted sophisticated statistical techniques.
- Among the young generation, there is greater emphasis on locational analysis of phenomena. There is increasing cognizance of the branches of climatology, botany and sociology. The new trend shows that the spatial phenomena cannot be explained simply by correlation as expressed by Vidal de Lablache; they need to be explained as a part of the geographical whole (ensemble).

4.4 CONTRIBUTIONS OF GERMAN GEOGRAPHERS (FERDINAND VON RICHTHOFEN, FRIEDRICH RATZEL, ALFEREDHETTNER)

THE GERMAN SCHOOL OF GEOGRAPHY :

German's contribution to the development of geography is enormous. In the 18th and 19th century, the Germans made great strides and put the subject on a sound footing. They gave it philosophical and scientific base. In the post- Humbolt and Ritter period, a definite change in the role of universities occurred. It was in the middle of 19th century when courses for various physical, biological and social sciences were standardized and students were allowed to select their optional subjects. In Germany, the first university was established in 1809 but there were very few universities till the end of 19th century in which geography was taught. At the initial stage, the growth of geography was very slow and the teacher of geography did not have a proper geography background. Most of the geography teachers were pupils of Carl Ritter and even they were not sufficiently proficient in geography as they had backgrounds of other disciplines.

The German scholars also gave several definitions of geography and tried to delineate its scope. Some of the important concepts of geography advocated and defined by the German scholars. The middle of the 19th century was a period of political turmoil in Europe. There was a great demand for maps and charts by military officers and administrators since they wished to learn about the physical and cultural condition of different nations and regions of the world. Owing to practical utility of maps, anything that could be plotted on maps was considered geography.

CONTRIBUTIONS OF GERMAN GEOGRAPHERS:

(a) Oscar PescheL (1826-1875) :

- Oscar Peschel was a leading German geographer and was appointed as a professor at the University of Leipzig in 1871. He as the editor of "DAS AUSLAND"- a periodical in which articles about the geography of foreign countries used to be published. He developed comparative Geography. He also laid the foundation of modern physical geography. In his studies of landforms and physical geography, he ignored man as an

important component of the disciple of geography. He died at the age of 49 and his book on physical geography was published posthumously.

(b) Ferdinand Von Richthofen (1833-1905):

- In 1871, at the end of Franco-Prussian War, Germany was unified and the German empire came into existence. The end of the Franco-Prussian war led to heavy demand for the teaching of geography. Under these circumstances, new geography text books were written and geography was introduced in ten universities of the country. At this stage, Ferdinand von Richthofen was essentially a geologist pleaded for the cause of geography. He visited China and prepared a map of coalfields of China. He also noted the loess formations of Northern China and tried to explain the genesis. In his opinion the purpose of geography is to focus attention on the diverse phenomena that occur in the interrelation on the face of the earth.
- Richthofen was the first German scholar to differentiate between the "general" and the "regional" geography. He emphasized the point that regional geography must be descriptive to highlight the salient featured of a region. However, General Geography deals with spatial distribution of individual phenomena in the world. For the systematic regional study, he emphasized the need of field work. He distinguished the different methods of study in areas of different size which he named:

(1) Erdteile (Major divisions of the world)

(2) Lander (Major Regions)

(3) Landschaften (Landscape or the small regions)

(4) Ortlichkeiten (Localities)

He insisted that Erdkunde (geography) must refer to a study of the earth where lithosphere, the atmosphere, the biosphere and the hydrosphere are in contact with each other.

(c) Friedrich Ratzel (1844-1904):

- Born in 1844, Ratzel got his early education at several universities in Germany. He visited Italy in 1872, U.S.A. and Mexico in 1874-75. He was trained in geology and in the later part of the 19th century Ratzel dominated the geographical scene in Germany. Being a contemporary of Darwin, he was influenced by Darwin's Theory of Evolution

of Species and was noted for the application of Darwin's biological concepts to human societies.

- Before Ratzel, the foundation of systematic geography was laid down by Alexander Von Humbolt and that of regional geography by Carl Ritter. Ratzel compared the mode of life of different tribes and nations and thus made a systematic study of human geography. His interest in tribes, races and nations was keen and after during adequate field work he coined the term "anthropogeography".
- In 1870, Ratzel joined Prussian army and after the unification of Germany (1871), he devoted himself to the study of the modus of life of Germans living outside Germany. For this purpose, he visited Hungary and Transylvania. In 1874-75, he reached US and Mexico and expanded his sphere of study. In United States, he studied economy, society and habitat of the original inhabitants and tribes, especially the mode of life of the Red Indians. On the basis of his field study, he tried to formulate some general concepts regarding the geographic patterns resulting from the contact between aggressive and expanding human groups and the retreating groups.
- At the completion of his field study in U.S.A. and Mexico, he returned to Germany in 1875 and was appointed Professor of Geography in 1876 at the University of Leipzig.
- In 1878 and 1880 he published 2 books on North America dealing with physical and Cultural geography. His work "ANTHROPOGEOGRAPHY" was completed between 1872 and 1899. This first volume of anthropogeography is a study of man and earth relationship, while in the second volume the influence of man on environment has been discussed. In anthropogeographie, he used deductive approach to present the first systematic study of geography of man.
- His deterministic approach became very popular outside Germany, especially in France, England and U.S. Ratzel was also influenced by Darwin's Theory of Evolution of Species. He applied Darwin's concept to human societies which suggests that groups of human beings must struggle to survive in particular environments as much as plant and animals do. This is known as "SOCIAL DARWINISM".
- In 1897, Ratzel wrote "Political Geography" in which he compared state to an organism. He said that state like some simple organism must either grow or die and can never stand still. It was this philosophy of Lebensraun 'living space' which created the

controversy of superior and inferior races by claiming that the superior peoples (nations) has a right to expand their territory (kingdom) - 'living space'- at the expense of inferior neighbours. It was Ratzel who tried to build a "fundamental unity in diversity". The controversy regarding dichotomy between physical and human geography started during Ratzel's time.

- To summarize, we believe that Ratzel's Anthropogeographie was a seminal work and the amount of intellectual debate it created on both sides of the Atlantic Ocean makes it an exemplar. Ratzel's view about geography dominated for decades – a tribute to his ability as a teacher and scholar.

(d) Alfred Hettner (1859-1941):

- Alfred Hettner was a pupil of Richthofen and Ratzel. He was essentially a physical and regional geographer. He wrote research papers after making extensive travels. His book "Europe" was published in 1907. According to him, geography is a chorological science or it is the study of regions. He elaborated the importance of distribution of phenomena and stressed the significance of regional geography. He was of the opinion that geography is a field in which things have to be described in their areal context on the face of the earth, much as history was the field in which things are to be considered in their time context.
- Hettner claimed that geography is an idiographic (regional) rather than monothetic (general). In his opinion, the distinctive subject of geography was the knowledge of the earth areas as they differ from each other. Man was included as an integral part of nature of an area and thus "mere description has been replaced in all branches of geography by search of causes. The concept that "the unity of geography is in methods" was advocated by him.
- Hettner rejected the view that geography could be either general or regional. Geography, like other fields of learning, must deal in both the unique things (regional geography) and with universals (general geography) but the study of regions is the main fields of geography. This theory of uniqueness (regional geography) attracted the attention of German geographers for decades and is still the point of controversy in geography. After Hettner, regional studies were made with the outline of location,

geology, surface features, climate, vegetation, natural resources, settlement distribution, economy transport systems and political divisions.

- Hettner's approach invited criticism also. Those who criticized were of the opinion that Hettner tried to give more weight to physical environment ignoring the cultural factors. For example: there is a direct relationship between the density of population, economy, social institutions, religious beliefs, cultural traits and political policies. Moreover, many of the interrelations observed in regional studies were in the process of change through time. Many of the nomadic herders start settling down and adopt sedentrized life under the impact of socio-cultural and political factors.

(e) Albrecht Penck:

- Albrecht Penck was a leading German geographer of the early part of 20th century who formulated the concept of 'geomorphology'. He was a professor at Vienna from 1885 to 1906. He was associated with Eduard Suess, who prepared maps of the major geological regions of the world. He founded the principles of landforms evolution and showed how the systematic study of features can be approached from the chorological (regional) point of view. In 1910, Penck postulated the hypothesis that classification of climates can be made with the help of study of landforms even where the meteorological data are not available. He was the first to point out that evaporation increases with higher temperature. He also pointed out that the effective rainfall, i.e. the difference between rainfall of a place and run-off plus evaporation is directly dependent on the prevailing temperature.
- He considered man also as an important agent who carves out the face of the earth. Penck stressed the importance of accurate maps showing relief features for a systematic study of geography. The idea of topographical maps was thus put forward by him. It was because of his suggestions that topographical maps on the large scale i.e. one inch to one mile, showing the major relief features, water bodies, vegetations and the work of man, started being prepared.
- Penck's pioneering ideas inspired many young scientists to pursue research in the field of geomorphology and climatology. Wladimir Koppen- the Russian- born German climatologist started studying world climate on the lines advocated by Penck. For his

climatic study, he took into consideration the observable relief features, besides the recorded temperature and rainfall data between 1884 and 1918, Koppen made several attempts to produce a satisfactory classification of climates. For his classification, he took into consideration temperatures, vegetation, and rainfall effectiveness to temperature, seasonal and annual variations of temperature and rainfall with the help of these indicators, Koppen arrived at certain regularities in the temperature and rainfall distribution. He established that moisture deficiencies exist throughout the year on the western margins between 20° and 30° in both the hemispheres and similarly the continental areas on the same latitudes are colder in winter and warmer in summer than the parts lying in the vicinity of water bodies (oceans, seas).

4.5 CONCLUSION

In brief, recent researchers are less oriented towards description and regional analysis in a regional presentation rather more concentrated towards explanation with a genetic prospective. In physical geography, there is greater emphasis on process and systems of erosion and reconstituting the stages of morphogenetic evolution. In human geography, emphasis has been placed on economic factors of production and consumption, economic systems and regions, zones of influence, economic regionalization, the analysis of traffic flow and for more than on the relations of these with natural milieu. Regional geography in France is now more concerned with describing and explaining the complexity of the organization of space. To achieve this goal, there is more use of detailed maps and above all aerial photographs.

4.6 SUMMARY

In the first part of this unit, we tried to understand about contributions of French Geographers. In the second part of this unit you have know the contributions of German Geographers. Studying this unit you will be able to understand that contributions of French and German Geographers in the development of Geography.

4.7 GLOSSARY

Philosophical - relating or devoted to the study of the fundamental nature of knowledge, reality, and existence
Criticized- to give an opinion or judgment about a book
Concept- idea
Consequence- a result of a particular action or situation
Century- a period of one hundred years
Scientific- based on or principles of science.
Lithosphere- the rigid outer part of the earth
Atmosphere- the mixture of gases around the earth
Biosphere- the part of the earth's environment where life exists
Hydrosphere- the water on or surrounding the surface of the globe
Inhabitants- a person or animal that lives in or occupies a place
Political Geography- a branch of geography that deals with human governments, the boundaries and subdivisions of political units, and the situations of cities
Organism- an individual animal, plant, or single-celled life form

4.8 ANSWER TO CHECK YOUR PROGRESS

1-Who was known as the founder of Human Geography?

2-When was Jean Brunches born?

3-What was the main work of Jean Brunches?

4-When was Albert Demangeon born?

5- Name the era in which German scholars have contributed?

6-Which book is edited by Oscar Peschel?

7-Which German scholar mentioned differences in General and Regional Geography?

8-Who was the writer of book " Europe"?

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4.10 SUGGESTED READINGS

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4.11 TERMINAL QUESTIONS

1- Evaluate the contributions of French and German Geographers in the development of Geography.

2- Discuss the contribution of French Geographer Vidal de La Blache.

3- Evaluate the contribution of German Geographer Friedrich Ratzel.

UNIT 5 : AMERICAN AND BRITISH GEOGRAPHICAL THOUGHT

5.1 OBJECTIVES

The main objectives of this chapter are to understand the history of the development of geographical thought in modern period in United States of America and United Kingdom and to throw light on the contributions of some selected American and British geographers in the development of geography as a branch of learning.

5.2 INTRODUCTION

After reading this unit students will be able to understand the contribution of American and Portish geographers about the geographical thought.

The modern period in the history of geographical thought began in the latter part of the 19th century. It is distinguished by the appearance of the professional field called geography that is a field of study in which trained students could earn a living by being geographers. To create a professional field three conditions have to be satisfied which are:

(a) There should be a body of concepts or images that is accepted by the members of a profession as well as an accepted way of asking questions and seeking answers;

(b) There should be departments/institutes in universities offering advanced training in concepts and methods; and

(c) Presence of jobs for students who had earned advanced degrees from these departments.

When all these conditions were fulfilled, a new professional field came into existence. This is what we call the new geography. The new geography began in Germany in 1874, when the departments of geography headed by scholars with the rank of professor were established in the German Universities. Before this time students could attend lectures and then perhaps go on to give lectures themselves; but never before were there clusters of scholars qualified to offer graduate training in geography. When such positions became available in Germany in 1874, there were no trained geographers to take them; those who were appointed to the newly created professorships had to find their own answers to the question: What is geography? This German innovation spread rapidly to other countries- notably to France, Great Britain, Russia and United States. In each of these five countries (Germany, France, U.K., USA and Russia (and later U.S.S.R.)) distinctive national schools developed, depending on the answer given to the question concerning the nature of geography. This chapter aims to reveals something of the development of new geography in the United States and the Great Britain.

5.3 CONTRIBUTION OF AMERICAN GEOGRAPHERS(MARK JAFFERSON, ELLEN CHURCHILL SEMPLE, ELLSWORTH HUNTINGTON)

GEOGRAPHICAL THOUGHT IN MODERN PERIOD IN UNITED STATES

When the new geography arrived in North America about a decade after its appearance in Germany, there was already a long record of interest in geographical studies and in the teaching of geography in schools and colleges. As in other parts of the world, work that can be identified as geographical in nature was contributed by scholars (e.g. Benjamin Franklin and Thomas Jefferson) for whom geographical studies constituted only one of many intellectual interests. There were pioneers, such as George Perkings, Marsh and Mathew and Fontaine Maury, who brought new understanding to the study of the earth as the home of man. European geographical ideas were brought to America by such scholars as Louis Agassiz at Harvard and Arnold Guyot at Princeton. During the 19th century, major advances in thematic mapping were introduced from Europe through the efforts of such men as Lorin Blodget, Joseph C.G. Kennedy, Daniel Coit Gilman, and Francis A. Walker. An important part of the background for the development of the new geography in America was the tradition of field survey and the resulting emphasis on induction from observations rather than deduction from theory. In the 1880s the Great Surveys of the West had just been combined in the U.S. Geological Survey. The men who worked on these surveys had not received previous training in the concepts and methods of geography and they had to find their own answers to the five important questions which are i) what to observe ii) how to observe iii) how to generalize iv) how to explain and v)how to communicate? Since these fieldmen were not blinded by preconceptions based on earlier influential studies, hence they were able to observe landforms and the processes that produced them without strong preconceptions. Another advantage enjoyed by these fieldsmen in United States which was not shared by the students of landforms in Europe was that, In the western part of North America there are large areas that are arid or semi-arid, which means that the forms of the surface are not hidden under a thick cover of vegetation. This conducive environment facilitated the observation of landform features and understanding the processes behind their construction. There was a practical motivation for their work. They distrusted theory and the findings of scholars that had been deduced from theory. Grove Karl Gilbert wrote:

"In the testing of hypotheses lies the prime difference between the investigator and theorist. The former one seeks diligently for the facts which may overthrow his tentative theory, the other closes his eyes to these and searches only for those what will sustain it". (Gilbert, 1886).

By the 1880 the stage was set for the appearance of what we have called new geography. The concept of the university as a community of scholars first appeared in America in 1876 when Daniel Coit Gilman became president of the newly founded Johns Hopkins University but

thereafter the idea spread rapidly to other established universities. For the first time faculties qualified by advanced training and continued activity in research were selected to guide the training of younger generations. For the first time a professional group could lead and direct scholarly performance in each discipline free from external interference.

Geographers began to participate in this new kind of university in Germany in 1874 and thereafter the innovation spread around the world. The pioneer who introduced the new geography in America was the geologist William Morris Davis, who had been appointed instructor of physical geography in the geology department at Harvard in 1878.

Davis set the early paradigm for geographical study and helped in the establishment of some of the professional institutions. At first geography was usually associated with geology and soon departments offering six geography courses emerged at Columbia Teachers College (1899), Cornell University (1902), University of California (1903), University of Chicago (1903), University of Nebraska (1905), Maimi University, Ohio (1906), University of Minnesota (1910), University of Wisconsin (1911), Harvard University (1911), University of Pennsylvannia and New York University (1913) etc.

Of these universities, Harvard, Yale, Pennsylvania and Chicago were perhaps the major sources of the ideas that were involved in the scholarly competitive discussion. At Harvard William Morris Davis was developing physical geography though finding a place for man in his construct. At Yale was H.E. Gregory (one of Davis'own pupils) who developed a fine departmental offering in human geography notably owing to E. Huntington and I. Bowman. At the university of Pennsylvania E.R. Johnson and J.R. Smith developed economic and commercial geography. At the University of Chicago in 1903 the first geography department in the United States was founded offering advanced study to the doctorate. The Chicago programme included strengths in physical, human and economic geography.

William Morris Davis the pioneer who introduced the new geography in America was born of Quaker parents in Philadelphia in 1850. He graduated from Harvard in 1869 and a year later he received the degree of Master of Engineering. From 1870 to 1873 Davis worked as an assistant at the Argentine Meteorological observatory in Cordoba, Argentina. Returning to Harvard for further study in geology and physical geography, he was appointed assistant to N.S. Shaler in 1876 and was promoted to instructor in physical geography in 1878. In 1885 he was appointed assistant professor of physical geography and later promoted to professor.He was visiting professor at many universities.He was one of the founders of the Association of American Geographers in 1904 and was its president three times- 1904, 1905 and 1909.

He was also president of the Geological Society of America and the Harvard Travelers Club. Among the many contributions Davis made to geology and geomorphology, the one that was central to all the others was the concept of the cycle of erosion, which he called the "geographical Cycle".Besides providing the names for the stages of his cycle, Davis also suggested technical terms for the various landforms, each term with an exact definition. He adopted Powell's three types of rivers: *consequent, antecedent* and *superimposed* and to these he

added *subsequent, obsequent* and *re-sequent.* For the low mountains that stand above the general level of a peneplain, he gave the name *monadnock* from Mt. Monadnock of New England peneplain. He also attempted to rescue the teaching of geography from too much attention to factual knowledge and not enough use of general concepts around which to organize the facts. In addition to these, Davis was a remarkable teacher. He was so versatile that it is rather impossible to describe his contribution in the development of American geographical thought in a limited space. His students further contributed in the development of discipline of geography.

Mark Jefferson:

None of the Davis' students did more to promote and improve the teaching of geography in the U.S. than the Mark Jefferson, who was the professor of geography at the Michigan State Normal College in Ypsilanti for 38 years from 1901 to 1939. Jefferson deserves a special place in the history of geography not only because of enthusiasm he kindled in his students but also for many contributions to the conceptual structure of geography that came from his pen. Before Mark Jefferson graduated from Boston University in 1884, he left to accept a position at the observatory in Cordoba, Argentina. He was in Argentina from 1884 to 1889 serving for two years as sub-manager of a sugarcane plantation near Tucuman. He then returned to Massachusetts, where he held various administrative posts in secondary schools and where he taught geography. In 1897-98 he studied geography at Harvard with Davis and was greatly stimulated by this experience. In the summer of 1900, when Harvard received a group of some 1300 Cuban school teachers seeking to find out about the new geography; Jefferson was appointed to lecture to them in Spanish. He gave eighteen lectures and led twelve field trips. Davis was greatly impressed with Jefferson's ability as a teacher. Jefferson started teaching at Ypsilanti in June, 1901 and only retired in 1939 at the age of seventy-six after the Michigan Board of Education had set an age limit for active teachers. During his 38 years in Michigan he had a hand in the training of a large number of teachers of geography, some of whom were to make important contribution to the profession. Jefferson who was a great admirer of Davis, nevertheless, took issue with many of his teacher's ideas. He never accepted the concept of determinism. Furthermore, he disagreed strongly with the recommendations of the Committee of Ten regarding the content of school geography. Jefferson insisted that the focus of geography instruction should be "man on the earth" in that order- not "the earth and man". Nor was he willing to omit the teaching of geographic conditions in certain particular countries, which we might describe as regional geography. He wanted to make these countries seem real to grade-school pupils-real in landscape, life, and institutions. This kind of geography was not part of the recommended systematic approach that Davis favored. In 1904, Jefferson surveyed the geography instruction in Michigan schools and among the 129 largest high schools; he found less than a dozen following the committee of Ten's program. Jefferson remained aloof from the endless discussion of the question: "What is geography?" He never began a course with a definition of the field but rather let the scope of geographical study emerged from the material he

covered. No one definition, he believed, could be more than partially inclusive. Here is what he wrote in 1931 in answer to a questionnaire:

… "Someone has said that anything that you can put on a map is subject matter of geography. That is what I would call locational or distributional geography…But geographers are contemplative persons who cannot be satisfied with so meager an account of subject…The nature of geography is the fact that there are discoverable causes of distributions and relations between distributions. We study geography when we seek to discover them… But there is an art of geography – the delineation of the earth's features and inhabitants on maps- cartography, and a science of geography, which contemplates the fact delineated and seeks out causes of the form taken by each distribution and its relationships to others.

Jefferson was the perfect example to demonstrate that vitality and effectiveness in teaching are related to research and to the communication of the results of research in scholarly publication. Although his teaching 'Load' in many semesters was as much as six courses (18 semester hours), he, nevertheless, established an outstanding reputation as a productive scholar. In the period between 1909 and 1941, he had 31 papers published in the Bulletin of the American Geographical society and its successor, the Geographical Review. This is by far the largest number of professional articles published in these prestigious periodicals during this time by any one scholar. These were not trivial pieces written for the purpose of building a list of titles. Some of them were major contributions to the concepts of geography. In these articles he examined the size, extent and functions of cities, and areas of access to rail-roads under the succinct phrase '*The civilising rails'*. The concept of *'Central places'*, the laws of *'Primate City'* and the 'Civilising rails' were coined and identified by him. His students of urban geography, urban centres as 'Central places' were far ahead of their time. He stated many times that his geographical concern was with man: 'where they are', 'what they are like', and 'why they are there'. This approach is eminently ecological, which seeks to discover casually interrelated associations of various distributions that lead to further understanding of human groups in their environmental settings. So it can be concluded that as one of the first American students of population of distribution and of urban structures, he was an innovator and trailblazer.

Ellsworth Huntington:

Another scholar who studied with Davis at Harvard and associated with Bowman at Yale was Ellsworth Huntington. Huntington was a creative thinker, a prolific writer and an imaginative interpreter of the effects of climate on human life. During his field studies in Asia between 1903 and 1906 he found much evidence to support the idea that there had been a worldwide progressive desiccation since the glacial period. But on his return from Asia during the early part of 1906 the idea came to him that instead of progressive change toward warm and dry conditions, there were cycles of cool-wet and hot-dry period of varying length. Correlating the periods of drought with historical dates, he developed the hypothesis that the great outpouring of nomadic people from central Asia, which led to the Mongol conquest of India and China and the invasions of the eastern Europe in the 13th century, could be explained by the drying of

pastures on which the nomads were dependent. This thesis was presented in his book '***The Pulse of Asia'*** (Huntington, 1907), which started him on the road to fame as a student of climatic influences on human society. In 1915 he published ***Civilisation and Climate*** in which he developed the hypothesis that the man's civilisation could only develop in the regions of stimulating climate and that the monotonous heat of tropics would forbid attainment of the higher level of civilization. His book ***Principles of Human Geography*** (1920), which was written as a college text-book, organized a picture of world geography in terms of human activities with the "explanatory description" of the physical earth omitted or greatly reduced.

Huntington's book has enjoyed recognition not only among geographers but also among historians, sociologists and medical scholars. His generalization about climate and man remain thought provoking. His vivid descriptions of places are among the most effective examples of geographical writings of any age. Yet in the period when Huntington was making his studies, the quantitative data on which such work had to be backing were not in existence. The identification of climatic cycles was based on scattered evidence, including the study of growth rings on trees, the bands of clay in drained lake beds, or even the scattered references to floods and droughts in the literature. Modern studies of growth rings and clay bands are much more reliable than the information he was able to bring together. His maps of degrees of civilization were based on the opinions of people with whom he corresponded. Since people commonly rate their own country as the most civilized and since most of Huntington correspondents lived in north-eastern United States, Western Europe, or Eastern Asia, he found these regions most highly civilized. In his earlier years he could write passage such as this:

The geographical distribution of health depends on climate and weather more than on any other single factor.

But as the time went on he came to realize that things were much more complex than he had at first believed. In his last book he even suggested that diet was as important as climate as an explanation of human energy. Huntington worked on subjects for which objectively defined data were lacking and in a period before the methods of collecting such data had been worked out. D.H.K. Lee writes of Huntington's work as follows:

Huntington's brilliant generalizations covering such a wide range of relationships to climate are worth reading for two reasons: First they are thought-provoking, and not all of them have been disproved; and second, as a demonstration of effective presentation they are unequaled. (Lee, 1954).

Ellen Churchill Semple:

Another pioneer geographer of this period was Ellen Churchill Semple. After graduating from Vassar in 1882, she taught for a few years in her native Louisville, Kentucky. She received a master's degree from Vassar in 1891, earned externally on the basis of a two years program of readings in sociology and economics, a final written exam, and a thesis, 'Slavery: A study in Sociology'. From friends she heard enthusiastic reports about a professor in Germany, at Leipzig, whose lectures were bringing new worlds into view. She went to Leipzig; and in spite of

difficulties placed in the way of woman who wanted to undertake graduate work, she studied with Ratzel in 1891-92 and again in 1895. She returned to the United States greatly stimulated by Ratzel's new approach to anthropogeography and his interpretations of so-called geographic influences on the course of history. She rejected his ideas about the state as an organism which he had derived from Herbert Spencer. Semple's aim then was to present Ratzel's ideas in English, but clarified and reorganized with many new illustrations drawn from different parts of the world. In 1897, she published her first professional article dealing with the Appalachian Barrier in American history and 1901 she published a paper based on her own field observations on the highlands of Eastern Kentucky regarding the results of isolation on the settlers of that area. This second paper started her along the road to fame, but her professional status was confirmed in 1903 with the publication of her first book ***American History and its geographic conditions.*** She presented her version of the first volume of Ratzel's Anthropogeographie in her great book ***Influences of Geographic Environment*****,** which was published in 1911. Here is what she had to say about her method:

…The writer's own method of research has been to compare typical people of all stages of cultural development, living under similar geographic conditions. If these people of different ethnic stocks but similar environments manifested similar or related social, economic, or historical development, it was reasonable to infer that such similarities were due to environment and not to race. Thus by extensive comparison, the race factor in these problems of two unknown quantities was eliminated for certain large classes of social and historical phenomena.

And here is another quotation from the opening paragraph of her book:

'Man is a product of the earth's surface. This means not merely that he is a child of the earth, dust of her dust but that the earth has mothered him, fed him, set him tasks, directed his thoughts, confronted him with difficulties that have strengthened his body and sharpened his wits, given him his problems of navigation or irrigation and at the same time whispered hints for their solution ….. On the mountains she has given him leg muscles of iron to climb the slope, along the coast she has left these weak and flabby, but given him instead vigorous development of chest and arm to handle his paddle or oar…..'

These quotations suggest two things: first, that her style of writing has a certain literary quality that makes reading it a delight, yet which might and sometimes does carry the theme beyond what sober judgment would permit; second, that the concept of the earth as the controlling factor in human life is carried beyond the possibility of objective verification. It is true that in combining the writing of all nations for example to illustrate her principles, she fell into an error not uncommon when deductive reasoning is followed- she failed to look carefully for evidences that contradicted her principles. Is it not possible to find examples of people who worship one God yet are not pastoral nomads? People who live in pass routes, she wrote, tend to become robbers of passing travelers. Then she presented case after case of people in pass routes who rob for a living. But she did not look for people in pass routes who do not rob, nor did she seek an explanation for robbers who do not live in pass routes.

Nevertheless, two other observations must be made. First she was very careful to make the point that the environment does not control human action: only that under certain circumstances there is a tendency for people to behave in a predicable ways which is a verbal approach to probability theory. Second, there are some brilliant passages where her insight is even now thoroughly relevant. Her "islands of ethnic expansion and islands of ethnic retreat" offer an important modification for the contemporary theory of innovation dispersal.

Semple was an enormously persuasive teacher. Generations of American geographers were brought up to believe these teachings. During the time that she lectured at Chicago and later at Clark University, a large number of future geographers passed through her classrooms. It is easy to condemn her for presenting concepts that have not withstood the test of time but she must be appreciated for kindling among her students an enthusiasm for the broad view of the earth as the home of man.

In 1911 Semple started to work on the geography of Mediterranean region. Over the period of twenty years she was a frequent visitor in the countries bordering the Mediterranean. In 1915 she published the first of numerous articles on different aspects of the region. Her papers dealt with Mediterranean agriculture, the relation of climate to religion and the geographic basis of Mediterranean trade. All of this work was brought together in her last great book that was published only a few months before her death

5.4 CONTRIBUTION OF BRITISH GEOGRAPHERS (HALFORD J MACKINDER, CHRISHOLM)

GEOGRAPHICAL THOUGHT IN MODERN PERIOD IN GREAT BRITAIN

Geography started its growth in the universities in Great Britain after the appointment of Halford J. Mackinder at Oxford in 1887 but the period of major expansion came after 1900. In the 19th century British geography as taught in the schools was generally considered to be dull and laborious subject. Uninspired and untrained teachers presented pupils with list of places and products to be memorized. In the universities geography was offered by geologists, and lectures on geography as a background for understanding the course of history were given by historians.

19th century Britain, however, had that remarkable lady Mary Somerville. A self made geographer, who read widely and who was in close touch with the leading scholars of her time. She was far in advance of her contemporaries in her understanding of the nature of geography as a field of study. After two earlier books on celestial mechanics and on the physical sciences, she started on her work ***Physical Geography*** in 1839. The first edition of Physical Geography came out in 1848. In it she described the surface features of the land, the oceans, the atmosphere, plant and animal geography and man as an agent of change of the physical features of the earth. She worked on many revisions during her life time, adding new materials as they became known to her, including materials contained in the Physical Atlas by Keith Johnston based on the

Berghau's Atlas. Yet her book seemingly made little impact on geography in Britain. It struck a responsive chord in faraway Vermont. George P. Marsh found her observations about men's destructive used of the earth very stimulating and he made frequent references to her work.

Another British scholar who made important contributions to geography was Francis Galton, better known for his studies of heredity. After travelling in South Africa, he served on the council of the Royal Geographical Society from 1854 to 1893. His interests in the study of British weather led him to make the first British weather map in 1861 based on reports from eighty stations. He was the first to point out the weather pattern that could be revealed by plotting lines of equal air pressure on a map (isobars) and he was also first to recognize the nature of air circulation around a centre of high pressure. The first weather map to be published in a newspaper was one that he prepared for the Times (April 1, 1875).

At the time when Somerville and Galton were making their contributions, there was no professional body of scholars to carry their ideas on because there were no clusters of geographers in the universities. The introduction of geography into the British Universities resulted chiefly from the efforts of Royal Geographical Society. In 1884, John Scottt Keltie, then Secretary of the Society, was asked to make a survey of the status of geography in Great Britain and to compare it with the position of geography in other countries. He reported that in the other countries of Europe and in America there were professors of geography in most of the universities and that Britain compared unfavorably with the rest of the world in this field. In 1886 the President of the Society wrote to the authorities of Oxford and Cambridge, pointing to the findings of the survey and urged that something to be done about it. The result was the appointment of a geographer at Oxford in 1887, at Cambridge in 1888 and thereafter at almost all of the other British Universities.

Halford J. Mackinder:

H.J. Mackinder became the grand old man of British geography who led the way in the expansion of geography in the Universities. He was appointed reader in geography at Oxford in 1887. Mackinder's training was in natural science and history. He reached at the conclusion that history without geography was mere narrative and that since every event occurred in a particular time at a particular place, history and geography, which deal respectively with time and place, should never be separated. In a lecture delivered before the Royal Geographical Society (1887), he identified geography as the field that traces the interactions of man and his physical environment. He said, "we hold that no rational political geography can exist which is not built upon and subsequent to physical geography".

Mackinder was less interested in the details of man-land relations than he was in developing a world view. His first major work, Britain and the British Seas (1902) was an example of regional study in a global context. Two years later in 1904, he gave the now- famous lecture at the Royal Geographical Society on "***The Geographical Pivot of History"***. In this he announced the heartland theory as a concept of global strategy. His warning regarding the challenge to sea power by land power fell on deaf years in a Britain security in control of the

world oceans in 1919, however, people were ready to listen when he elaborated the same theme in ***Democratic Ideals and Reality.***

Mackinder's heartland theory was nothing less than a model to place the broad sweep of world history on the stage provided by global geography. He identified a ***world island*** consisting of continents of Africa and Eurasia. The most inaccessible part of the world island he called the heartland, throughout which the rivers flow either into island seas such as the Caspian, or into the frozen Arctic ocean. And extending like a peninsula from one end of the heartland are the deserts of Arabia and Sahara. In contrast to this curving area of generally thin population and difficult accessibility from the oceans are the coastland on either side: the European coastland and the so called monsoon coastland, both easily accessible from the sea. In these coastlands is found most of the world's population.

Africa south of Sahara, Mackinder identifies as a southern heartland of slight strategic importance but like the interior of Eurasia, inaccessible from the sea. Mackinder's main theme has to do with the repeated invasions of the coastlands by conquerors coming from the heartland. He went back to the prehistoric migration of mankind, spreading from the heartland in three directions: i) southeastward into the monsoon coastland and onto Australia ii) northeastward through Siberia and iii) Alaska into the Americas and westward into the European coastland and the southern heartland of Africa. Repeatedly throughout the course of history the earlier migrants along these routes were invaded and conquered by migrants who came later. The coastland, he insisted had always proved vulnerable to attack from the heartland and the heartland remained invulnerable because sea-power could be denied access to it.

In 1919 after World War I, Mackinder argued for the formation of a buffer-zone of small states to keep Germany and Russia apart. He summarized his view of global strategy with the famous dictum:

i) who rules east Europe commands the heartland;
ii) who rules the heartland commands the world island;
iii) who rules the world island commands the world.

If Germany and Russia could form an alliance or if Germany could conquer Russia, the stage would be set for world conquest. These were the ideas that were embraced by German geo-politician, Karl Houshofer.

Like all theoretical models that generalize geographic observations, Mackinder's heartland concept helps people to understand complex sequences of events by oversimplifying them. The model is based on the selection of a few facts of location and a few sequences of events and ignores complicating details it cannot provide a precise blue print of things to come, yet it cannot be entirely ignored. In terms of its premises, its deductions are startlingly clear.Mackinder himself was concerned with the global view but most of his contemporaries and his followers turned their attention to the analysis of man-land relations in small areas.

George Goudie Chisholm (1850-1930):

One of Mackinder's contemporaries who also contributed to the development of British geography was George G. Chisholm. He was born in Edinburgh and educated at the high school and university in that city. He began his career in London, but returned to the university of Edinburgh as the first Lecturer in geography in Scottland (1880), securing the recognition of geography at that University and in the country. He was respected by his students for his extraordinary depth of knowledge and kindness. In 1921, he was one of the first to be appointed to the senior position of reader by the University and he was also secretary to the Royal Scottish Geographical Society for fifteen years. He was a pioneer in the field of commercial geography and his ***Handbook of Commercial Geography*** (1889) became a classic that appeared in many revised editions. In it, he brought together a vast amount of information about world trade and he also formulated the basic theory describing such trade. The eleventh edition of starts as follows:

'The great geographical fact on which commerce depends is that different parts of the world yield different products or furnish the same products under unequally favorable conditions. Hence there are two great results of commerce: i) to increase the variety of commodities at any particular place and ii) to equalize more or less, according to the facilities for transport, the advantages for obtaining any particular commodity in different places between which commerce is carried on.

Huge Robert Mill outlined the contrast between Mackinder and Chisholm in the following words:

Mackinder was brilliant, brushing aside all irrelevances, sketching the broad outlines of science with a masterly hand and by his gifts of generalizations and exposition often suggesting new lines of research to the more pedestrian votaries of geography…….Chisholm was profoundly learned, laborious, accurate and meticulous in definitions and safeguarding of every detail.

5.5 CONCLUSION

The modern geography in both the countries i.e. in the U.S.A. and U.K. came into existence in the latter part of 19th century, when the departments of geography were established in these countries. The introduction and growth of geography in British Universities resulted chiefly from the efforts of the Royal Geographical Society whereas in the U.S. introduction and growth of geography in universities to a large extent may be attributed to the U.S. Geological Survey. William Morris Davis and Halford J. Mackinder were the pioneers in the field of geography in the U.S.A. and U.K. respectively. Davis who was a geologist by training contributed significantly in field of geography especially in geomorphology. His major contribution in the field of geomorphology was his 'geographical cycle'. His students such as Mark Jefferson and Ellsworth Huntington further advanced the field of geography in U.S.A. Mark Jefferson coined and identified the concepts of 'central places', the laws of 'primate city' and the 'civilizing rails'. Ellsworth Huntington is noted for showing "the effects of climate on human life". His famous works are '***Pulse of Asia***' (1907); '***Civilization and Climate***' (1915) and '***Principles of Human Geography***' (1920). Another American

geographer who contributed significantly during this period was Ellen Churchill Semple. She was the foremost female geographer of her time and a leading exponent of *environment determinism*. A pupil and follower of Ratzel, Semple further advanced his ideas. Her important works are '***American History and its Geographical Conditions***' (1903); '***Influence of Geographic Environment***' (1911), and '***The Geography of the Mediterranean Region, its Relation to Ancient History***' (1931).

In the United Kingdom Halford J. Mackinder is considered as the founder of the British School of Geography. He considered geography as a bridge between humanities and the natural sciences. He applied these concepts to the interpretation of world political affairs. In 1904, Mackinder formulated the concept of the '***Geographical Pivot of History***' which is also known as the '***Heartland theory of Mackinder***'. His other important works are '***Britain and the British Seas***' (1902), and '***Democratic Ideals and Reality***' (1919). George G. Chisholm a contemporary of Mackinder also contributed to the development of British geography. He was a pioneer in the field of commercial geography. His most important work is '***Handbook of Commercial Geography***' (1889), which is considered a classic.

5.6 SUMMARY

The modern period in the history of geographical thought began in the latter part of the nineteenth century in both of the countries viz. U.S.A. and U.K. with the establishment of departments of geography at Universities in these countries. Scholars of both the countries attempted to find out their own answers of the question: What is geography? In each of these countries distinctive national schools developed, depending on the answers given to the question concerning the nature of geography. The development of distinct geographical thought and perspectives may be attributed to the prevailing physical, socio-economic and political conditions in these countries during the latter part of nineteenth century and the earlier part of twentieth century.

5.7 GLOSSARY

1. Central Place : A term of city engaged primarily in the tertiary stage of production; A regional centre.

2. Environment determinism : The school of thought based on the belief that cultures are, directly or indirectly, shaped by the physical environment, that is cultures are molded by physical surroundings.

3. Geographical Cycle : The sequence of denudational processes and forms which in theory, exist between the initial uplift of a block of land and its reduction to a gently undulating surface or peneplain close to base level.

4. Heartland theory : A 1904 proposal by Mackinder that the key to world conquest lay in control of the interior of the Eurasia.

5. Primate City : A city of large size and dominant power within a country.

5.8 ANSWER TO CHECK YOUR PROGRESS

1. What are prerequisites for the creation of a professional field?
2. Why were the geographical schools developed in five countries (U.K., U.S.A., France, Russia and Germany) distinct and different from each other?
3. What were two advantages enjoyed by American Geographers that were not shared by European Geographers? And how these advantages contributed in the development of geographical thought in the U.S.A.?
4. Describe the initial phase of development of modern geographical thought in USA.
5. Briefly describe the contribution of W. M. Davis in the development of American Geographical thought.
6. Write short notes on the contributions of Jefferson, Huntington and Miss. Semple in the development of American school of geographical thought.

5.9 REFERENCES

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5.10 SUGGEST READINGS:

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5.11 TERMINAL QUESTIONS

1. Describe briefly the various phases of development of modern geographical thought in United Kingdom and United States of America.
2. Throw light on the contribution of H. J. Makinder in the development of British school of modern geographical thought. Also describe briefly his heartland theory.
3. Describe briefly contribution of G. G. Chisholm in the development of commercial geography.

UNIT 6 : RUSSIAN GEOGRAPHICAL THOUGHT

6.1 OBJECTIVES

After reading this unit learners will be able to understand the contribution of Russian and Philosophers' and their contribution in the development of Geography as a subject.

- The basic objective of the Russian geographical thought was to build the socialist economy and society. To achieve this objective they adopted quantitative techniques instead of regional science.
- They considered Geography as landscape science in which matter and energy are circulating and developing structure of great importance of crucial importance to man and society.
- The soviet geographer's main objective is to solve geographic deficiency on the ideological field.
- In the later parts of the 19th century, Soviet Union published many atlases, maps, and monographs.
- At present, Russian geographers are concentrating on the management of natural resources.

6.2 INTRODUCTION

The roots of the Russian geography are hard to trace. However, the school is believed to have evolved during the Age of Discovery. But, the major impetus came after the establishment of 'Imperial Geographical Society' in 1845, The Russian geography has a rich and valuable heritage and a long history of its development. It is an immense store of geographic facts. During its existence, Soviet geography has repeatedly enlarged its scientific heritage. It has gathered new factual materials, continued and enriched the progressive classic scientific trends and created new theoretical concepts which have developed on the basis of Scientific Marxism.

Russian had a long history of geographical work, including the production of maps and atlases and the writing of regional monographs. Russian geographers were influential in promoting geographical study of the new parts of the national territory. Because of the language barrier', an understanding of the importance of the work of the Soviet/Russian geographers and their predecessors was delayed in reaching the geographical scholars of Western Europe and America for many decades.

The exploration and mapping work were carried out mostly by Russians but with considerable assistance from skilled map-makers from the west. Peter the Great who ruled Russia from 1682 to 1725 encouraged Von Humboldt to explore the accurate geographical information to guide the east ward expansion of the Russian empire. He gave his support to exploring expeditions and to the publication of the results of their discoveries. The Southern part of European Russia was surveyed in the late 17th century and the resulting maps were published. In 1719, all official Russian map-making activities were placed under the first Russian

Cartographic office and frequently revised new information became available. The preparation of an atlas of Russia also came in 1734 with technical assistance from French cartographers. The basic objectives of the expeditions were to establish the location of rivers, coasts, mountains and to identify places where furs or precious metals could be found. The Academy of Sciences provided an institutional focus for the great variety of works which were geographical in purpose.

The Russian geographers adopted the idea of the division of European Russia into latitudinal zones of differing natural conditions North, Middle and South because before 1800 there were numerous regional descriptions in existence. Early in the 19th century, Russian geography had emphasis on regions as the basis of organization for geographical work and the study of these regions for practical purposes. In 1840's geography created a need for some kind of institution to provide a forum for the presentation and discussion of different kinds of studies dealing with the physical earth and its human habitants. After the establishment of Imperial Geographical Society in 1845, geography made tremendous studies in Russia. Many faculties, institutions and department of geography were established. The society also promotes the study of geology, meteorology, hydrology, anthropology and archaeology. The diverse specialities represented in the society were known collectively as the 'Geographical Sciences' (Hooson, 1968).

6.3 CONTRIBUTION OF RUSSIAN GEOGRAPHERS (PETRE PETROIVCH SEMENOV, V.V. DOKUCHAIEV)

Philosophy of Soviet Geographers:

The important events that have shaped the development of geography in Russia are:

Establishment of 'Imperical Geographical Society' in 1845,
The Great Russian Revolution of 1917 and the resultant political instabilities; and
The disintegration of U.S.S.R. into several independent nations in 1991.

Thus the years 1845, 1917 and 1991 may be considered as the important divides in the history of evaluation of geographical thought in Soviet Russia. Accordingly, the various phases of development into which the discussion is organized may be identified as follows:

i) Classical phase (< 1845);
ii) Pre-Revolutionary Phase (1845-1917); and
iii) Past Revolutionary Phase (> 1917-1991).

It is believed that the roots of the evolution of geographical thought lie in the Classical Phase, the maximum growth took place during Pre-Revolutionary Phase (1845-1917) in the soviet world.

Classical Phase (< 1845):

The geographical tradition makes its beginning in Russia before 1845. The important developments of this phase include the following:

Eastward expansion of the Russian territory, under the regime of Peter the Great, who ruled during 1682-1725.

The beginning of map-making activities in 1719 with the help of French Cartographers: the first Cartographic Office being started under the direction of Ivan Kinlov who was also the first Russian head of this office.

The establishment of Department of Geography in the Russian Academy of Sciences in Moscow in 1758 under the leadership of Lomonosov, who was also one of the founder members of the Moscow state university.

The vast expanse of the Russian empire was a most potent factor in the development of geography as an institutionalized discipline (Dikshit, 1997, 94). Peter the Great, who ruled Russia from 1682 to 1725, appreciated the need for accurate geographical information to facilitate the eastward march of the empire. State supported expeditions were sent to the east and the north to explore the vast uninhabited streches of territory and generous funding was provided to prepare maps of the explored regions.

In 1719, all official Russian map-making activities were placed under the direction of 'Ivan Kirilov, the first Russian to be appointed as the head of the Cartographic office. He supervised the preparation of an atlas of Russia which was published in 1734. In the preparation of the atlas, he took technical assistance of French cartographers.

The Great Russian encyclopaedist M.V. Lomonosov (1711-1765), who was one of the founding members of the Moscow State University, insisted that the exploring parties be asked to make systematic collection of information about the physical character of the land, the population and the conditions of the economy. In 1758, Lomonosov was appointed the head of the world's first officially named Department of Geography which was in the Russian Academy of Sciences.

The recognition of geography department in the Russian Academy of sciences gave considerable academic prestige to geography as a useful field of scientific learning. Under the patronage of the Academy, the Department of Geography launched several schemes of regional surveys and mapping of data.

Establishment of the Department of Geography in the Russian Academy of Sciences in 1758, much before the birth of the founders of modern classical geography, Humboldt and Ritter, showed that the tradition of geography in an organized way first developed in Russia rather than in Germany (Adhikari, 1992, 169). But the impact of the contemporary Russian geography was not as strong as that of German. This was primarily due to the language barrier. However, some contacts did develop between these two Schools. It was through the works of Auton Friedrich Busching (1724-1793), the German scholar, who had a profound, effect on the Russian geographic heritage.

Busching was a geographer and theologian. He was one of the creators of modem geography. He was professor of philosophy in Gottingen, a Protestant minister and was director of a Gymnasium in Berlin. He advocated the collection of data similar to the kind of data now used in political and economic geography. The most important of' his many works is Neue Erdbeschreibung (10 vol., 1754-92; Vol. XI was written after his death). This was the most complete and scientific work of its kind and was translated into many languages. Its six volumes, describing the geography of Europe, were translated into English as A New System of Geography (1762). Busching helped to develop a scientific basis for the study of geography by stressing statistics 'rather than descriptive writing.

Busching was a pastor of a German Lutheran Church in St. Petersburg from 1761-l765 (Dikshit, 1997, 95). Portions of his New Geography dealing with Russia were translated into Russian and his suggestion that the imperial territory be divided into natural regions in order to facilitate administration was quickly adopted so that by 1800, regional descriptions of a number of the regions had already been published.

By the beginning of the 19th century Russian geography had already developed two distinguishing characteristics. The first was an emphasis on regions as the basis for organizing geographical work and the belief that regions are concrete entities that can be objectively defined. Second was the continued use of geography to include a wide variety of specialties. This was sharply contrasted to the contemporary trend in Germany where classical geography was torn apart into physical and human, each establishing its separate existence.

In Russia, the classical tradition of geography as a field of study dealing with the physical environment of the earth and its human inhabitants had continued. To formalize this structure of geography, the Imperial Geographical Society was founded in l845. The Society was charged with promoting work alongside geography, in geology, meteorology, hydrology, anthropology, and archaeology. The several specialties covered under the Society were collectively identified as “the Geographical Sciences”. Unlike in Germany where the deaths of Humboldt and Ritter in 1859 were marked by a break in the continuity of scientific geographical study, in Russia the developments continued unabated. For this reason, in the case of Russian geography, it is difficult to pick up any single scholar as the “grand old man of Russian geography” (Dikshit, 1997, 95).

Thus, the beginning of geography in Russia was made with empirical approach. These developments provided a conceptual framework for further growth of our discipline with a positive outlook. And after 1845, when there came up the ‘Imperial Geographical Society?, the progress was more steady and widespread all over the region.

Pre-Revolutionary Phase (1845-1917):

The earlier part of this phase coincides with the period of Environmental Determinism in Germany, the middle part with that of Davisian School in America and the later part with that of Rise of Humanistic Approach (Possibilism) in France. Although the professional contacts with the Western Schools of Thought had already developed during the 19th century, Soviet School

was the least influenced. It shaped itself in a different way. And the philosophy of environmental determinism did not have much impact on Soviet Geography during this period when it was at peak in German and American Schools of Thought.

Certain persistent characteristics of Russian geography in the early 19th century may be identified (James and Martin, 1981, 225). These included: emphasis on regions as the basis of organization for geographical works that the regions are real entities that can be objectively defined; the study of these regions was undertaken for practical purposes i.e. the emphasis on the social relevance of these regions, a form of applied study. While classical geography was undergoing analysis in Germany as each academic discipline sought to establish its separate existence but in Russia the tendency was for scholars with diverse interests to come together as geographers. In 1840 this created need for some kind of institution to provide a forum for the presentation and discussion of different kinds of studies dealing with the physical world and its human habitants. In 1845, the Imperial Russian Geographical Society was founded by Arsenyev. The great professionalization came in Russian geography after the establishment of Imperial Geographical Society in 1845. This society promoted what has been collectively called as 'geographical sciences' including geography with its sister disciplines (geology, meteorology, hydrology, anthropology, archaeology, etc.).

The contemporary Russian Tsar, like Peter the Great, also recognized the vital importance of having accurate geographical information about the virgin land, islands of Siberia across the Urals and under his royal patronage several expeditions to Siberia and Far East were organized. The German scholar Alexander von Humboldt was entrusted by the Russian Tsar to explore the virgin lands across the Ural Mountain. He explored the virgin lands of Siberia as far as the borders of China. He visited the shores of the Caspian Sea. In course of his expedition, Humboldt observed that the temperatures varied at the same latitude in accordance with the distance from the ocean. The Russian Tsar was so much influenced by Humboldt that he agreed to set up weather stations where weather data could be recorded. By 1935 the Russian network of recording stations extended all the way from St. Petersburg to an island off the Alaskan mainland. On the basis of the weather data collected at the recording stations, Humboldt deduced 'the concept of Continentality'. This heritage that Humboldt founded had a profound effect on the contemporary Russian geography, and empirical studies of areal phenomena with the positivist approach formed an inevitable symbiosis for the conceptual framework.

Most of the Russian geographers of the pre-revolutionary period seemed to have had direct or indirect contact with the professional German geographers. Some of them studied in the German universities and were pupils of Ritter, Richthofen and Ratzel. But the impact of German geographical ideas had produced quite different results in Russia. Russian geographers of the pre-revolutionary period always believed in the mechanical explanation rather than in teleological explanation where the phenomena and observation were understood as outcomes of prime causes.

Pre-revolutionary Russian geography was largely centred on the works of Petre Petrovich Semenov, Alexander lvanovitch Voikov, V.V. Dokuchaiev and D.N. Anuchin. They formed the

true heritage of the Russian Geography that continued its existence even after the October Revolution of 1917.

Petre Petrovich Semenov (1827-1914)

He a great traveller is known to have a distinct humanistic approach to contemporary Soviet geography which emphasized on Social Equality. His works are available in the form of regional monographs. In his works, he handled geography as a discipline of practical utility i.e. as a means of removing disparities in development and decreasing the poverty of rural people in Russia.

Semenov is often regarded as the 'grandfather' of the pre- revolutionary Russian geography who acted as bridges between the scholars of the classical period such as Lomonosov, Busching and Arsenyev and the scholars of the modern period. He attempted to build his own conceptual framework. In 1853-54, Semenov attended Ritter's lectures at Berlin and worked with Richthofen to prepare for exploring work in Central Asia. He was more influenced by Richthofen than by Carl Ritter. Ritter's teleological philosophy made no appeal to him (Adhikari, 1992, p. 171). In 1858 he explored the Dzungarian Basin bordering Altai Mountains to the North and the Tien-Shan Mountains to the South. In 1888 he discovered the desert of Turkistan, east of the Caspian Sea. In 1870's he became the director of the Geographical Society in St. Petersburg.

Semenov is credited with a distinct humanistic approach in the contemporary Russian geography that emphasized questions of social inequality. He developed a 'welfare paradigm' to social relevance in geography that-stressed the quality of life. The empirical identification of social inequality in terrestrial distribution involved developing social indicators such as poverty in rural areas, hunger and crime. His empirical generalizations on social relevance appeared to have a naturalistic pragmatic trend that had a profound effect on the future paradigm of Russian geography.

His regional monographs including a five-volume work on Russia (Geographical and Statistical Dictionary of the Russian Empire, 1863-68) dealt with "the causal interrelations among the diverse things in particular areas". The work has been described as a perceptive blend of natural, historical and economic phenomena. In 1871, Semenov also published a general work on the historical geography of Russian settlement. He was also a member of the committee that planned and directed the first Russian Census of Population in l897. He is often credited with having set a distinctive stamp on Russian geography giving it unity in spite of the variety of its parts and pointing it toward practical and remedial objectives.

Professionalism in pre-revolutionary Russian geography 'seemed to have been initiated by three outstanding 'followers of Semenov who left their distinct imprints on the contemporary methodologies. They were Alexander lvanovitch Voikov, V.V. Dokuchaiev and D.N. Anuchin. The first two are credited with innovative studies of the climate and soils, and Anuchin tried to establish geography as a major university subject and drew up the curricula for the primary and secondary schools. Besides, as regards the pre-1917 phase in the development of geography in

Russia, there was Peter Kropotkin who became influential because of his concept of geography as social ecology and his concept of 'mutual aid'.

V.V. Dokuchaiev (1846-1903)

He was the first professor of geography in Russia, appointed at St. Petersburg in 1885. He specialized in physical geography. Dokuchaiev is believed to have developed a distinct heritage of soil geography at St. Petersburg in pre-revolutionary Russia and the tradition he established was carried forward by his pupils.

Dokuchaiev's pioneering work is in the field of soil science, including the study of soil formation processes and soil layers or horizons. His soil studies followed systematic approach. He observed that different kinds of soil could be identified by looking closely at the layers or horizons, which differed because of differences in the soil-forming processes. Soil is formed by water percolating through the loose material at the surface and carrying away soluble minerals, and soil is also formed by mixture of organic matters from plants and animals with the upper horizon. According to Dokuchaiev, the 'soil' "reflects the extraordinary complex interaction of climate, slope, plants and animals with the parent material derived from the underlying geological formations". A soil that has been exposed to all these conditions for a long time would more closely reflect the complex of climate and vegetation than it would the parent material. His generalizations were quite different from those of German and French soil scientists, who conceived of the soil as a reflection of the underlying geological formations. The generalization of Dokuchaiev was essentially based on empirically observed arrangement of climatic zones that could produce observations soil differences over a large tract of plain.

Dokuchaiev like his predecessor Voikov, also attempted to adopt a holistic approach to explain the very concept of man as a major agent of change on the surface of the earth. Especially in the steppe region, he observed that the genre de vie of the people that brought about the transformation of natural zones into agricultural regions. Dokuchaiev's concept of natural zones transformed by man resembles Schluter's concept of the landscape. In fact, geography to him appeared as 'landscape science' (Landschaflovedenie).

Undoubtedly, Dokuchaiev was one of the leading professional geographers of Russia and deserved major place among the world's leading geographers of his time because of his contributions to systematic soils studies. Since all of his works were written in Russian, his major ideas could produce little impact on West European geographers. It was only through the translation of his works into German and French after his death that he came to be known beyond the frontier of Russia as one of the founders of applied soil geography.

Others

A.L. Voeikov (1842-l9l6) studied at Berlin, Gottingen and Heidelberg. His doctoral dissertation "Direct Insolation in various Parts of Globe" was accepted at Gottingen University. Voeikov was essentially a physical geographer. His area of interest covered climatology, agriculture and environmental problems. Voeikov founded the Main Geophysical Observatory (MGO) in 1849

and it is the oldest meteorological research institution in Russia. He studied the earth's heat and water balances and is credited with the expertise in snow-science. His studies of climatology were directed to the improvement of agriculture. He laid down the foundation of systematic agro-climatic geography through elaboration of the comparative method as expounded by Carl Ritter. His concern with the improvement of Russian agriculture led him to compare the farm practices in places similar to those of European Russia. It was because of his suggestions that the Russians first introduced tea-plantations .in Georgia, cotton in Turkistan (Turkmania) and wheat in Ukraine.

His book 'The Climate of the World' was published in Russian in 1884 and a monograph 'Distribution of Population on the Earth in Relation to Natural Conditions and Human Activities' was published in 1906. Both of these works were later translated into German. He was a regular contributor to the French periodical, Annals de Geographie.

On man-environment relationship, Voeikov followed the tradition of Comte de Buffon that man was an agent of destruction. The positivist approach was inherent in his report on the destructive effects of man's use of the land. He pointed to the over-grazing of some of the Russian steppes with a consequent acceleration of gully erosion. The cleaning of forests in the North could produce a change in the climate toward increasing drought. He was always enthusiastic about what irrigation could do to improve the productivity of arid or semi-arid lands. Peter Alexeyevich Kropotkin (1842-l92l) was one of Russia's foremost anarchists and one of the first advocates of what he called "anarchist communism". The model of society he advocated for most of his life was that of a communalist society free from central government Because of his title and his prominence as an anarchist in the late l9th and early 20th centuries, he was known by some as "the Anarchist Prince". He left behind, many books, pamphlets and articles. The most prominent being his works The Conquest of Bread and Fields, Factories and Workshops and his principal scientific offering, Mutual Aid: A Factor of Evolution. He was also a contributor to 1911 Encyclopedia Britannica.

Kropotkin was writing during the period when social Darwinism was in ascendancy and no intellectual could escape the impact of evolutionary theories. Kropotkin's view of nature was based on three premises namely, nature is organic (i.e. holistic); it is historic; and it is spontaneous. His originality lay in the manner in which he interpreted the organic (holistic) characteristics of nature, especially in relation to man's place in the web of nature. This theme was the key idea and the central focus of his theory of and his book on Mutual Aid. He demonstrated that both cooperation and competition are present in nature simultaneously as also in the case of human communities. Thus, "man is no exception in nature", wrote Kropotkin, since the same forces operate in the "living world of nature". In his view, therefore, it was erroneous to interpret biological evolution in terms only of struggle and competition between species as the social Darwinists insisted on doing.

In course of developing his concept of "Mutual Aid" among organisms and human groups, Kropotkin laid foundation for a radical theory of social ecology. He viewed nature and social groups as organic wholes so that the action of one part affected all the parts. He considered

social groups as being subject to many of the same processes as are found in organic nature. In a paper entitled "What Geography Ought to Be?" (1885), published as part of a larger report on geographical education in Britain, Kropotkin had made a forceful plea for making the content and methodology of academic geography socially relevant.

Thus, during Pre-Revolutionary Phase geography in Soviet World was propagated as a discipline at academic and administrative levels both. During this phase, geography witnessed a steady progress in an indigenous manner with its basic branches being well established. Although his maximum contribution was made to physical geography. The foundation was also strongly laid for the humanistic and welfare geography during this period. The fields of Cartography and regional geography were the other areas of contribution by the scholars of pre-revolutionary phase. However, this development was interrupted by the rise and spread of communist philosophies after the 'Great Russian Revolution".

Post-Revolutionary Phase (19I7-1991):

The communist thinking dominated the Russian Society after the Great Revolution of 1917, following the principles of the Russian and German philosophers like Lenin, Marx and Engels. Vladimir Llyich, popularly known as Lenin (1870-1924) was a Communist revolutionary of Russia. The leader of the Bolshevik party, the first Premier of the Soviet Union and the main theorist of what has come to be called Leninism. Friedrich Engels (1820 - 1895) was a 19th century German political philosopher who developed communist theory alongside his better-known collaborator Karl Marx. Along with Engels, Marx took pan in the political and .philosophical struggle of his times and co-authored the Communist Manifesto. Karl Heinrich Marx (1818-1883) was an immensely influential German philosopher, political economist and socialist revolutionary. While Marx addressed a wide range of issues, he is most famous for his analysis of history in terms of class struggles. The opening line of the introduction to the Communist Manifesto states that "The history of all hitherto existing society is the history of class struggles."

Communism is a political ideology that seeks to establish a future classless and stateless social organization based upon common ownership of the means of production. It can be classified as a branch of the broader socialist movement. Communism also refers to a variety of political movements which claim the establishment of such a social organization as their ultimate goal. There is a considerable variety of views among self-identified communists. However, as far as Karl Marx is considered, he held that society could not be transformed from the capitalist mode of production to the communist mode of production all at once but required a state transitional period.

Socialism, on the other hand, refers to a broad array of doctrines or political movements that envisage a socio-economic system in which property and the distribution of wealth are subject to social control. As an economic system, 'socialism is usually associated with state or collective ownership of the means of production. This control, according to socialists, may be either direct, exercised through popular collectives such as workers, councils or it may be

indirect, exercised on behalf of the people by the state. The modem socialist movement had its origin largely in the working class movement of the late 19th century. In this period, the term "socialism" was first used in connection with European social critics who condemned capitalism and private property. For Karl Marx, who helped establish and define the modern socialist movement, socialism implied the abolition of markets, capital and labour as a commodity.

Marx and Engels regarded themselves as "socialists". For Marxists, socialism is viewed as a transitional stage characterized by state ownership of the means of production. They saw this stage in history as a transition between capitalism and communism, the final stage of history. For Marx, a communist society describes the absence of differing social classes and thus the end of class warfare. According to Marx, once private property had been abolished, the state would then "wither away" and humanity would move on to a higher stage of society, communism.

Lenin is known as an 'Economic Determinant'. For him geography could serve the necessary foundation on which the design of a new kind of economy had to be based. Under his leadership, applied aspect of geography became very strong in post revolutionary phase in Russia. According to him, the most important product of geographical study was the identification of rational regions within which the segments of new economy could be constructed. Thus, in the 1920s, the Soviets seemed interested in 'economic regionalization' of the USSR.

As far as the philosophical developments in the first half of the 20th century were concerned, they were parallel to that in France and Germany. But, the Russian ideology was not in favour of the doctrine of Determinism. Instead, the stress was on Human studies and with an economic bias. In other words, the dichotomy of physical versus economic geography was quite strong. And Economic Geography emerged as an important branch of study.

The continued emphasis on economic regionalization was one of the distinctive aspects of geography in the Soviet Union 'immediately after 1917. The State Planning Commission (GOSPLAN) was established in 1921 to prepare the regional plans. The GOSPLAN divided Soviet Union in 21 regions and proceeded to a detailed study of each of them. In this the geographers played an important role along with the economists and engineers. Moreover, the geographers also helped in the selection of industrial location and resource development. Various industrial regions were also planned, e.g. Ural-Kuznetsk and Dnieper Basin Industrial Regions.

In 1950s onwards, the focus of geographical studies was found specifically on Resource Planning. This increased the importance of physical geography. The study of economic or resource geography is baseless without physical geography. This was evident in the following developments:

- Soviet geographers developed the sound theoretical principles of forecasting and a typology of climatic phenomena based on dynamic methodology.
- They studied the radiation budget and moisture cycle and their role in the formation of climates.
- They worked on the theory of water budget, the relationship between surface water and soil water.

- Soviet geographers developed the theory of glacial processes, based on the study of heat and mass exchange in various types of glaciers.
- Geomorphologists studied the crustal movements and developed the morpho-structural approach to geomorphology.
- Soil Scientists identified many soil types.
- Bio geographers gave emphasis to ecological approaches.

By 1960s, however, the dichotomy between Economic and Physical geography got resolved. The Soviet Scholars started believing in Unified Geography.

Till 1960s, Soviet geographers have been concentrating on the management of natural resources. Their efforts were directed towards solving the related regional problems and the management of environment. The Soviet leaders, like Leonid Brezhnev, were interested in seeking answers to the questions related to the man's interactions with the natural environment and encouraged studies, which contained practical recommendations in this direction. They promoted the research based on the study of development trends in Soviet Society and its productive economic forces. The issues related to environment, society and industrial economy were largely stressed upon the writings of geographical nature.

Most recently, i.e. before disintegration in 1990s, the geographical science in the Soviet Union manifested considerable interest in the concept of Territorial Industrial Complexes (T.I.C.). The Territorial Industrial Complex is the concept of planned organization of the large industrial units. Moreover, the Soviet geographers were concentrating on environmental problems. They were trying to find out new methods for consolidating harmonious relationships between society and nature. Another sphere in which the Soviet scientists were doing constructive research was the study of the theoretical foundation of recreational geography and the establishment and development of recreational zones near large towns.

6.4 CONCLUSION

To conclude, since very beginning Geography has been put in the academy of sciences in Soviet Union. Geography remained, more or less, a well understood discipline throughout in terms of its content and methodology. The dichotomies remained for a very short period and were soon resolved. The Russians, therefore, provided a very sound base to geographical thinking. Soviet geographers were highly conscious about man-environment relationships. They always emphasized on the applied aspect of geographical studies. The regional and economic geography were the most sought after fields of geographical study in Soviet Russia. Since the Russians adopted a more practical approach, the theoretical and philosophical aspect of geography always remained poor here. In brief, the Russian geographers, together with experts of other sciences place sharp focus on the society's productive forces and have become an important factor in the development of production enterprises, planning, management etc. Thus, geography is playing a very vital role in judicious utilization and conservation of natural resources to provide more amenities to the society.

6.5 SUMMARY

Geographical science in Russia today manifests considerable in the concept of territorial industrial complexes (TIC). This concept is planned organization of large industrial units. Moreover, the Russian geographers are concentrating on environmental problems. They are trying to find out new methods for consolidating harmonious relationship between society and nature. Another sphere in which they are doing constructive research is the study of the theoretical foundation of recreational geography. The establishment and development of recreational zones near large towns is an important move to counter the harmful effects of urbanization. Geographers are doing constructive research for the betterment of society with limited natural endowments. The constructive research has to be based in a comprehensively understanding of the fundamental laws underlying the organization and functioning of natural systems, since the introduction of new technology into these systems meamt not disrupt natural processes, rather serve purposefully to regulate such processes and strengthen those of them which enhance the overall quality of environment and its resources (Gerabemov, 1981, 247)

6.6 GLOSSARY

- **Cartography**: the art and science of map-making.
- **Chorology**: the study of areal differentiation of the earth surface.
- **Cultural Landscape**: Landscape developed by man.
- **Ecology**: The study of interrelations between organism and their biotic and a biotic environment.
- **Environmental Determinism**: The doctrine that human activities are controlled by environment.
- **Geography**: As the study of earth's surface as the space within which the human population lives or as the study of earth as the home of people.
- **Morphology**: the science of forms (Landforms).
- **Paradigm**: The working assumptions procedures and finding routinely accepted by a group of scholars, which together define a stable pattern of scientific activity.
- **Region**: a differentiated segment of earth surface or homogeneity in area.
- **Regional Geography**: the study of the geography of regions.
- **Resource**: a concept employed to denote sources of human satisfaction, wealth or strength.
- **Social geography**: the study of social relations in space and the spatial structures that underpin those relations.
- **Thematic map**: a map that depicts statistical variations of objects in space.
- **Time geography**: an approach in contextual theory originally developed by Hager stand and his associates in the University of Lund, which conceives of time and space as providers of 'room' for collateral processes.

6.7ANSWER TO CHECK YOUR PROGRESS

1. What are the basic objectives of Soviet geography?

2. Give the reasons, which encourage the Russian geographers to develop geography.

3. Examine the views of P.P Semenov.

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6.10 TERMINAL QUESTIONS

1. What are the major events that shaped the development of geography in Russia?
2. Evaluate the contribution of V.V Dokuchaiv in the evolution of Russian Geography.

BLOCK 3 : MODERN APPROACHES

UNIT 7 : QUANTITATIVE REVOLUTION AND CHALLENGES

7.1 OBJECTIVES

Main objective of this unit is to understand the advent and development of Quantitative Revolution (QR) in geography. You have already learned about various schools of geographical thought based in various countries such as France, Germany, America, Britain as well as Russia. You are also aware of all the prominent geographers and their contributions to geographical studies in the above mentioned countries. Now we would start with modern approaches to the study of geography, starting with QR. In this unit, we would start with a brief account of some of the most prominent schools, approaches and paradigms in geography before the advent of QR in geography. After that, we would learn about the influence of QR on geographical studies, its advantages, disadvantages and the challenges faced by geography during QR.

7.2 INTRODUCTION

Traditionally geography was considered as the study of earth's surface and providing descriptions about all its physical aspects. Geography for more than two hundred years was confronted with the problems of generalization and theory building. All other social and physical sciences have a long tradition of theory building. Especially after the Second World War, geographers of the developed world realized the significance of using mathematical language rather than the language of literature in the study of geography. As a consequence, descriptive geography was discarded and great stress was given on the formulation of abstract models. Mathematical and abstract models require the use of sophisticated statistical techniques. "This diffusion of statistical techniques in geography to make the subject and its theories more precise is known as the 'quantitative revolution' in geography" (Husain 2004, p-315). "Now geography is concerned with providing accurate, orderly and rational descriptions and interpretations of the variable character of the earth surface" (Holt-Jensen 1981). As Yeats puts it, "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". In order to fulfil this objective geographers started to apply quantitative tools and techniques which gained momentum during 1960's. Quantitative revolution brought about changes it the methods and techniques of geography as various quantitative techniques and general system theory were used extensively in geographical enquiry.

QUANTITATIVE REVOLUTION: HISTORICAL BACKGROUND

Quantitative revolution was a major paradigm shift in geographical studies. To understand the historical context of quantitative revolution in geography, we must first go through the then existing paradigms and research methodologies of the discipline. A brief account of different paradigms in geography is provided here which would aid you in understanding various events and processes which led to the paradigm shift to QR.

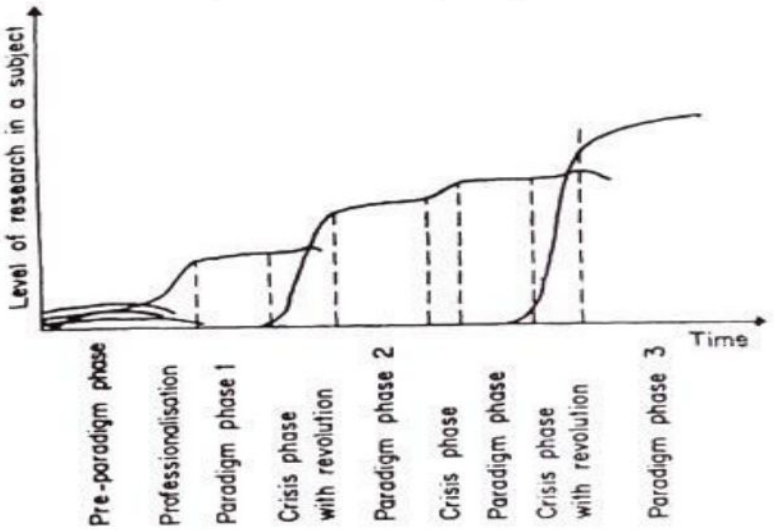
Kuhn's Paradigm:

Thomas Kuhn, American historian of science, postulated a very important theory about the growth and development of science. According to Kuhn, scientific enquiry is not a well regulated activity where each generation automatically builds upon the results achieved by earlier generation. Rather, it is a process of varying tension in which tranquil periods characterised by steady accretion of knowledge are separated by crises which can lead to upheaval within subject disciplines and breaks in continuity. In order to elucidate this process of development of science, Kuhn (1962) prepared a model which he termed as the 'paradigm of science'. He defines paradigm as "universally recognised scientific achievements that for a time provide model problems and solutions to a community of practitioners". Haggett defines them "as a kind of super model". In other words, a paradigm is "a theory of scientific tasks and methods which regulates the research of most geographers or where there is conflict between paradigms of a group of geographers. The paradigm tells researchers what they should be looking for and which are in this particular case 'geographic'."

The Kuhn Cycle is a simple cycle of progress described by Thomas Kuhn in 1962 in his seminal work- 'The Structure of Scientific Revolutions'. In his work, Kuhn challenged the world's current conception of science, which was that it was a steady progression of the accumulation of new ideas. In a brilliant series of reviews of past major scientific advances, Kuhn showed this viewpoint was wrong. Science advanced the most by occasional revolutionary explosions of new knowledge, each revolution triggered by introduction of new ways of thought so large they must be called new paradigms. From Kuhn's work came the popular use of terms like "paradigm", "paradigm shift" and "paradigm change". The Kuhn Cycle is preceded by the Pre-science step. After that the cycle consists of the five steps as shown in figure 7.1.

Kuhn advocated that the development of science consists of pre-paradigm phase, professionalization, paradigm phase 1, crisis phase with revolution, paradigm phase 2, crisis phase, paradigm phase, crisis phase with revolution, paradigm phase 3, and so on and so forth. The concept, geographically plotted by Henriksen (1973) depicted that scientific knowledge progresses and develops like a plateau. There are sudden upheavals and then abrupt rise which is followed by smooth and slow progress. The first phase, i.e. the pre-paradigm period, is marked by conflicts among several distinct schools which grow around individual scientists. This period is also characterised by a rather indiscriminate collection of data over a very wide field and by a low level of specialisation. This period is full of communication among various schools of thought and with other scientists and laymen. One school of thought does not consider itself to be any more 'scientific' that the other.

Figure 7.1: A Graphical Interpretation of Kuhn's Theory of the Development of Science (after Henriksen, 1973).



From the pre-paradigm phase, scientific development marches and enters into professionalization. It takes place when one of the conflicting schools of thought begins to dominate the others and thus a clear answer to the questions raised is given. A particular school of thought may become dominant because it develops new methods or puts questions which come to be regarded as more interesting or significant. Kuhn argues that mathematics and astronomy left the pre-paradigm phase in antiquity whereas in parts of the social sciences the transition may well be occurring today. The third phase is the paradigm phase. This phase is characterised by a dominating school of thought which has often in quite a short space of time, displaced others. A paradigm is established which leads to concentrated research within a clearly distinguishable problem area, an activity described as 'normal science'. After the normal science phase, there occurs stagnation in research which leads to chaos and turmoil. This crisis phase with revolution is the starting point for the paradigm phase 2, which, in turn is followed by crisis phase and leads to paradigm phase 3. The sequence of crisis revolution and paradigm continues throughout the history of science and helps in the advancement and decline of societies.

Paradigms in Geography

According to Kuhn's terminology, geography was in the pre-paradigm phase until the time of Darwin. Kant clarified the role of the subject and its position in relation to other contemporary sciences but he did not introduce any paradigm for geography and thus he did not found a school of geography.

Ritter and the Pre-paradigm Phase: Carl Ritter approximated the Baconian classical model of how a scientist works and was probably the first geographer to have provided a clear description of his methodology. "Ritter used the inductive method as a framework for his presentation of data and as means to arrive at some simple empirical generalization" (Adhikari 2010, p. 264). He was a proponent of teleological philosophy which sought to explain that everything happened with a purpose and God laid down the controlling conditions. Problem with teleological philosophy was that such explanations cannot be tested empirically and hence, does not qualify

as scientific method. However, it does have the qualities of a paradigm. But due to Ritter's teleological philosophy, it was very difficult to identify the professionalism phase in geography. It is important to note that even though Ritter's school of geography was the first actively founded school but it did not pave the way for the first paradigm in the discipline. Rather it was Darwinism that gets the credit for moving geography in the first phase of paradigm. Darwinism, however, did not completely discredit the major ideas of cotemporary geography.

Darwinism and Environmental Determinism: "It was largely from the Darwinian tradition that Friedrich Ratzel led the subject into the first phase of professionalism and then the *deterministic school* founded by him represented the first paradigm phase in geography" (Adhikari 2010, p. 265). During the latter half of the nineteenth century, the most interesting aspect of the development of geography was that researchers increasingly attempted to develop the subject as a *nomothetic science*. After Darwin, scientists were increasingly trying to understand the governing laws of nature as well as the materially conditioned social laws and therefore, adopted a nomothetic or law-making approach. At the same time, the inductive explanation was replaced by the hypothetic-deductive method which was especially a characteristic of the natural sciences. Researchers tried to devise *a priori* models of the structure of reality which were used to postulate a set of hypotheses which could be confirmed, corroborated or rejected by testing empirical data.

"An increasing number of human geographers sought to apply such a procedure during the 1950's. The method known as *positivism* was developed by a group of philosophers working in Vienna during the 1920's and 1930's" (Harvey 1969, p. 35). It is based on the conception that it is an objective world with *order* that is waiting to be discovered. In the case of geography, this *order* is described as the spatial patterns of variations and covariations which exists in the world and cannot be contaminated by an observer. In other words, scientific studies were believed to be free of any kind of subjectivity. A neutral observer derives hypotheses on the basis of observations and then tests those hypotheses and the verified ones become laws. "A key concept of the philosophy is that laws must be proved through objective procedures and not be accepted simply because they seem plausible" (Adhikari 2010, p. 265). The hypothetic-deductive method led human geography to develop into a model building theoretical science as it deals with quantifiable phenomenon which seems to have known situation in time and space. However, unlike the tests in physics or chemistry, it was very difficult to test geographical phenomena repeatedly. Statistical tests could help to overcome this situation but such methods were not sufficiently developed to deal with specific geographical problems at that time.

Possibilism: The ruling deterministic paradigm of Ratzel-Semple-Huntington was challenged by a new *possibilist-regional* paradigm developed by the French school of geography led by Vidal de la Blache. He stressed that human beings have free will and they participate in the development of each landscape in a unique historical process. The possibilist paradigm presented a model where humans perceive a range of alternative uses they could put in an environment and select that which best fits their cultural dispositions. The study of *unique single region* was the focus point of geographical study in this paradigm and it adopted the method called the *participating observation* that involved the study of region in order to identify the uniqueness of the man-environment relationships.

Possibilism and the regional geographical school established a new paradigm but did not immediately displace its predecessor which was due to the strong position of physical geography. The deterministic explanatory model survived side by side with Possibilism. Debate over Environmental Determinism and Possibilism continued into 1960's and led to the emergence of some new concepts in geography. For instance, Spate (1957) proposed a middle ground with the concept of *Probabilism.* The major reaction to the Possibilist paradigm was the *'Stop and Go Determinism'* postulated by geographer Griffith Taylor. He felt that the Possibilists built their explanations based on temperate regions where the environment is indeed less extreme and provides with several alternative forms of human occupancy. But in other parts of the world, the environment is much more extreme and consequently, its control over human survival is much greater. He used the term *'stop and go determinism'* to describe that humans might attempt to change their environment but the environment would win in the long run and force humans to adapt and compromise accordingly.

The *regional paradigm* that was dominant in the years before and just after the Second World War was not only an attempt at generalization but generalization without structured explanation. Main focus of the paradigm was on *areal differentiation* and the very character of the earth's surface, especially of the inhabited parts. The regional paradigm flourished in France, Great Britain and United States. Richard Hartshorne was one of the most prominent geographers associated with regional paradigm. However, by 1950's the regional paradigm lost much of its earlier acceptability.

Spatial Science Paradigm and the Advent of Quantitative Revolution: Schaefer brought about a paradigm shift when he criticised the exceptionalist claims made by the regional paradigm. "He claimed that the major regularities described in geography refer to spatial patterns and hence, geography should be convinced as the science concerned with the formulation of the laws governing the spatial distribution of certain features on the surface of the earth" (Adhikari 2210, p. 266). "It is these spatial arrangements of phenomena and not the phenomena themselves about which geographers should be seeking to make law-like statements" (Schaefer 1953). He presented geography as a spatial social science and assigned the nomothetic (law-producing) philosophy to the discipline. He also recognised the problems of experimentation and of quantification. Schaefer, with his *spatial organisation paradigm*, initiated what may be called the *quantitative and theoretical revolutions* in geography.

7.3 QUANTITATIVE REVOLUTION

Burton (1963) described the Quantitative Revolution (QR) as "a radical transformation of [the] spirit and purpose" of Geography. By this, he meant a new-found enthusiasm for the use of numerical techniques of some kind directed towards explaining the details of Earth surface patterns or what became known as 'spatial science'. It was perhaps the most famous episode in the discipline's history. However, QR cannot be attributed to one specific person rather it was the result of the works of various scholars working on different things, in different places and at different times. The QR involved the use of various techniques, including:

- descriptive statistics;
- inferential statistics (e.g. correlation and regression);

- basic mathematical equations: e.g. the gravity model of social physics or the Coulomb equation;
- deterministic models: e.g. Von Thünen's and Weber's location models both of which were resurrected in the 1950s and 1960s;
- Stochastic models, involving concepts of probability such as some of the work on spatial diffusion processes.

Useful quotes

"The Quantitative Revolution was yet another attempt to make geography "more scientific" by taking it off on yet another new track and in the process the revolutionaries tried to force regional geography to walk the plank"- John Fraser Hart, *The Highest Form of the Geographer's Art* (1982).

"If geomorphology is to achieve full stature as a branch of geology operating on the frontier of research into fundamental principles and laws of earth science, it must turn to the physical and engineering sciences and mathematics for the vitality it now lacks... The establishment of mathematical models may be regarded as the highest form of scientific achievement because the models are precise statements of fundamental truths. We are already half-a-century behind if development is to be measured against chemistry, physics and the biological sciences"- Arthur Strahler, *Dynamic Basis of Geomorphology* (1952).

The common factor linking all the above mentioned techniques of QR was its preference for numbers over words and a belief in its superior scientific pedigree (see 'positivism'). Work of the QR/spatial science tradition was certainly closer to what was expected of academic research in the 1950s and 1960s than was the regional geography which preceded it. However, this does not mean it was superior- it was just different but different in a way which matched the prevailing mood. This mood changed by the late 1960s, with a significant number of geographers beginning to question the wisdom- and even the morality of this quantitative turn. Much of what has happened in geography over the last 30 years can be read as a product of the QR, either as a hardening of its traditions (mostly in physical geography and related disciplines) or as an attempt to dismantle the damage done (mostly in human geography).

Positivism: A particular set of rules and beliefs which define how to 'do' science; positivist procedure is often portrayed as the 'scientific method'. Positivism is designed to eliminate subjectivity; it is meant to be value free, i.e. concerned with what (positively) is. Positivism does not depend on opinions or judgements nor does it make normative statements about what should be. Positivists don't 'think', they 'know'- something either is a fact, or it isn't, and everyone can agree on this. Positivism deals with facts and facts equate with what we can observe. This gives positivism a distinct *empiricist* tendency which is the idea that only 'concrete' data matters to science. Ideas and theories are not scientific because they are not facts. The additional ideas attached to positivism that were supposedly absent from regional geography and disqualified inter-war regional geography from counting as positivist science include:

- Positivism is nomothetic devoted to the search for laws. Statements of what is must be backed up by statements of why it is, i.e. a move from description to analysis and explanation. Patterns which are observed regularly (i.e. empirical regularities) tend to reveal these laws. For example, steelworks tend to cluster around supplies of coal and

iron ore. This concern with pattern and order explains why concepts such as geometry, equilibrium and statistical 'best-fit' relationships appear so frequently in the geographical studies of the 1950s and 1960s.

- Positivism has a liking for numbers rather than words. Numbers are more precise and so more scientific.
- Positivism aspires for theory/model building with the understanding that these can then be tested with a view to verification/falsification.
- Positivists were of the idea that once we have discovered laws (which survive testing) we can use them to make successful predictions and these successful predictions would help us to plan and control successfully. It also led to the rather arrogant idea that *only* positivist science is useful and relevant (in fact, according to positivists, the only kind of science is positivist science).

AIMS AND OUTCOMES OF THE QUANTITATIVE REVOLUTION IN GEOGRAPHY

The 'Quantitative Revolution' in geography refers to the era in the 1950s and 60s when the subject moved to a more scientific approach seeking objectivity in the testing of hypotheses and theories. "A series of statistical and mathematical techniques and abstract models were adopted leading to a radical transformation of spirit and purpose of geography" (Burton, 1963, p. 151). As a part of this revolution, the old ideographic geography based around areal differentiation and regional geography was displaced. Regional geography was heavily criticised for being too specific and incapable of contributing towards effective generalisation. Both Bunge (1962) and Haggett (1965) argued that "one can do little with the unique except contemplate its uniqueness". Thus, the aims of the quantitative revolution were to overcome this specificity and establish nomothetic (universal/general) model-based paradigms. It provided greater theoretical awareness within the subject meaning.

The quantitative revolution was formulated around the paradigm of spatial science associated with the philosophy of positivism. "Spatial science involved the presentation of human geography as a key component of social science, which concentrates on the role of space as the fundamental variable influencing both society's organisation and operation and the behaviour of its individual members" (Cox, 1976). Berry and Marble (1968) expressed "the goal of spatial science as building accurate generalisations with predictive power by precise quantitative description of spatial distributions, spatial structure and organisation, and spatial relationships". QR also strongly influenced physical geography involving the widespread adoption of abstract modelling techniques and 'scientific' methodology in order to reaffirm geography's status as a respected scientific discipline. This had a huge impact upon the subject as a whole, leading to David Harvey (1986) coining the famous slogan- "by our models you shall know us".

However, as many geographers such as Chrisholm (1975) have argued, the phrase 'quantitative revolution' is something of a misnomer. This is due to the fact that geography has in reality and its formal institutionalisation been quantitative since the nineteenth century. For example, The Royal Geographic Society as a 'centre of calculation' (Latour, 1987) involving the assimilation of maps, tables, figures and statistics. As Chrisholm argues, the widespread use of

formal statistical techniques from the 1950s to the present day therefore represents more of an evolution than a revolution. Similarly, the significance of the 1950s was not the introduction of numbers per se, but the introduction of theory: it was thus much more of a theoretical revolution.

Before the 1950s, geography (especially human geography) lacked any sort of theoretical approach. With the quantitative revolution, however, a flood of theoretical models from other disciplines were imported and applied. These theories, among many others, were applied through an innovative set of practises stemming from a distinct set of technical and theoretical competencies. Consequently, both physical and human geography shifted away from field-based inquiry to technical, desk-bound roles involving analysis from afar. The major advances towards a unifying methodological and philosophical basis of the quantitative school were made in the 1960's by Peter Haggett, Richard Chorley and David Harvey.

Haggett's book 'Locational Analysis in Human Geography' (1965) called for a debate within the subject on this paradigm shift. In 'Models in Geography' (1967), Chorley and Haggett looked at the traditional paradigm in geography and found that "it was only classificatory and under severe stress". They propounded the view that it is time for geography to adopt an alternative model based paradigm. They firmly believed that the new development within the subject not only represented a wider range of methods, but demands a fundamental paradigm shift. Model building was set up as the aim of geographical investigation and inquiry; this task was to be fulfilled with the help of quantitative methods. "The geographers have the option to choose between the traditional and the new model-based paradigm" (Holt-Jensen 1981). Webber (1977) identified an entropy maximising paradigm which focuses on location models (the probability of an individual being in a particular place at a particular time), interaction models (the probability of a particular trip occurring in a particular time) and on the location/interaction model. The entropy maximising theory suggests that it is not necessary to study the individual behaviour for the study of aggregate social relations. The patters predicted by the models are functions of the constraints (which are the information provided at the meso-state). Thus, the entropy maximising paradigm is capable of yielding meaningful answers to short-run operational problems and is very useful for immediate planning purpose.

ADVANTAGES OF QUANTITATIVE TECHNIQUES:

1. Quantitative techniques are firmly based on empirical observations and are readily verifiable.

2. These techniques help us in handling a multitude of observations and turning them into manageable number of factors.

3. They aid in formulating structured ideas and theories that can be tested under the assumed conditions.

4. They allow us to derive suitable models to understand the interaction of the involved factors. They also help us to understand their process within the model and with reference to observed facts.

5. They aid in identifying trends and patterns, laws and theoretical concepts.

DISADVANTAGES OF QUANTITATIVE TECHNIQUES

1. The theories and models developed on the basis of empirical data do not take into account the normative questions like beliefs, emotions, attitudes, desires, hopes and fears and therefore, cannot be taken as the tools explaining exact geographical realities.

2. The over-enthusiastic followers of quantitative revolution ignored many good qualitative statements which were quite useful.

3. These techniques require sophisticated data which are very difficult to attain. Especially, it is extremely hard to generate such data in developing and poor countries.

4. One of the prominent drawbacks is that generalisation attained with the help of these techniques bring exaggerated results. Generalisation on the basis of quantitative techniques may prove to be misleading and negative instead of positive.

5. The factorial designs depend on the use of the costly computer time and considerable financial assistance which are rarely available to the individual researcher of areal variation.

6. Apart from this, the data used is hardly for a period of about hundred years and that too reflects the modes of production and distribution of the developed societies. Thus, the Quantitative Revolution is not adequate in formulizing the universal laws and paradigms.

MAJOR THEORETICAL AND METHODOLOGICAL DEVELOPMENTS

Duing 1950s ad 1960s, Anglo-American geography underwent a radical transformation when an earlier 'idiographic' approach concerned with areal differentiation was replaced by the 'nomothetic' search for models of 'spatial structure'. "The quantitative revolution was in geography was largely concerned with giving geography a scientific approach along with the application of statistical methodology to geographical research" (Adhikari 2010, p. 267). QR paved the way for the acceptance of the elements of positivism that were previously discarded, i.e. "there is one science and one methodology that extends from the natural into the human sciences" (Adhikari 2010, pp. 267-268). "The quantitative school set out to discover universals, to build models and establish theoretical structures into which geographical realities may be fitted" (Burton 1963). The movement which led to this revolution was started by physicists and mathematicians and went on to transform first the physical and then the biological sciences. It was mostly the works of non-geographers that resulted in the advent of QR in geography. A brief account of some of the most prominent concepts developed during quantitative revolution is provided here.

Space: The word 'space' is very much associated with the QR. Conceptions of space became a prominent inquiry within geography during the late 1940s and 1950s. Schaefer (1950) declared that "spatial relations alone are that matter in geography Space has now become the basic organising concept of the geographer". Various scholars provided with increasing understanding of the conceptualisations of space. Blaut for instance, distinguished between 'absolute' and 'relative' space. He suggested, "Space in absolute conception is a distinct, physical and eminently real or empirical entity in itself; and space in relative conception is merely a relation between events or an aspect of events, and thus bound to time and process". This distinction attempted to develop general theories of spatial organisation, as in order to generalise geography must be able to replicate cases and has to use relative space. Theorisations of space in general

and relative space in particular are still in progress and was probably the most fundamental change in the history of geography. Space becomes relative as it is related to the perception of an individual rather than the absolute space. Location theorists were also trying to use the measures of relative space in order to build spatial models. Forer (1978) introduced the concept of "plastic space"- space that is continuously changing its form and size as a result of socio-economic demands and technological progress making it dynamic and truly relative (Adhikari 2010, p. 268). The quantification has led to the identification of two major approaches to the study of geography:

1. **Spatial analysis:** "It is a type of geographical analysis which seeks to explain patterns of human behaviour and its spatial expression in terms of mathematics and geometry, that is, locational analysis. Some of the examples are nearest neighbour analysis and Thiessen polygons" (Mayhew 2004).
2. **Spatial science:** "The presentation of human geography as that component of social science which focuses on the role of space as a fundamental variable influencing the organisation and operation of society and the behaviour of individuals. It was formulated during QR and it is closely related to the philosophy of positivism" (Adhikari 2010, p.269).

The following aspects of the conception of space under the above two approaches appear to be central to be the central features of geography:

- *Spatial interaction:* It refers to interdependence between geographic areas which complements the society-environment interdependence within a single area and therefore, becomes a major focus of quantitative inquiry.
- *Spatial structure:* It refers to the arrangements of phenomena on earth's surface that appear as a result of the *spatial interaction*. It could be defined by interpreting structure as geometrical which explains that the science of space (geography) found the logic of space (geometry). The revival of this classical geometric tradition appeared to be the major focus of the QR and it reconstituted geography as spatial science.

Bunge in his Theoretical Geography (1962) sought to extend Schaefer's arguments and defined geography as "science of spatial relations and interrelations; geometry is the mathematics of space; and so geometry is the language of geography". "The study of whereabouts of things, their spatial distribution which the regional-chronological paradigm considered as a deviation, formed the core of the geographic enterprise" (Holt-Jensen 1981). The philosophical debate between Hartshorne and Schaefer during 1950s led to an early acceptance of theory building and modelling in geography. Ackerman (1958) presented an account of this theoretical discussion and controversy and urged the younger generations of geographers to concentrate on the systematic branches of geography which would lead to the development of more refined theories and models.

Major Theories developed during Quantitative Revolution:

Location Theory: Location theories are the body of theories that attempt to account for the location of economic activities. It was formally admitted into the developing area of human geography mainly through the efforts of W. L. Garrison (1959) and his associates in the University of Washington. They focussed on the "fundamental role of locational concepts within human geography" and called for a reaffirmation of its geometric tradition. However, the

classical location theories of Von Thunen (1826) on the use of area in agriculture and Weber's (1909) study of industrial locations were primarily economic theories.

Central Place Theory: It is a major theory within urban geography that deals with the analysis of the size and distribution of settlements within an urban system. Christaller (1933) was the first geographer who made the first major contribution in Central Place Theory. He treated urban settlements solely as centres for retailing goods and services. He used the concepts of range (the maximum distance a consumer would travel to purchase a good or service) and threshold (the maximum volume of business necessary for an establishment to be economically viable). He noted that different retailing functions varied in their ranges and thresholds. Another approach to this theory was developed by Losch (1954) who incorporated manufacturing as well as retailing functions in his model of urban system. He identified a separate range, threshold and hexagonal hinterland for each establishment type. "These two approaches were very prominent in the new quantitative urban geography of 1950s and 1960s" (Johnston 1986).

Social Physics: It is an approach that attempts to study human society while drawing analogy within the physical world for analysing aggregate human behaviour. J. Q. Stewart (1947) of Princeton University and William Warntz (1959) together developed social physics to create *Macro Geography*. The Gravity Model is a prominent example of a quantitative model that can be used as a tool for spatial analysis. It is based upon Newtonian physics (physical objects attract each other with a force that is directly proportional to their mass and inversely proportional to the distances between them). Geographers used this concept to evaluate the potential for interaction between places. In its most simplistic form, the Gravity Model can be expressed as: $I=P1.P2/D$ (Interaction equals the population of *place one* times and the population of *place two* divided by the distance between them). Of course, this simple form of the model assumes that all else is equal. For example, we could use the Gravity Model to get an idea of the probable interaction between a given central place and two of its neighbours. However, this does not take into account friction of distance variables such as the quality of the transportation networks, intervening opportunities and the like. Nonetheless, the concept is important because understanding it and being able to do the simple math clarifies the importance of the size and distance between places relative to spatial interaction. This model was utilised by Stewart in his works. Warntz applied analogy models from physics to his studies of population potentials. Zipf (1949) devised a 'principle of least effort' which explains that individuals organise their lives in ways so as to minimize the amount of work undertaken. Minimisation of movement (as movement requires work) is part of the general principle of least effort.

Diffusion of Innovation: Diffusion means the spread of phenomena over space and time. Concept of diffusion is not new to geography as it was developed by Ratzel. However, it was Hagerstrand who quantifies this concept, developed the diffusion model and provided the theoretical structure to the concept. Hagerstrand became interested in the possibilities of investigating the process of innovation with the aid of mathematical and statistical procedures. He focussed on spatial processes and examined the diffusion of several innovations among the population of a part of central Sweden. "Hagerstrand's diffusion model represents an interaction matrix that suggests the contours of a generalized or mean information field, which structures the

way in which information circulates through regional system" (Adhikari 2010, p.271). Both physical barriers and individual resistances mould these information flows and together check the transformation and so shape successive diffusion waves which break into adoption surface. He constructed a general stochastic model of the process of diffusion with the aid of 'Monte Carlo stimulation' which involves the use of random samples from a known probability distribution. The stochastic Hagerstrand model enabled the spread of innovation to be stimulated and later tested against empirical study. This theory and the associated model has been constantly developed by various researchers since then.

Regional Science: Theoretical development in the American human geography led to the emergence of the field of regional science. This discipline links economics, geography and planning; and deals with the theoretical and quantitative analysis of regional economics and problems. Regional science was created by Walter Isard (1956), an economist who developed spatial components into his models, in part to provide a stronger theoretical basis for urban and regional planning. Regional science is economics with spatial emphasis and it tends to focus on mathematical modelling and economic theorising. "The focus of regional science has encompassed both quantitative modelling and more purely theoretical analysis of location problems and regional economics" (Adhikari 2010, p.271). Major works in empirical modelling included input-output models, industrial complex analysis, gravity model of spatial interaction and statistical works of central place theory. The development of regional science theory was strongly influenced by cotemporary trends in economic theory. Geographers such as B. J. L. Berry, M. Dacey, R. Morrill, W. Tobler and W. Warntz were involved with the Regional Science Association and their journal of Regional Science published some of the classic papers on quantitative geography.

Locational Analysis: Locational analysis is an approach to human geography which focuses on the spatial arrangement of phenomena on earth's surface hence, the approach is sometimes referred to as spatial science. The philosophy of positivism is fundamental to the approach which gives emphasis on models and laws of spatial arrangements. Thus, it has strong association with QR. "The main objective of locational analysis was expressed as building accurate generalization, models and theories with productive power" (Berry and Marble 1968). Peter Haggett's 'Locational Analysis in Human Geography' (1965) is a classic work on this approach. He emphasised on the questions of order, location order and patterns as depicted in the phenomena traditionally studied as human geography and called for the revival of geometric tradition in geography. He postulated that geographers need to adopt a systems approach that focuses on spatial patterns and linkages. He also stressed on the need to utilize models and quantitative procedures as the means to achieve precise generalizations regarding the location order. Haggett's major contribution lies in the depiction of pattern and order in spatial structures. The impact of locational analysis with its emphasis on spatial arrangements and quantification on human geography was substantial on the discipline.

System Theory and System Analysis: Geographers have used various aspects of system approach since earlier times. Even then, the systematic approach has remained more of a philosophical concept rather than a practical research technique. There were no models or

techniques available before the Second World War which would help in the analysis of complex systems accurately. Systems concept was rather invoked in descriptive contexts while referring the balance in nature. The concept of systems is often associated with particular theorising styles such as positivism and functionalism.

General Systems Theory: General systems theory was originally proposed by biologist Ludwig von Bertalanffy in 1928. Since Descartes, the "scientific method" had progressed under two related assumptions which are i) A system could be broken down into its individual components so that each component could be analyzed as an independent entity, and ii) the components could be added in a linear fashion to describe the totality of the system. Von Bertalanffy proposed that both assumptions were wrong. On the contrary, a system is characterized by the interactions of its components and the nonlinearity of those interactions. In 1951, Von Bertalanffy extended systems theory to include biological systems. Kuhn described one common element of all systems which is that knowing one part of a system enables us to know something about another part. "The *information content* of a 'piece of information' is proportional to the amount of information that can be inferred from the information" (A. Kuhn 1974). In geography, their formal incorporation into a 'metalanguage' occurred during the 1960s. This approach included a set of scientific procedures which could be connected to those of QR. This also involved a set of concepts that offered the prospect of a theoretical integration of physical and human geography. R. J. Chorley was the first geographer who introduced general systems theory in geography. His paper titled 'Geomorphology and General System Theory' (1962) was the first major work exclusively dealing with the systems approach within the framework of general systems theory. Chorley applied the concept of open and closed systems to geomorphology. Berry (1964) pointed out that cities are *'open systems'* in a steady state as exemplified by their behaviour-describing equations.

System Analysis: It is a methodological framework for investigating the structure and functions of a system. System consists of a set of entities with specification of relationships between them and their environment. Hence, the study of systems appears to be associated with the study of complex structures. The system must be seen as a useful abstraction or model which will enable a particular form of analysis. Harvey (1969) points out that, "reality is infinitely complex in its links between variables but systems analysis provided a convenient abstraction of the complexity in a form which maintains the major connections". A system comprises of three main components:

(a) A set of elements
(b) A set of links (relationships) between those elements
(c) A set of links between the system and its environment

Every system has three basic aspects: structure, function and development. The *structure* is the sum of elements and the connections between them. *Functions* refer to the flows (exchange relations) which occupy the connections. *Development* represents the changes in both structure and function which may take place over time (Johnston 1983; Holt-Jensen 1981). The structure of the system can be treated in two different frameworks: *closed systems* and *open systems*. Closed systems have defined sealed boundaries across which no input or output of energy

occurs. Such systems are rarely found in nature and thus are rarely the subject of geographical studies. On the other hand, open systems are those systems which have both inputs and outputs of energy to maintain the system. Most real systems found in nature are open systems. However, closed systems are often created, in physical sciences as well as human geography, either experimentally or by imposing artificial boundaries. Various scholars have identified as explained various types of systems based on various elements.

7.4 CHALLENGES IN GEOGRAPHY DURING QUANTITATIVE REVOLUTION

Key aims of Quantitative revolution were to achieve empiricism, exclusivity, autonomy and universality. These same aspects ultimately led to its critique and downfall. In this section, we would try to understand how that happened. By the late 1960s and 1970s, the widely accepted ideas began to lose their support. "A different kind of world was emerging at this time where wide-spread debates were raging concerning issues of poverty, racial equality, war, gender, environment and civil rights that the quantitative revolution seemed both unable and unwilling to address". Quantitative geographers were not able to prove their relevance to this debate. As David Harvey (1973, p. 129) put it, "there is an ecological problem, an urban problem, an international trade problem and yet we seem incapable of saying anything of depth or profundity about any of them...the Quantitative Revolution was thus ripe for an overthrow". However, the theoretical aspects of it persisted and geography moved towards Marxists and radical concepts.

Human geographers argued that geography should depend more on the situated knowledge based on local cultures, customs and specifics. As poststructuralist and post-modern ideologies started gaining more and more attention, human geographers argued that geographers should not just concentrate on the universal and global. Instead, they postulated that geographers should be more concerned with the interplay of different positions, different interests as well as different voices. They also argued that the social foundations and social responsibilities should be essential in any kind of intellectual inquiry including geographical studies. They also criticized the basis of separating 'science' from 'discourse' in general.

Consequently, many geographers started to emphasise their role at the heart of humanities, rather than identifying as social scientists. In any case, very few geographers actually called themselves positivists. This debate ultimately widened the gap between the physical and human aspects of the discipline where physical geographers continue to follow more universal 'scientific' methods and human geographers rely more on the particularistic characteristics of societies and cultures. This is largely due to the fact that physical geography remained largely unaffected by the arguments forwarded by the 'humanists' and the critique of the 'Quantitative Revolution' at large. Thus, there is no doubt regarding the tenuous connections between the disciplines of human geography and physical geography. From this perspective, the outcome of the 'Quantitative Revolution' can therefore be seen as profound, highlighting the ultimate question in geography: "What does the discipline really entail and can the increasingly disparate human and physical elements continue to operate under the same umbrella?"

Useful quotes

"... [As measurements increase in complexity and refinement and as mathematical manipulation of the data become more sophisticated, these measurements and manipulations may become so impressive in form that the investigator tends to lose sight of their meaning and purpose...When mechanical processes replace reasoning processes and when a number replaces understanding as the objective, danger enters"- J. Hoover Mackin, "*Rational and Empirical Methods of Investigation in Geology"* (1963).

"How can we take it all so seriously, when it contributes so little to the improvement of the human condition? Most geography is inconsequential claptrap and never more so than during the quantitative revolution"- David Smith, "*Recollections of a Revolution"* (1984).

Another significant point of criticism was that this 'new' geography (during QR) was not able to adhere to the rigorous standards put forth by the positivist scientific method. Many geographers believed that they were building a new, rational, value-free, useful and above all *scientific* geography even though many of the claims they made for it turned out to be less secure than they thought. It is the reaction against positivism and the associated dogma of *scientism* (i.e. the uncritical belief that what is supposedly science represents a form of knowledge superior to that arrived at by other means), which has spurred many developments in human geography since 1970.

7.5 CONCLUSION

The positivist/spatial science tradition in geography was criticised by many geographers who sought alterative frameworks for analysis. Many geographers grew dissatisfied with this emphasis on spatial patterns and inductivism. In extreme cases, the spatial science approach was out rightly rejected. For example, in human geography, the spatial science view was considered as a hurdle in understanding more fundamental social questions. It was postulated that any spatial theory is ultimately part of a general social theory. In physical geography, this change came when non-geographical criteria were introduced in its subject matter. New emerging behavioural approach, Marxist theory and critical social theory ultimately became the main frameworks for analysis.

7.6 SUMMARY

The 'Quantitative Revolution' in geography refers to the era in the 1950s and 60s when the subject moved to a more scientific approach seeking objectivity in the testing of hypotheses and theories. Regional geography was heavily criticised for being too specific and incapable of contributing towards effective generalisation. Thus, the aims of the quantitative revolution were to overcome this specificity and establish nomothetic (universal/general) model-based paradigms. It provided greater theoretical awareness within the subject meaning. The quantitative revolution was formulated around the paradigm of spatial science associated with the philosophy of positivism. The goal of spatial science was to build accurate generalisations with predictive power by precise quantitative description of spatial distributions, spatial structure and organisation and spatial relationships. QR also strongly influenced physical geography involving the widespread adoption of abstract modelling techniques and 'scientific' methodology

in order to reaffirm geography's status as a respected scientific discipline. QR influenced all the branches of geography and quickly various theories and models were either adopted or developed. Some of these theories are: location analysis, central place theory, location theory, social physics, diffusion of innovation, regional science and so on. However, the quantitative revolution did not remain unchallenged for long. The criticism especially came from the branches of human geography. Human geographers postulated that geographers should be more concerned with the interplay of different positions, different interests as well as different voices. They also argued that the social foundations and social responsibilities should be essential in any kind of intellectual inquiry, including geographical studies. Thus QR soon gave way to behavioural geography and critical social theory.

7.7 GLOSSARY

1. Areal Differentiation (Hartshorne 1939): The study of the variation of the physical and human phenomena as they relate to other spatially proximate and casually liked phenomena.

2. Darwinism (Darwin 1859): Darwinism is a theory of biological evolution developed by the English naturalist Charles Darwin (1809-1882) and others, stating that all species of organisms arise and develop through the natural selection of small, inherited variations that increase the individual's ability to compete, survive, and reproduce. English biologist Thomas Henry Huxley coined the term *Darwinism* in April 1860. It was used to describe evolutionary concepts in general, including earlier concepts published by English philosopher Herbert Spencer.

3. General System Theory (Bertalanffy 1968): An attempt to develop general statements about the common properties of specifically different systems usually identified with the work of Bertalanffy.

4. Scientific Models or Modelling: It is the generation of a physical, conceptual or mathematical representation of a real phenomenon that is difficult to observe directly. Scientific models are used to explain and predict the behaviour of real objects or systems and are used in a variety of scientific disciplines ranging from physics and chemistry to ecology and the Earth sciences. Although modelling is a central component of modern science. Scientific models at best are approximations of the objects and systems that they represent—they are not exact replicas. Thus, scientists constantly are working to improve and refine models.

5. Nomothetic and Idiographic: Nomothetic and idiographic are terms used by Kantian philosopher Wilhelm Windbelband to describe two distinct approaches to knowledge, each one corresponding to a different intellectual tendency and each one corresponding to a different branch of academe. *Nomothetic* is based on what Kant described as a tendency to generalize and is typical for the natural sciences. It describes the effort to derive laws that explain objective phenomena in general. *Idiographic* is based on what Kant described as a tendency to specify and is typical for the humanities. It describes the effort to understand the meaning of contingent, unique and often subjective phenomena.

7.8 ANSWER TO CHECK YOUR PROGRESS

1. What is Quantitative Revolution?

2. What were the historical developments that led to the advent of QR in Geography?

3. Give a brief account of the various schools of thought in Geography predating QR.

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7.11 TERMINAL QUESTIONS

1. What were the advantages and disadvantages of Quantitative Revolution in Geography?

2. Give a brief account of the important methodological and theoretical developments under QR in geography.

3. Name the prominent geographers who introduced and/or developed various quantitative methodologies and techniques in geographical studies?

4. What were the major points of criticism against QR in geography?

5. What is the significance of quantitative methods and techniques in cotemporary geography?

UNIT 8 : IMPORTANT CONTRIBUTION OF GEOGRAPHERS

8.1 OBJECTIVES

The major aim of this unit is to introduce the students to the world of scholars in geography especially Davies and Sir Halford Mackinder. It will help the students in clearing their concepts as regards the following:

1. Understanding the important contribution of geographers in different periods.
2. Comprehending the development and growth of different theories in human and physical Geography.
3. Discussing the contribution of Davis and Mackinder.

8.2 INTRODUCTION

The word Geography was coined by Eratosthenes, a famous Greek scholar in third century B.C. and as a branch it is amongst the oldest out of all the branches of earth science. Geography is actually a combination of two words 'Geo' means earth and 'Graphy' means to describe, hence if we look at the literal meaning of term geography which stands for description of the earth surface. Geography as a discipline concentrates largely on interaction of all human and physical phenomena and the resultant features. Many geographers since ancient times have tried to describe this relationship in a different manner. Different kinds of relationships can be studied in terms of both physical and human angles and thus geographical studies can be divided into two major branches namely physical and human geography.

What have you learnt?

- Geography means the description of the earth surface.
- It is mainly divided into two branches.
- The word Geography was coined by Eratosthenes.

INTEXT QUESTION

1. What is Geography?
2. Which are the two major branches of Geography?

GROWTH AND DEVELOPMENT OF GEOGRAPHY :

In order to understand the growth and development of geography as a subject over time, it is highly essential to look into details the contribution of different scholars over time.

The contribution of Geographers can be studied in three different time periods:

1. Ancient
2. Medieval
3. Modern

Ancient Period : This is the time period largely dominated by scholars dominated the knowledge world during development of different civilizations like Greeks, Romans and so on.

All scholars have contributed to a great extent in the growth of geographical knowledge by propounding certain important aspects which formed the base for development of scientific knowledge in present times.

Medieval Period : This period has largely been dominated by contribution from Arab scholars. Most of the Arab scholars tried to change the version given by earlier scholars and few of them gave birth to many new concepts as well. This period is also called as period of Dark Ages. Major Arab scholars during this period namely Al-Biruni, Ibn Sina, Al-Idrisi, Al-Masudi, Ibn Batuta and Ibn Khaldun. Then, in the late medieval period came the period of discovery and renaissance marked by contribution of scholars like Columbus, Vasco da Gama, Captain Cook, Amerigo Vespucci and William Jansz. This period was marked with great scientific and technological developments.

Modern Period : This period involves contribution of scholars from all over the world and especially German, American, French, British and other European scholar. This has given birth to some great scholarly works like cycle of erosion by Davies, heartland theory by Mackinder, Concept of Cultural landscape by Carl Sauer and so on. Indian scholars have also shown their contribution during this period.

The history of geography spans across many centuries and over time the subject has evolved and developed. A deep analysis of its historical evolution gives a great understanding of the concepts and methodologies of the subject. These valuable insights can help us in a more meticulous understanding of geography. Hence, it can be stated that, geography has undergone many changes with respect to the meaning and definition, subject matter along with various methods and approaches of study with the help of contribution of different scholars.

What have you learnt?

- In each period of development of geography different scholars have given their contribution.
- Late Medieval period was the period of different scientific and technological development .

IN TEXT QUESTION

1. Which are the major time periods for studying the contributions of the geographers?
2. What do you understand by Dark Ages?

8.3 CONTRIBUTION OF MACKINDER (HEARTLAND THEORY)

Introduction:

Sir Halford Mackinder was a famous British geographer who wrote the famous paper called "The Geographical Pivot of History" in year 1904 and presented in the Royal Geographical Society. Halford is considered to be a person propagating geopolitics by promoting concept of geographical pivot but, he was not the propounder of theory of geopolitik.

Halford Mackinder hails from Gainborough, located at a small port based market town near the river trent in England. His main idea behind giving theory of Heartland was to relate history and geography and he was of the belief that, history and geography can never be studied separately. He worked on the development of a new branch of geography called the synthetic geography which included many sub-disciplines from both physical as well as human geography. Mackinder made all efforts to bring human and physical geography under one umbrella of geography.

In 1886, Mackinder joined the Royal Geographical Society and in 1887, he joined as a reader in Oxford University. While his work Mackinder has travelled to Germany as well. He made a lot of efforts for promoting geography at different Universities. He later on started promotion of geography at school levels as well.

What have you learnt?

- The theory of Heartland was given by Sir Halford Mackinder.
- Mackinder made a lot of efforts to promote geography at both school and University levels.

Theory :

In his theory of Heartland Mackinder suggested that there is a Pivotal area in the close heartland of Euro-Asia which most likely has the chance to become the world power. His theory is basically based on a combination of world history in association with geographical facts.

The theory of Heartland basically states that:

- One who rules East Europe commands the Heartland.
- One who rules the Heartland commands the World-Island.
- And finally whosoever rules the World-Island, controls the world.

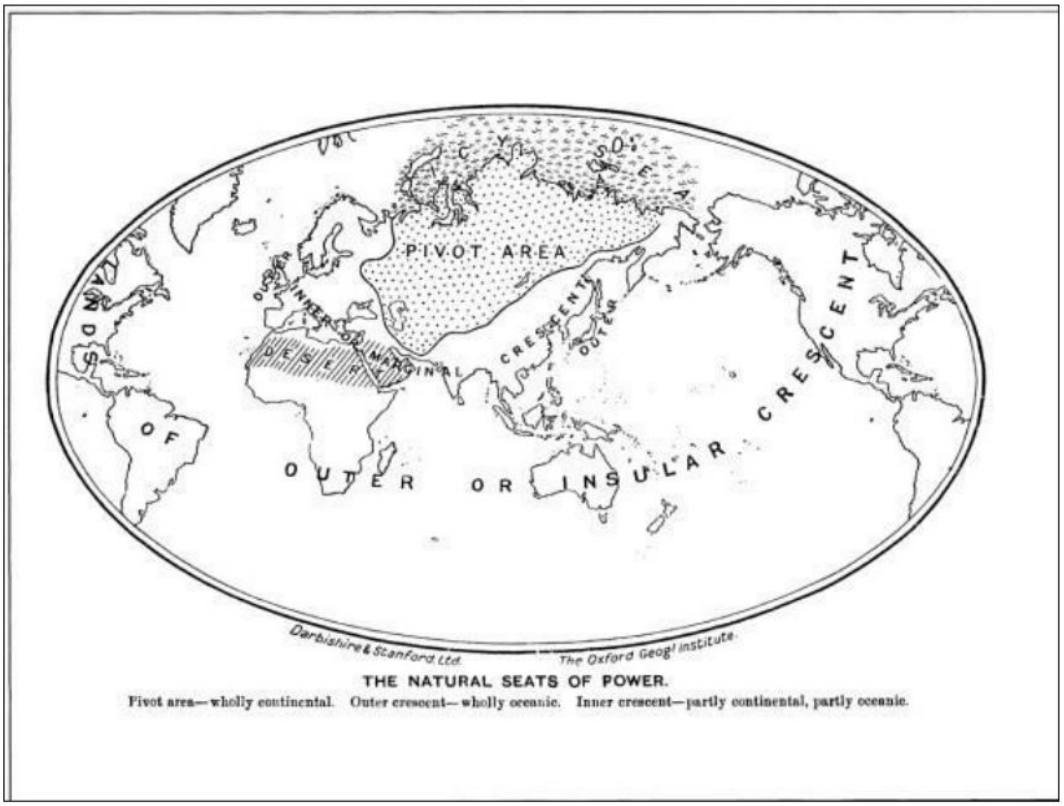
Mackinder stated that the world can be divided into three categories:

- **World-Island** consists of countries of Europe, Asia and Africa.
- The second category consists of countries on the **offshore islands** like British Island along with Islands of Japan.
- **The outlying islands** are the third category consists of North and South America as well as Australia.

Mackinder defined a world island that consisted of two major continents Eurasia and Africa. In 1919, however after the world war I, Mackinder came to the conclusion that the struggle for the command of the heartland will most likely be between Germany and Russia. In order to keep the two struggling countries apart, Mackinder suggested that, there should be a buffer zone between them that could be composed of several small states. Throughout explanation of his theory Mackinder gave importance to Germany than Russia while talking about World Power. Later, some of his predictions have proved remarkably accurate as Germany had controlled many areas like Austria, Czechslovakia and Poland. It is believed that though Mackinder has given an oversimplified model but still it has helped in understanding the complex political events.

These affirmations of Mackinder can be considered accepted to some extent when geopoliticians of Nazi Germany and Japan certainly tried to apply them. This act of Mackinder to correlate history and geography in a state of world affairs appears highly challenging to define the inescapable destiny of the world political structure. Sir Halford Mackinder had a highly sound knowledge of the world based on spatial and historical aspects to provide a base to his prediction. “But this was essentially a long-term forecast and although it was subjected under his eyes to the partial test of an era which included two world wars. It belonged of course to that kind of prediction not easy to gainsay, since the chance of its being literally and exactly tested was small”(East.G, 1950). The world as described by Mackinder and he was quick enough to analyze remains simply a "Going Concern," a delicate interlocking mechanism, dependents on changes in actions at any point of time. But in this finite world having areal contours of land and sea and along with its human occupants is dynamic. Indeed, "geography changes as rapidly as ideas and technologies change;" new maps have always been designed by continuously evaluating the geography of land and seas. The entire conception of mobility and accessibility to which Mackinder gave prime importance has drastically changed due to several new revolutions like introduction of internal combustion engine and the airplane. Scientific and technological innovations in industry have changed the art of war and such changes are dynamic in nature. Introduction of sophisticated weapons like the atom bomb makes it necessary to reexamine the time-honored assumptions of concept of geopolitics. The dynamic world relations in physically unchanging planet it is highly unrealistic to accept, a predetermined end based on the predictions or assumptions based on specific portions of the earth. Neither history or geography or even a combination of both can leads to a precise decision given the indeterminate character of social behavior.

Fig : 8.1



Source: The Geographical Journal, Vol.170 (4), pg: 312.

What have you learnt?

- Theory of Heartland is a combination of geography and history.
- This theory has ignored scientific and technological development in ever changing world.

INTEXT QUESTION

1. Discuss the major contribution of Mackinder in geographical world?
2. Discuss the major facts of Theory of Heartland by Mackinder.

EVALUATION OF MACKINDERS THEORY:

Heartland theory had a great influence on the Nazis in Germany. Adolf Hitler and the Nazis followed the Heartland theory in the literal sense. They started believing that by controlling the Heartland or Eastern Europe (including Russia), they can rule the world and it was the possible reasons that lead Germany to invade Russia after they were unable to take over Great Britain.

Strength of Heartland Theory:

- It gave birth to the concept of Geopolitics.

- The Heartland theory gave the people regarding an idealized location of World.
- It was a simplified model for understanding complex world political phenomenon.

Weaknesses of Heartland Theory:

- Mackinder did not paid attention to any shift of powers.
- Mackinder did not account for any gain or loss of territory by a nation.
- Mackinder did not take into account the ever-changing technological and scientific development.

What have you learnt?

- Adolf Hitler was highly influenced by Theory of Heartland.
- This theory reflected in a simplified way the world power pattern at that point of time.

INTEXT QUESTION

1. Discuss the major points of advantages and disadvantages of Heartland Theory?

8.4 CONTRIBUTION OF W.M.DAVIS (CYCLE OF EROSION)

Introduction:

W.M.Davis (1850-1934) was an American geomorphologist. Davies was highly influenced by Hutton's theory of Uniformitarinism. He has presented a cycle called 'Cycle of Erosion 'in his general theory of landform development. He propounded his theory in an essay he has written on 'The Rivers and Valleys of Pennsylvania' in 1889.

He believes that all landforms undergo some sequential changes like a human being and these changes he termed stages namely youth, maturity and old stage. These stages ultimately give way to an end product which according to Davis is called peneplain. Therefore Davis believed that landforms evolution in a cyclic form passes through different forms of development.

Basic premise of Davisian cycle:

The Davisian cycle of erosion is based on the following assumptions:

- Landforms are evolved due to interactions between the endogentic and exogenetic forces.
- Evolution of landforms takes place in an orderly manner and the intial upliftment is a major source of energy in development of landforms and over time landform gets converted into a peneplain.
- The upliftment of landmass is rapid and while it is getting uplifted there is no erosion.
- Uniform lithology
- There is a short period of upliftment in landmass.
- Erosion does not start until the upliftment is complete.

The basic premise of Davisian cycle of erosion is the systematic description of landforms through time. Every landform has a definite history and as the processes of land structure operate in it the surface features are marked by several changes in its lifetime. Thus, development of landscape passes through a cycle and cycle follows a definite sequence of development.

The successive development stages can be classified as youth, maturity and old stage. According to Davis, three factors namely structure, process and time plays a highly important role in origin and development of landforms of a particular place. These three factors have been termed as 'Trio of Davis'. Thus, it can state that landscape is function of Structure, Process and time.

Structure refers to lithological and structural characteristics of rocks.
Time refers to process leading to progress or change in landforms.
Process refers to agents of denudation including weathering and erosion.

What have you learnt?

- Theory of Uniformitarinism was propounded by Hutton.
- Landscape is a function of three different elements.

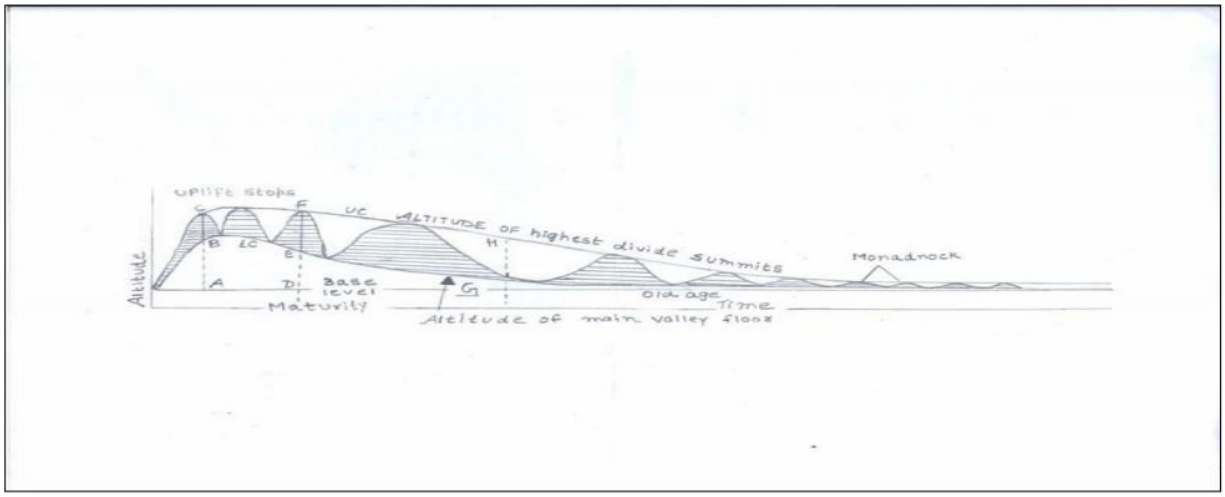
IN TEXT QUESTION

1. Highlight the major premise of Davisian theory?
2. What do you understand by 'Trio of Davis'?

THEORY :

The cycle of erosion begins with the upliftment of landmass. There is a rapid rate of upliftment of landmass of homogeneous structure. Figure below represents the model of geographic cycle of erosion. In the figure UC means Upper Curve and LC means Lower Curve denotes the hill tops or crests of water divides and valley floors respectively. The horizontal line indicates time whereas vertical axis depicts altitude from sea level. AC represent maximum absolute relief whereas BC denotes initial average relief. Initial relief is defined as difference between upper curve and lower curve of a landmass. In other words relief is defined as the difference between the highest and lowest points of a landmass. ADG line denotes base level which represents sea level. No river can erode its valley beyond base level. Thus, base level represents the limit of maximum vertical erosion by the rivers. The upliftment of landmass stops after point C as the phase of upliftment is complete.

Fig 8.2 : Geographic cycle of Erosin



Once the erosion starts, the whole cycle passes through the following three stages:

Youthful Stage : In this stage erosion begins once the landmass has been uplifted. The top level of the summits of water divides are not affected by erosion as the rivers are relatively small and widely spaced. Such rivers and short tributaries will follow headward erosion due to which the length will be extended. Availability of steep slope and steep channel gradient rivers deepening of valleys through vertical erosion is active and this results in gradual increase of the depth of river valleys. With time valley becomes deeper and narrow having steep valley side slopes of convex plan. The lower curve will keep on falling rapidly due to valley deepening and the upper curve will remain parallel to the horizontal axis as the summits of the landmass are not affected by erosion. Thus, Youthful stage is characterized by:

- Absolute height being constant as no lateral erosion is prevalent.
- Upper divides are not affected by erosion.
- Lower curve will fall due to rapid rate of valley deepening as vertical erosion is prevalent.
- There is continuous increase in relief.
- V shape valleys are developed.
- The overall valley form is a gorge or a canyon.
- The profiles will be characterized by rapids and waterfalls and these will diminish over time.

Mature Stage : In the mature stage there is lateral erosion along with well integrated drainage network. Valley deepening is considerably reduced as vertical erosion is reduced. The summits of water divides gets eroded due to which there is fall in upper curve (UC) i.e and marked lowering of absolute relief. Valleys are getting widened due to lateral erosion and there is a transformation of V-shaped valley into wide valleys. There is decrease in valley deepening due to substantial decrease in channel gradients, flow velocity and transporting capacity of the rivers. The transformation of youth into maturity depends greatly on texture of the drainage. Speed will

be determined by number of streams along with relative distances. The inter steam areas are being continuously denuded.

Old age : The erosion intensity is reduced due to increase in horizontal action and deposition. There is absence of valley incision but lateral erosion and valley widening is active. Water divides are now more rapidly eroded. Water divides are considerably reduced in dimension due to down wasting and backwasting. The upper curve falls more rapidly indicating a decrease in absolute height. Relative relief decreases sharply due to active lateral erosion. Valley deepening is absent due to extremely low channel gradient and reduced kinetic energy. The valley becomes almost flat with concave valley side slopes. All over the landscapes graded valley sides and divide crests, broad, open and gently sloping valleys having extensive flood plains, well developed meanders, residual Monadonocks are prevalent. So, a ***Peneplane*** is developed.

What have you learnt?

- There are three different stages of development in Cycle of Erosion.
- The end product of a cycle of erosion is a peneplain.

INTEXT QUESTION

1. What are monadnocks?
2. Highlight the major features of Youth stage?

EVALUATION OF THE DAVISIAN MODEL OF LANDFORMS DEVELOPMENT :

Davisian Model of landform development and cycle of erosion has gained worldwide recognition and the geomorphologists all across the world readily applied this model in many of their geomorphological investigations.

Positive Aspects :

1. The Davisian cycle of erosion gives a classification and nomenclature of landscape, which provides a means of expressing texture and the build of a landscape.
2. Davis Model of 'geographical cycle' is highly simple and has great applicability in all many geographical works.
3. Davis has presented this model in a very lucid, compelling style using really simple but expressive language.
4. This model is based on detailed and careful field observation. This model was introduced by Davis after a long gap after Hutton gave his theory of Uniformitarinism.
5. Davis consideration of base level change as indication of initiation of a new cycle has two major advantages. One, the base level change can be considered a unit of time compared to the geologists' stratigraphical time unit. Two, the base level changes during glaciations are accommodated.
6. Davis model is capable of both predictions and historical interpretation of evolution of landforms. This model is combination of many current geological thoughts.

7. Davis ideas have faced many challenges, and were being criticized from beginning of its postulation. The major critics of Davis model were Walther Penck, S. Judson and C.G. Higgins.

Criticism :

1. It is believed that, for simplicity Davis declared that, erosion is insignificant during upliftment, Davis has assumed that erosion begins only after the upliftment has been completed and that upliftment occurs very rapidly then ceases for the rest of the period of time. But it is a natural fact that as land rises, erosion begins and erosion and upliftment goes hand in hand. As landmass begins to be formed due to upliftment erosion starts it work.
2. It is difficult to logically prove the assumption that flat slopes are old and steep slopes are young. There are many other variables controlling the slope like nature of soil material and the bedrock, climate, vegetation along with downslope factors which acts at the slopefoot.
3. A model as suggested by Davis requires a long period of crustal stability and such eventless long period are tectonically unstable. It can be proved from the Plate tectonics theory which clearly states that plates are always in motion and the crust is exposed to different tectonic events.
4. Davis has been criticized by Penck for an overemphasis on time. Penck states that, landform do not experience progressive and sequential changes through time.
5. There are too many generalizations in the Davisian cycle of erosion which presents a highly inadequate framework for landform interpretation.
6. Davis was also criticized on the fact that there is hardly any evidence to prove that landform evolves to an end product called peneplain.
7. Strahler, Hack and Chorley have rejected the Davisian concept of historical evolution of landforms and have forwarded the dynamic equilibrium theory for landform development.
8. Davis interpretation of geomorphic processes was entirely based on empirical observation and lacks field instrumentation and measurement.

Though Davis theory has been criticized but there is no denying the fact that his theory is still a limelight in the field of cycle of erosion. His work provided an enormous impetus to the science of geomorphology and initiated the development of alternative models later by many other geoscientists.

What have you learnt?

- Cycle of erosion is a highly simplified theory of understanding the landscape evolution.
- This theory is highly relevant in studying the landforms.

INTEXT QUESTION

1. Discuss the major points of criticism of cycle of erosion?

8.5 CONCLUSION

Mackinder's Heartland theory, engages Geography in International politics. Makinder suggested that the state that dominated the Heartland would possess the necessary geopolitical and economic potential to ultimately control the world politics.

Cycle of erosion theory given by W.M.Davis. He said that landforms were assumed to change through time from youth to maturity to old age each stage having specific characteristics.

8.6 SUMMARY

It can be summarized that, geography is an old and important science and a lot of contribution to this subject has been done by ancient scholars during different time periods. In physical geography Davis has created a special place by propounding theory of Cycle of Erosion. It was a landmark theory and in a simplified manner he has described the systematic evolution of landforms. Though he has been criticized on many grounds but, still it is relevant even in the present world. Mackinder has carved a name of his own in field of human geography. He has stated that geography has three major characteristics namely, observation, cartography and teaching. "The observer obtains the material for maps, which are constructed by the cartographer and interpreted by the teacher" (Kearns, 1985). Mackinder has built his philosophy based on three major elements. Firstly, he was influenced by philosophy of environmental determinism. Secondly, he had put much effort in much effort in promoting study of geography as a serious academic field of study at University or School level. He was involved in founding of the Reading Society and London School of Economics. Mackinder was called as the grand old Geographer of Britain. Mackinder has been contributed with development of New Geography and led the field from an age of exploration to age of education (Martin James, 1993).

8.7 GLOSSARY

Geopolitics : A study of influence of factors like geography, economics and demography on the politics set up and foreign policy of a state.

Renaissance : The cultural rebirth that occurred in Europe from roughly the fourteenth century through the middle of the seventeenth centuries based on the rediscovery of the literature of Greece and Rome (Dictionary.com).

Landforms : A landform is that feature of the Earth's surface which is part of the terrain. Mountains, hills, plateaus and plains are the major types of landforms.

Environmental Determinism : This is a philosophy which believes that physical geography especially climate influenced the psychological mind-set of individuals and this in turn defined the behavior and culture of the society.

Uniformitarinism : It is one of the most important unifying concepts in the geosciences. It was developed in the late 1700s and it suggests that catastrophic processes are not responsible for the landforms that existed on the Earth's surface.

Upliftment : The act or process of raising or lifting up.

Erosion : The process by which rock or soil is gradually reduced in size by the action of wind, rain, or sea.
Evolution : A gradual process of changing something in a different and complex form.
Plate Tectonics : A theory which states that the lithosphere of the earth is divided into a small number of plates which float over the mantle and much of the earth's seismic activity occurs at the boundaries of these plates.
Stratigraphical : It is the study of rock strata, their distribution, deposition and age of sedimentary rocks.
Pivot : The center point of any rotiational system.

8.8 ANSWERS TO CHECK YOUR PROGRESS

1. Geography is largely the study of the interaction of all physical and human phenomena and landscapes created by such interactions.
2. The two major branches of geography are physical and human geography.
3. The major time periods for studying the contributions are:

- Ancient
- Medieval
- Modern

4. Dark Ages refers to the early medieval period wherein there was total control of church and they did not support any scientific and technological development resulting in total absence of any scholarly work.
5. The basic premise of Davisian theory are:

- Landforms are evolved due to interactions between the endogentic and exogenetic forces.
- Evolution of landforms takes place in an orderly manner and the intial upliftment is a major source of energy in development of landforms and over time landform gets converted into a peneplain.
- The upliftment of landmass is rapid and while it is getting uplifted there is no erosion.
- Uniform lithology
- There is a short period of upliftment in landmass.
- Erosion does not start until the upliftment is complete. Erosion and upliftment goes hand in hand.

6. Davis stated that landform development is the result of a combination of structure, process and time and these are called as ‘Trio of Davis’.
7. Monadnocks are the end product of the Cycle of Erosion and it is also called as peneplain.
8. The major features of the Youthful features are:

- Absolute height being constant as no lateral erosion is prevalent.
- Upper divides are not affected by erosion.
- Lower curve will fall due to rapid rate of valley deepening as vertical erosion is prevalent.

- There is continuous increase in relief.
- V shape valleys are developed.
- The overall valley form is a gorge or a canyon.
- The profiles will be characterized by rapids and waterfalls and these will diminish over time.

9. The major points of criticism of cycle of erosion are:

- It is believed that, for simplicity Davis declared that, erosion is insignificant during upliftment, Davis has assumed that erosion begins only after the upliftment has been completed and that upliftment occurs very rapidly then ceases for the rest of the period of time. But it is a natural fact that as land rises, erosion begins and erosion and upliftment goes hand in hand. As landmass begins to be formed due to upliftment erosion starts it work.
- It is difficult to logically prove the assumption that flat slopes are old and steep slopes are young. There are many other variables controlling the slope like nature of soil material and the bedrock, climate, vegetation along with downslope factors which acts at the slopefoot.
- A model as suggested by Davis requires a long period of crustal stability and such eventless long period are tectonically unstable. It can be proved from the Plate tectonics theory which clearly states that plates are always in motion and the crust is exposed to different tectonic events.
- Davis has been criticized by Penck for an overemphasis on time. Penck states that, landform do not experience progressive and sequential changes through time.
- There are too many generalizations in the Davisian cycle of erosion which presents a highly inadequate framework for landform interpretation.
- Davis was also criticized on the fact that there is hardly any evidence to prove that landform evolves to an end product called peneplain.

10. The major contribution of Mackinder is propounding the theory of "The Geographical Pivot of History", which had played a great role in shaping of world politics in later years.

11. The major facts of Theory of Heartland are:

- One who rules East Europe commands the Heartland.
- One who rules the Heartland commands the World-Island.
- And finally whosoever rules the World-Island controls the world.

12. Following are the major advantages and disadvantages of Heartland theory:

Advantages of Heartland Theory:

- It gave birth to the concept of Geopolitics.
- The Heartland theory gave the people regarding an idealized location of World.
- It was a simplified model for understanding complex world political phenomenon.

Disadvantage of Heartland Theory:

- Mackinder did not paid attention to any shift of powers.

- Mackinder did not account for any gain or loss of territory by a nation.
- Mackinder did not take into account the ever-changing technological and scientific development.

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8.11 TERMINAL QUESTIONS

1. Define the term Geography.
2. Define the two major branches of Geography.
3. Highlight the contribution of Davis in geomorphological studies.
4. Discuss the major criticism of theory of Cycle of Erosion.
5. Discuss the concept of Geopolitics.
6. Highlight the contribution of Halford Mackinder in political geography.
7. Discuss the relevance of Theory of Heartland in present times.
8. Discuss the relevance of cycle of erosion in present times.
9. Elaborate on the assumptions of Cycle of erosion.
10. Elaborate on the assumptions of Heartland as stated by Mackinder.

UNIT 9 : MODERN APPROACHES-PARADIGM, POST MODERNISM

9.1 OBJECTIVES

- To understand the concept of Paradigm .
- To understand and discuss Qualitative paradigm, Behavioral revolution, Perception, Cognition and Mental maps.
- To know the theory of Marxism and concept of Post Modernism.

9.2 INTRODUCTION

Any discipline always proceeds within a framework of some conceptual matrices called paradigms. Paradigms focus the philosophical perspectives and methodologies that have been in vogue and which continue to provide the theoretical feedback for new researches. Any model, idea, concept, technique and method that is capable of generating scholarly concern in a particular time period may be called a paradigm. The history of development of geographical thought is not a story of continuous progress. The periods of intellectual progress have been interrupted by the periods of stability of regression. In the light of Kuhn's Model, one can be discuss the evolution of paradigms in geography through various stages in succession. The paradigmatic shifts in the discipline have been relatively faster in its modern period than earlier. Postmodernism is a late-20th-century movement in the arts, architecture and criticism that was a departure from modernism. Postmodernism articulates that the world is in a state of eternal incompleteness and permanent unresolved. Postmodernism promotes the notion of radical pluralism; that there are many ways of knowing and many truths to a fact. From a postmodern perspective knowledge is articulated from perspectives with all its uncertainties, complexity and paradox. Thus knowledge is relational and all realities are woven on local linguistic looms. Postmodernism includes skeptical interpretations of culture, literature, art, philosophy, history, economics, architecture, fiction and literary criticism.

9.3 QUALITATIVE PARADIGM

A paradigm is a distinct set of concepts or thought patterns including theories, research methods, postulates and standards for what constitutes legitimate contributions to a field. *Paradigm* comes from Greek (*paradeigma)*, "pattern, example, sample" from the verb (*paradeiknumi)*, "exhibit, represent, expose" and that from (*para*), "beside, beyond" and (*deiknumi*), "to show, to point out" paradeigma is known as a type of proof. The purpose of paradeigma is to provide an audience with an illustration of similar occurrences. This illustration is not meant to take the audience to a conclusion, however it is used to help guide them there. A personal accountant is a good comparison of paradeigma to explain how it is meant to guide the audience. It is not the

job of a personal accountant to tell their client exactly what (and what not) to spend their money on, but to aid in guiding their client as to how money should be spent based on their financial goals.

The Merriam-Webster Online dictionary defines this usage as "a philosophical and theoretical framework of a scientific school or discipline within which theories, laws and generalizations and the experiments performed in support of them are formulated; *broadly: a philosophical or theoretical framework of any kind*."

Scientific paradigm : The *Oxford English Dictionary* defines the basic meaning of the term *paradigm* as "a typical example or pattern of something; a pattern or model". The historian of science Thomas Kuhn gave it its contemporary meaning when he adopted the word to refer to the set of concepts and practices that define a scientific discipline at any particular period of time. In his book *The Structure of Scientific Revolutions* Kuhn defines a scientific paradigm as: "universally recognized scientific achievements that, for a time, provide model problems and solutions for a community of practitioners," i.e., *what* is to be observed and scrutinized

Thomas Kuhn explains in his preface to *The Structure of Scientific Revolutions* that he developed the concept of paradigm precisely to distinguish the social from the natural sciences. While visiting the Center for Advanced Study in the Behavioral Sciences in 1958 and 1959, surrounded by social scientists, he observed that they were never in agreement about the nature of legitimate scientific problems and methods. He explains that he wrote this book precisely to show that there are no, nor can there be any, paradigms in the social sciences. Mattei Dogan, a French sociologist, in his article "Paradigms in the Social Sciences," develops Kuhn's original thesis that there are no paradigms at all in the social sciences since the concepts are polysemic, involving the deliberate mutual ignorance between scholars and the proliferation of schools in these disciplines. Dogan provides many examples of the non-existence of paradigms in the social sciences in his essay, particularly in sociology, political science and political anthropology.

However, both Kuhn's original work and Dogan's commentary are directed at disciplines that are defined by conventional labels (e.g., "sociology"). While it is true that such broad groupings in the social sciences are usually not based on a Kuhnian paradigm, each of the competing sub-disciplines may still be underpinned by a paradigm, research programme, research tradition and/ or professional imagery. These structures will be motivating research, providing it with an agenda, defining what is - and what is not - anomalous evidence and inhibiting debate with other groups that fall under the same broad disciplinary label. A good example is provided by the contrast between Skinnerian behaviourism and Personal Construct Theory (PCT) within Psychology. The most significant of the many ways these two sub-disciplines of psychology

differ concerns meanings and intentions. In PCT, these are seen as the central concern of psychology and in behaviourism, they are not scientific evidence at all because they cannot be directly observed Handa, M.L. (1986) introduced the idea of "social paradigm" in the context of social sciences. He identified the basic components of a social paradigm. Like Kuhn, Handa addressed the issue of changing paradigm; the process popularly known as "paradigm shift". In this respect, he focused on social circumstances that precipitate such a shift and the effects of the shift on social institutions including the institution of education. This broad shift in the social arena, in turn, changes the way the individual perceives reality.

Another use of the word *paradigm* is in the sense of "worldview". For example, in social science, the term is used to describe the set of experiences, beliefs and values that affect the way an individual perceives reality and responds to that perception. Social scientists have adopted the Kuhnian phrase "paradigm shift" to denote a change in how a given society goes about organizing and understanding reality. A "dominant paradigm" refers to the values or system of thought in a society that are most standard and widely held at a given time. Dominant paradigms are shaped both by the community's cultural background and by the context of the historical moment. The following are conditions that facilitate a system of thought to become an accepted dominant paradigm:

- Professional organizations that give legitimacy to the paradigm
- Dynamic leaders who introduce and purport the paradigm
- Journals and editors who write about the system of thought. They both disseminate the information essential to the paradigm and give the paradigm legitimacy
- Government agencies who give credence to the paradigm
- Educators who propagate the paradigm's ideas by teaching it to students
- Conferences conducted that are devoted to discussing ideas central to the paradigm
- Media coverage
- Lay groups or groups based around the concerns of lay persons, that embrace the beliefs central to the paradigm
- Sources of funding to further research on the paradigm

The word *paradigm* is also still used to indicate a pattern or model or an outstandingly clear or typical example or archetype. The term is frequently used in this sense in the design professions. Design Paradigms or archetypes comprise functional precedents for design solutions. The best known references on design paradigms are *Design Paradigms: A Sourcebook for Creative Visualization*, by Wake, and *Design Paradigms* by Petroski.

This term is also used in cybernetics. it means (in a very wide sense) a (conceptual) protoprogram for reducing the chaotic mass to some form of order. Note the similarities to the

concept of entropy in chemistry and physics. A paradigm there would be a sort of prohibition to proceed with any action that would increase the total entropy of the system. To create a paradigm requires a closed system that accepts changes. Thus a paradigm can only apply to a system that is not in its final stage.

The Qualitative Paradigm :

The design of a research study begins with the selection of a topic and a paradigm. A paradigm is essentially a worldview, a whole framework of beliefs, values and methods within which research takes place. It is this world view within which researchers work.

According to Cresswell (1994) "A qualitative study is defined as an inquiry process of understanding a social or human problem based on building a complex, holistic picture, formed with words, reporting detailed views of informants and conducted in a natural setting. Alternatively a quantitative study, consistent with the quantitative paradigm, is an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers and analyzed with statistical procedures in order to determine whether the predictive generalizations of the theory hold true."

The paradigm framework is made up of Scientific materialism

(1) Words and numbers:

Qualitative research places emphasis on understanding through looking closely at people's words, actions and records. The traditional or quantitative approach to research looks past these words, actions and records to their mathematical significance. The traditional approach to research (quantifies) the results of these observations.

In contrast qualitative research examines the patterns of meaning which emerge from the data and these are often presented in the participants' own words. The task of the qualitative researcher is to find patterns within those words (and actions) and to present those patterns for others to inspect while at the same time staying as close to the construction of the world as the participants originally experienced it.

(2) ***Perspective (Subjective) versus objective views***

(3) ***Discovery versus proof***

The goal of qualitative research is to discover patterns which emerge after close observation, careful documentation and thoughtful analysis of the research topic. What can be discovered by qualitative research are not sweeping generalizations but contextual findings. This process of discovery is basic to the philosophic underpinning of the qualitative approach.

Definitions of Qualitative Research

Denzin and Lincoln (1994) define qualitative research:

"Qualitative research is multi-method in focus involving an interpretive and naturalistic approach to its subject matter. This means that qualitative researchers study things in their natural settings, attempting to make sense of or interpret phenomena in terms of the meanings people bring to them. Qualitative research involves the studied use and collection of a variety of empirical materials case study, personal experience, introspective, life story interview, observational, historical, interactional and visual texts-that describe routine and problematic moments and meaning in individuals' lives".

Cresswell (1994) defines it as:

"Qualitative research is an inquiry process of understanding based on distinct methodological traditions of inquiry that explore a social or human problem. The researcher builds a complex, holistic picture, analyzes words, reports detailed views of informantsand conducts the study in a natural setting".

Characteristics of Qualitative Research :

An exploratory and Descriptive focus

1. Emergent Design
2. Data Collection in the natural setting
3. Emphasis on 'human-as-instrument'
4. Qualitative methods of data collection
5. Early and on-going inductive analysis

Cresswell (1994) divides qualitative research into five main Qualitative Research Types and identifies the key challenges of each mode of inquiry.

1. The Biography
2. Phenomenology
3. Grounded Theory
4. Ethnography
5. Case Study

Challenges of Each Type :

1.Biography : (i)The researcher needs to collect extensive information from and about the subject of the biography.(ii)In which The investigator needs to have a clear understanding of historical and contextual material to position the subject within the larger trends in society or in the culture.(iii)It takes a keen eye to determine the particular *stories,* slant, or angle that "works" in writing a biography and to uncover the "figure under the carpet" (Edel, 1984) that explains

the multilayered context of a life.(iv)The writer, using an interpretive approach needs to be able to bring himself or herself into the narrative.

2. Phenomenology study : (i) The researcher requires a solid grounding in the philosophical precepts of phenomenology. (ii) The participants in the study need to be carefully chosen to be individuals who have experienced *the phenomenon*. (iii) Bracketing personal experiences by the researcher may be difficult. (iv) The researcher needs to decide how and in what way his or her personal experiences will be introduced into the study.

3. Grounded Theory : Grounded *theory study* challenges researchers for the following reasons: (i) The investigator needs to set aside, as much as possible, theoretical ideas or notions so that the analytic substantive theory can emerge. (ii) Despite the evolving inductive nature of this form of qualitative inquiry, the researcher must recognize that this is a systematic approach to research with specific steps in data analysis. **(iii)**The researcher faces the difficulty of determining when categories are saturated or when the theory is sufficiently detailed.**(iv)**The researcher needs to recognize that the primary outcome of this study is a theory with specific components: a central phenomenon, causal conditions, strategies, conditions, context and consequences.

4. Ethnography : The ethnography is challenging to use for the following reasons: (i)The researcher needs to have grounding in cultural anthropology and the meaning of a social-cultural system as well as the concepts typically explored by ethnographers.(ii) The time to collect data is extensive and involving prolonged time in the field.(iii)In many ethnographies, the narratives are written in a literary, almost storytelling approach, an approach that may limit the audience for the work and may be challenging for authors accustomed to traditional approaches to writing social and human science research.(iv) There is a possibility that the researcher will "go native" and be unable to complete the study or be compromised in the study. This is but one issue in the complex array of fieldwork issues facing ethnographers who venture into an unfamiliar cultural group or system.

5. Case Study : The Case study poses the following challenges(i) The researcher must identify his or her case. He or she must decide what bounded system to study, recognizing that several might be possible candidates for this selection and realizing that either the case itself or an issue, for which a case or cases are selected to illustrate is worthy of study.**(ii)** The researcher must consider whether to study a single case or multiple cases. The study of more than one case dilutes the overall analysis; the more cases an individual studies, the greater the lack of depth in any single case. When a researchers chooses multiple cases, the issue becomes "How many?". Typically, however, the researcher chooses no more than four cases. What motivates the researcher to consider a large number of cases is the idea of *generalizability,* a term that holds little meaning for most qualitative researchers.

Qualitative Methods of Data Collection :

People's words and actions represent the data of qualitative inquiry and this requires methods that allow the researcher to capture language and behavior. The key ways of capturing these are:

- Observation – both participant and direct
- In-depth interviews
- Group Interviews
- The collection of relevant documents
- Photographs and Video Tapes

The Quantitative Revolution:

Geographers, for more than two hundred years, had been confronted with the problems of generalisation and theory building. After the Second World War, the geographers, especially those of the developed countries, realised the significance of using the mathematical language rather than using the language of literature. Consequently, the empirical descriptive geography was discarded and more stress was laid on the formulation of abstract models. The diffusion of statistical techniques in geography, to make the subject and its theories precise, is known as the Quantitative Revolution in geography. The earliest use of quantitative techniques started in climatic studies e.g. Koeppen's climatic classification, R.R. Crowe's the Analysis of Rainfall Probability, M.G. Kendall's The Geographical Distribution and Crop Productivity in England, H.A. Matthew's A New View of Some Familiar Indian Rainfall. Christaller made a major contribution to location theory by applying quantitative techniques enormously in his study Central Places in Southern Germany. In other branches of geography, e.g. populations, regional, cultural and economic geography, a range of different statistical methods were gradually brought into use. Thus the diffusion of quantitative techniques took place in the 1960s which enabled the geographers to develop more refined theories and models.

Advantages of Quantitative Techniques:

(i) All the techniques are firmly based on empirical observations and are readily verifiable.

(ii) They help in reducing a multitude of observations to a manageable number of factors.

(iii) They allow the formulation of structured ideas and theories which can be tested under the assumed conditions.

(iv) They help in deriving suitable models to understand the interaction of the evolved factors and their process within the models and with reference to observed facts.

(v) They help in identifying tendencies and desired trends, laws and theoretical concepts.

Disadvantages of Quantitative Techniques:

(i) The theories and models developed on the basis of empirical data do not take into account the normative questions like beliefs, emotions, attitudes, desires, hopes and fears and therefore, cannot be taken as the tools explaining exact geographical realities.

(ii) The over-enthusiastic preachers have sacrificed many good qualitative statements which were quite useful.
(iii) They also demand sophisticated data which are rarely attainable outside the developed countries.
(iv) It has been found that generalisation done with the help of these techniques is bringing exaggerated results.
(v) The factorial designs depend on the use of the costly computer time and considerable financial assistance which are rarely available to the individual researcher of areal variation.

Generalisation on the basis of quantitative techniques may prove to be misleading and negative instead of positive. Apart from this, the data used is hardly for a period of about hundred years and that too reflects the modes of production and distribution of the developed societies. Thus, the Quantitative Revolution also could not enable the geographers to formulate the universal laws and paradigms.

9.3.1 Behavioral Revolution :

It may be seen as a developing criticism from within the Quantitative Revolution, Behavioral geography treats man as a responder to stimuli. It seeks to identify how different individuals respond to particular stimuli (and also how the same individual responds to the same stimuli in different situations) to isolate the correlates of those varying responses to build models that can predict the probable impact of certain stimuli.

In the 1920s, the Finnish geographer Johannes Gabriel Grano and his Estonian student Edgar Kant were attempting a behavioral approach. It was Gilbert White whose thesis on human adjustments to floods was published in 1945. His associates at the University of Chicago developed a behaviorist approach for studying reactions to the natural hazards basing this on Herbert Simon's theories of decision-making.

White found it more important to map the personal perception of the decision-maker than to describe the factual physical and economic conditions of the environment, since the decision maker would act upon his own perception and not on the environmental factors themselves.

Kates, a major exponent of the behaviorist approach, states that the way men view the ranks and opportunities of this uncertain environment plays a significant role in their management as in resource management.

The aim in behavioral geography has been to derive alternative theories to those based on the economic man. These theories are more concerned with understanding why certain activities take place father than what patterns they provide in space.

Behavioral geography:

Behavioral Geography is an approach to Human Geography that attempts to understand human activity in space, place, and environment by studying it at the disaggregate level of analysis—at the level of the individual person. Behavioral geographers analyze data on the behavior of individual people, recognizing that individuals vary from each other. A key tenet of behavioral geography holds that models of human activity and interaction can be improved by incorporating more realistic assumptions about human behavior. For example, behavioral geographers agree with other human geographers that distance (or related factors such as travel time or effort) is an important determinant of human activity but they maintain that it is subjective rather than objective distance that is typically important. And because different people's beliefs about distances may vary considerably from one another and from objective distance, spatial activities will be more variable and less optimal than nonbehavioral models predict. Thus, the disaggregate study of human geography naturally led behavioral researchers to consider what the individual knows or believes about the world as playing an important role in explaining what the individual does or will do—that is, people do what they do because of what they think is true.

People evaluate decision alternatives according to their beliefs in order to make behavioral choices in space and place. What people think, in turn, arises from perceptual knowledge acquired via the senses, as organized and interpreted by existing beliefs and schematic knowledge structures and processes. These, in turn, are products of people's genetic and experiential histories and are often mediated by symbolic representations such as maps and language. Behavioral geography further maintains that human-environment relations are dynamic and bidirectional. The actions and mental states of individuals cause and are caused by physical and social environments within the context of ongoing and changing interactions. Because of these various interests and beliefs, behavioral geography has inherent interdisciplinary connections particularly with various subfields of psychology but also with other behavioral and cognitive disciplines such as linguistics, anthropology, economics and artificial intelligence and environmental disciplines such as planning, architecture and urban studies

9.3.2 Perception and Cognition


Perception : Perception is one of the oldest and most fundamental disciplines within Psychology dating back to at the time of the ancient Greeks. The goal of perception research is to understand how stimuli from the world interact with our sensory systems forming visual, auditory, tactile, olfactory and gustatory representations of the world. Research in perception and psychophysics is directed at discovering the lawful relations between environmental events and subjective experience. This area spans a wide range of problems extending from the structure and function of the sense organs through the processing of sensory information to the nature of subjective experience and the methods by which an accurate description of these experiences is obtained. As such, an understanding of perception is critical for all areas within Psychology. The modern study of perception is highly integrative combining cognitive, behavioral, computational, developmental and neuroscientific approaches.

Cognition : McMaster's cognitive psychologists study a wide variety of problems but are united in the goal of understanding how people mentally represent their experience and then use these representations to operate effectively. Neisser launched the "cognitive revolution" in 1966 with these words: "the world of experience is produced by the man who experiences it". This statement captures the student of cognition's belief that people are not passive organisms whose mental representations are simple or direct reflections of the outside world. Rather, they are active processors of environmental events and as such they bring their past knowledge and their biases to bear on how they perceive and understand all current events. Thus, perceiving, imagining, thinking, remembering, forming concepts and solving problems, indeed all aspects of people's mental lives define the domain of cognitive exploration.

The research effort in Cognition and Perception is diverse and many broad areas of interest are represented. Which include the study vision, audition, touch, multi-sensory integration,

perceptual and cognitive development, attention and spatial processing, human factors, psychophysics, music perception, perceptual illusions and after effects. The research effort to investigate the formation and use of concepts, the modeling of memory processes, human communication skills and reading and its development may be performed.

9.3.3 Mental maps :

Behavioral Geography, a mental map is a person's point-of-view perception of their area of interaction. Although this kind of subject matter in particular subject is most often studied by modern day geographers. They study it to determine subjective qualities from the public such as personal preference and practical uses of geography like driving directions. Mass media also has a virtually direct effect on a person's mental map of the geographical world. The perceived geographical dimensions of a foreign nation (relative to one's own nation) may often be heavily influenced by the amount of time and relative news coverage that the news media may spend covering news events from that foreign region. For instance, a person might perceive a small Island to be nearly the size of a continent, merely based on the amount of news coverage that he or she is exposed to on a regular basis in Psychology. The term names the information maintained in the mind of an organism by means of which it may plan activities, select routes over previously traveled territories, etc. The rapid traversal of a familiar maze depends on this kind of mental map if scents or other markers laid down by the subject are eliminated before the maze is re-run**.** Mental maps are an outcome of the field of behavioral geography. The imagined maps are considered one of the first studies that intersected geographical settings with human action. The most prominent contribution and study of mental maps was in the writings of Kevin Lynch. In *The Image of the City*, Lynch used simple sketches of maps created from memory of an urban area to reveal five elements of the city; nodes, edges, districts, paths and landmarks. Lynch claimed that “Most often our perception of the city is not sustained but rather partial, fragmentary and mixed with other concerns. Nearly every sense is in operation and the image is the composite of them all” (Lynch, 1960, p 2.). The creation of a mental map relies on memory as opposed to being copied from a preexisting map or image. In *The Image of the City*, Lynch asks a participant to create a map as follows: “Make it just as if you were making a rapid description of the city to a stranger, covering all the main features. We don’t expect an accurate drawing- just a rough sketch” (Lynch 1960, p 141). In the field of human geography mental maps have led to an emphasizing of social factors and the use of social methods versus quantitative or positivist methods. Mental maps have often led to revelations regarding social conditions of a particular space or area. Haken and Portugali (2003) developed an information view, which argued that the face of the city is its information. Bin Jiang (2012) argued that the image of the city (or mental map) arises out of the scaling of city artifacts and locations.

9.3.4 Marxism :

Marxism is a method of socio-economic analysis, originating from the mid-to-late 19th century works of German philosophers Karl Marx and Friedrich Engels that analyzes class relations and societal conflict using a materialist interpretation of historical development and a dialectical view of social transformation.

Marxist methodology originally used economic and sociopolitical inquiry to analyze and critique the development of capitalism and the role of class struggle in systemic economic change. According to Marxist analysis, class conflict within capitalism arises due to intensifying contradictions between highly productive mechanized and socialized production performed by the proletariat and private ownership and appropriation of the surplus product in the form of surplus value (profit) by a small minority of private owners called the bourgeoisie. As the contradiction becomes apparent to the working class, social unrest between the two antagonistic classes intensifies, culminating in a social revolution. The eventual long-term outcome of this revolution would be the establishment of socialism – a socio-economic system based on social ownership of the means of production, distribution based on one's contribution and production organized directly for use. As the productive forces and technology continued to advance, Marx hypothesized that socialism would eventually give way to a communist stage of social development, which would be a classless and stateless humane society erected on common ownership and the principle of "From each according to his ability to each according to his needs".

The Marxian analysis begins with an analysis of material conditions and the economic activities required satisfying society's material needs. It is understood that the form of economic organization or mode of production, gives rise to, or at least directly influences most other social phenomena – including social relations, political and legal systems, morality and ideology. The economic system and these social relations form a base and superstructure. As forces of production, most notably technology, improve existing forms of social organization become inefficient and stifle further progress. As Karl Marx observed: "At a certain stage of development, the material productive forces of society come into conflict with the existing relations of production or this merely expresses the same thing in legal terms with the property relations within the framework of which they have operated hitherto. From forms of development of the productive forces these relations turn into their fetters. Then begins an era of social revolution."

These inefficiencies manifest themselves as social contradictions in society in the form of class struggle. Under the capitalist mode of production, this struggle materializes between the minority (the bourgeoisie) who own the means of production and the vast majority of the population (the proletariat) who produce goods and services. Taking the idea that social change occurs because of the struggle between different classes within society who are under

contradiction against each other, leads the Marxist analysis to the conclusion that capitalism exploits and oppresses the proletariat, which leads to a proletarian revolution.

Capitalism (according to Marxist theory) can no longer sustain the living standards of the population due to its need to compensate for falling rates of profit by driving down wages, cutting social benefits and pursuing military aggression. The socialist system would succeed capitalism as humanity's mode of production through workers' revolution. According to Marxism, especially arising from crisis theory, socialism is a historical necessity (but not an inevitability).

In a socialist society private property in the means of production would be superseded by co-operative ownership. A socialist economy would not base production on the creation of private profits, but on the criteria of satisfying human needs – that is, production would be carried out directly for use. As Engels observed: "Then the capitalist mode of appropriation in which the product enslaves first the producer and then appropriator, is replaced by the mode of appropriation of the product that is based upon the nature of the modern means of production; upon the one hand, direct social appropriation as means to the maintenance and extension of production on the other, direct individual appropriation, as means of subsistence and of enjoyment."

The historical materialist theory of history dialectically analyses the underlying causes of societal development and change in the collective ways humans make their living. All constituent features of a society (social classes, political pyramid, ideologies) stem from economic activity, an idea often conveyed with the metaphor of the base and superstructure.

The base and superstructure metaphor explains that the totality of social relations in and by which humans product and re-product their social existence, forms a society's economic *base*. From this base rises a *superstructure* of political and legal institutions, i.e., ruling class. The base corresponds to the social consciousness (politics, religion, philosophy etc.) and it conditions the superstructure and the dominant ideology. A conflict between the development of material productive forces and the relations of production provokes social revolutions, thus the resultant changes to the economic base will lead to the transformation of the superstructure. This relationship is reflexive; at first the base gives rise to the superstructure and remains the foundation of a form of social organization. Hence, that formed social organization can act again upon both parts of the base and superstructure, whose relationship is not unilinear but dialectic, namely a relationship driven by conflicts and contradictions. As Friedrich Engels clarified: "The history of all hitherto existing society is the history of class struggles. Freeman and slave, patrician and plebeian, lord and serf, guild-master and journeyman, in a word, oppressor and oppressed, stood in constant opposition to one another, carried on uninterrupted, now hidden, now open fight, a fight that each time ended, either in a revolutionary reconstitution of society at large, or in the common ruin of the contending classes."'

Marx considered these socio-economic conflicts as the driving force of human history since these recurring conflicts have manifested themselves as distinct transitional stages of development in Western Europe. Accordingly, Marx designates human history as encompassing four stages of development in relations of production.

1. *Primitive Communism:* as in co-operative tribal societies.
2. *Slave Society:* a development of tribal to city-state; aristocracy is born.
3. *Feudalism:* aristocrats are the ruling class; merchants evolve into capitalists.
4. *Capitalism:* capitalists are the ruling class, who create and employ the proletariat.

Criticism of capitalism :

According to the Marxist theoretician and revolutionary Vladimir Lenin, "the principal content of Marxism" was "Marx's economic doctrine". Marx believed that the capitalist bourgeois and their economists were promoting what he saw as the lie that "The interests of the capitalist and those of the worker are ... one and the same"; he believed that they did this by purporting the concept that "the fastest possible growth of productive capital" was best not only for the wealthy capitalists but also for the workers because it provided them with employment.

Exploitation is a matter of surplus labour – the amount of labour one performs beyond what one receives in goods. Exploitation has been a socioe-conomic feature of every class society and is one of the principal features distinguishing the social classes. The power of one social class to control the means of production enables its exploitation of the other classes.

In capitalism, the labour theory of value is the operative concern; the value of a commodity equals the socially necessary labour time required to produce it. Under that condition, surplus value (the difference between the value produced and the value received by a labourer) is synonymous with the term "surplus labour"; thus, capitalist exploitation is realised as deriving surplus value from the worker.

In pre-capitalist economies, exploitation of the worker was achieved via physical coercion. In the capitalist mode of production, that result is more subtly achieved; because the worker does not own the means of production, he or she must voluntarily enter into an exploitive work relationship with a capitalist in order to earn the necessities of life. The worker's entry into such employment is voluntary in that he or she chooses which capitalist to work for. However, the worker must work or starve. Thus, exploitation is inevitable and the "voluntary" nature of a worker participating in a capitalist society is illusory.

Alienation is the estrangement of people from their humanity (German: *Gattungswesen*, "species-essence", "species-being"), which is a systematic result of capitalism. Under capitalism, the fruits of production belong to the employers, who expropriate the surplus created by others and so generate alienated labourers. In Marx's view, alienation is an objective characterization of the worker's situation in capitalism – his or her self-awareness of this condition is not prerequisite.

Social classes :
The identity of a social class derives from its relationship to the means of production; Marx describes the social classes in capitalist societies:

Proletariat : "the class of modern wage labourers who, having no means of production of their own, are reduced to selling their labour power in order to live". As Andrei Platonov expressed "The working class is my home country and my future is linked with the proletariat." The capitalist mode of production establishes the conditions enabling the bourgeoisie to exploit the proletariat because the workers' labour generates a surplus value greater than the workers' wages.

Bourgeoisie : Those who "own the means of production" and buy labour power from the proletariat, thus exploiting the proletariat; they subdivide as bourgeoisie and the petit bourgeoisie.

Petit bourgeoisie : Petit bourgeoisie are those who work and can afford to buy little labour power i.e. small business owners, peasant landlords, trade workers et al. Marxism predicts that the continual reinvention of the means of production eventually would destroy the petit bourgeoisie, degrading them from the middle class to the proletariat.

Lumpenproletariat : The outcasts of society such as criminals, vagabonds, beggars, prostitutes, et al., who have no stake in the economy and no mind of their own and so are decoyed by every bidder.

Landlords : a historically important social class who retain some wealth and power.

Peasantry and farmers : a scattered class incapable of organizing and effecting socio-economic change, most of whom would enter the proletariat, and some become landlords.
Class consciousness denotes the awareness – of itself and the social world – that a social class possesses and its capacity to rationally act in their best interests; hence, class consciousness is required *before* they can effect a successful revolution.

Without defining ideology, Marx used the term to denote the production of images of social reality; according to Engels, "ideology is a process accomplished by the so-called thinker consciously, it is true, but with a false consciousness. The real motive forces impelling him remain unknown to him; otherwise it simply would not be an ideological process. Hence he imagines false or seeming motive forces". Because the ruling class controls the society's means of production, the superstructure of society, the ruling social ideas are determined by the best

interests of the said ruling class. In *The German Ideology*, "the ideas of the ruling class are in every epoch the ruling ideas, i.e. the class which is the ruling material force of society, is, at the same time, its ruling intellectual force".

The term "political economy" originally denoted the study of the conditions under which economic production was organised in the capitalist system. In Marxism, political economy studies the means of production, specifically of capital and how that manifests as economic activity.

9.3.5 Postmodernism:

Postmodernism is a late-20th-century movement in the arts, architecture and criticism that was a departure from modernism. Postmodernism articulates that the world is in a state of perpetual incompleteness and permanent unresolve. Postmodernism promotes the notion of radical pluralism; that there are many ways of knowing, and many truths to a fact. From a postmodern perspective knowledge is articulated from perspectives, with all its uncertainties, complexity and paradox. Thus knowledge is relational and all realities are woven on local linguistic looms. Postmodernism includes skeptical interpretations of culture, literature, art, philosophy, history, economics, architecture, fiction and literary criticism. It is often associated with deconstruction and post-structuralism because its usage as a term gained significant popularity at the same time as twentieth-century post-structural thought. The term *postmodernism* has been applied to a host of movements, mainly in art, music and literature that reacted against tendencies in modernism and are typically marked by revival of historical elements and techniques.

The term *postmodern* was first used around the 1880s. John Watkins Chapman suggested "a Postmodern style of painting" as a way to depart from French Impressionism. J. M. Thompson, in his 1914 article in *The Hibbert Journal* (a quarterly philosophical review), used it to describe changes in attitudes and beliefs in the critique of religion: "The raison d'etre of Post-Modernism is to escape from the double-mindedness of Modernism by being thorough in its criticism by extending it to religion as well as theology, to Catholic feeling as well as to Catholic tradition."

In 1921 and 1925, postmodernism had been used to describe new forms of art and music. In 1942 H. R. Hays described it as a new literary form. However, as a general theory for a historical movement it was first used in 1939 by Arnold J. Toynbee: "Our own Post-Modern Age has been inaugurated by the general war of 1914–1918".

In 1949 the term was used to describe a dissatisfaction with modern architecture and led to the postmodern architecture movement, perhaps also a response to the modernist architectural movement known as the International Style. Postmodernism in architecture is marked by a re-emergence of surface ornament, reference to surrounding buildings in urban architecture, historical reference in decorative forms (eclecticism), and non-orthogonal angles.

Peter Drucker suggested the transformation into a post modern world happened between 1937 and 1957 (when he was writing). He described an as yet "nameless era" which he characterised as a shift to conceptual world based on pattern purpose and process rather than mechanical cause, outlined by four new realities: i) the emergence of Educated Society ii)the importance of international development iii)the decline of the nation state, and iv) the collapse of the viability of non-Western cultures.

In 1971, in a lecture delivered at the Institute of Contemporary Art, London, Mel Bochner described "post-modernism" in art as having started with Jasper Johns, "who first rejected sense-data and the singular point-of-view as the basis for his art and treated art as a critical investigation."

More recently, Walter Truett Anderson described postmodernism as belonging to one of four typological world views, which he identifies as either (a) Postmodern-ironist, which sees truth as socially constructed, (b) Scientific-rational, in which truth is found through methodical, disciplined inquiry, (c) Social-traditional, in which truth is found in the heritage of American and Western civilization, or (d) Neo-romantic, in which truth is found through attaining harmony with nature and/or spiritual exploration of the inner self.[11]

Postmodernist ideas in philosophy and the analysis of culture and society expanded the importance of critical theory and has been the point of departure for works of literature, architecture and design as well as being visible in marketing/business and the interpretation of history, law and culture, starting in the late 20th century. These developments—re-evaluation of the entire Western value system (love, marriage, popular culture, shift from industrial to service economy) that took place since the 1950s and 1960s, with a peak in the Social Revolution of 1968—are described with the term *Post modernity*, as opposed to *Postmodernism*, a term referring to an opinion or movement. Postmodernism has also been used interchangeably with the term post-structuralism out of which postmodernism grew, a proper understanding of postmodernism or doing justice to the postmodernist thought demands an understanding of the poststructuralist movement and the ideas of its advocates. Post-structuralism resulted similarly to postmodernism by following a time of structuralism. It is characterized by new ways of thinking through structuralism, contrary to the original form.[13] "Postmodernist" describes part of a movement; "Postmodern" places it in the period of time since the 1950s, making it a part of contemporary history.

The idea of Postmodernism in architecture began as a response to the perceived blandness and failed Utopianism of the Modern movement. Modern Architecture, as established and developed by Walter Gropius and Le Corbusier, was focused on the pursuit of a perceived ideal perfection and attempted harmony of form and function[14] and dismissal of "frivolous ornament." Critics of modernism argued that the attributes of perfection and minimalism themselves were subjective and pointed out anachronisms in modern thought and questioned the benefits of its philosophy.]Definitive postmodern architecture such as the work of Michael

Graves and Robert Venturi rejects the notion of a 'pure' form or 'perfect' architectonic detail, instead conspicuously drawing from all methods, materials, forms and colors available to architects.

Modernist Ludwig Mies van der Rohe is associated with the phrase "less is more"; in contrast Venturi famously said, "Less is a bore." Postmodernist architecture was one of the first aesthetic movements to openly challenge Modernism as antiquated and "totalitarian", favoring personal preferences and variety over objective, ultimate truths or principles.

It is this atmosphere of criticism, skepticism and emphasis on difference over and against unity that distinguishes the postmodernism aesthetic. Among writers defining the terms of this discourse is Charles Jencks, described by Architectural Design Magazine as "the definer of Post-Modernism for thirty years" and the "internationally acclaimed critic..., whose name became synonymous with Post-modernism in the 80s".

Urban planning :

Postmodernism is a rejection of 'totality', of the notion that planning could be 'comprehensive', widely applied regardless of context, and rational. In this sense, Postmodernism is a rejection of its predecessor: Modernism. From the 1920s onwards, the Modern movement sought to design and plan cities which followed the logic of the new model of industrial mass production; reverting to large-scale solutions, aesthetic standardisation and prefabricated design solutions (Goodchild 1990). Postmodernism also brought a break from the notion that planning and architecture could result in social reform, which was an integral dimension of the plans of Modernism (Simonsen 1990). Furthermore, Modernism eroded urban living by its failure to recognise differences and aim towards homogenous landscapes (Simonsen 1990, 57). Within Modernism, urban planning represented a 20th-century move towards establishing something stable, structured and rationalised within what had become a world of chaos, flux and change (Irving 1993, 475). The role of planners predating Postmodernism was one of the 'qualified professional' who believed they could find and implement one single 'right way' of planning new urban establishments (Irving 1993). In fact, after 1945, urban planning became one of the methods through which capitalism could be managed and the interests of developers and corporations could be administered (Irving 1993, 479).

Considering Modernism inclined urban planning to treat buildings and developments as isolated, unrelated parts of the overall urban ecosystems created fragmented, isolated, and homogeneous urban landscapes (Goodchild, 1990). One of the greater problems with Modernist-style of planning was the disregard of resident or public opinion, which resulted in planning being forced upon the majority by a minority consisting of affluent professionals with little to no knowledge of real 'urban' problems characteristic of post-Second World War urban environments: slums, overcrowding, deteriorated infrastructure, pollution and disease, among others (Irving 1993). These were precisely the 'urban ills'. Modernism was meant to 'solve', but more often than not, the types of 'comprehensive', 'one size fits all' approaches to planning made

things worse and residents began to show interest in becoming involved in decisions which had once been solely entrusted to professionals of the built environment. Advocacy planning and participatory models of planning emerged in the 1960s to counter these traditional elitist and technocratic approaches to urban planning (Irving 1993; Hatuka & D'Hooghe 2007). Furthermore, an assessment of the 'ills' of Modernism among planners during the 1960s, fuelled development of a participatory model that aimed to expand the range of participants in urban interventions (Hatuka & D'Hooghe 2007, 21).

Graphic design :

Postmodern designers were in the beginning stages of what we now refer to as "graphic design". They created works beginning in the 1970s without any set adherence to rational order and formal organization. They also seemed to entirely pay no attention to traditional conventions such as legibility. Another characteristic of postmodern graphic design is that "retro, techno, punk, grunge, beach, parody and pastiche were all conspicuous trends. Each had its own sites and venues, detractors and advocates". Yet, while postmodern design did not consist of one unified graphic style, the movement was an expressive and playful time for designers who searched for more and more ways to go against the system. Key influential postmodern graphic designers include Wolfgang Weingart, April Greiman, Tibor Kalman and Jamie Reid.

Deconstruction :

One of the most well-known postmodernist concerns is "deconstruction," a theory for philosophy, literary criticism and textual analysis developed by Jacques Derrida. The notion of a "deconstructive" approach implies an analysis that questions the already evident understanding of a text in terms of presuppositions, ideological underpinnings, hierarchical values and frames of reference. A deconstructive approach further depends on the techniques of close reading without reference to cultural, ideological, moral opinions or information derived from an authority over the text such as the author. At the same time Derrida famously writes: "Il n'y a pas d'hors-texte (*there is no such thing as outside-of-the-text*)." Derrida implies that the world follows the grammar of a text undergoing its own deconstruction. Derrida's method frequently involves recognizing and spelling out the different, yet similar interpretations of the meaning of a given text and the problematic implications of binary oppositions within the meaning of a text. Derrida's philosophy inspired a postmodern movement called deconstructivism among architects characterized by the intentional fragmentation, distortion and dislocation of architectural elements in designing a building. Derrida discontinued his involvement with the movement after the publication of his collaborative project with architect Peter Eisenmann in *Chora L Works: Jacques Derrida and Peter Eisenman*.

Criticisms of postmodernism :

Criticisms of postmodernism are intellectually diverse including the assertions that postmodernism is meaningless and promotes obscurantism. For example, Noam Chomsky has argued that postmodernism is meaningless because it adds nothing to analytical or empirical

knowledge. He asks why postmodernist intellectuals do not respond like people in other fields when asked, "what are the principles of their theories, on what evidence are they based, what do they explain that wasn't already obvious, etc.?...If [these requests] can't be met, then I'd suggest recourse to Hume's advice in similar circumstances: 'to the flames'

Christian apologist William Lane Craig has noted "The idea that we live in a postmodern culture is a myth. In fact, a postmodern culture is an impossibility; it would be utterly unliveable. People are not relativistic when it comes to matters of science, engineering and technology; rather, they are relativistic and pluralistic in matters of religion and ethics. But, of course, that's not postmodernism; that's modernism!"[39]

Formal, academic critiques of postmodernism can also be found in works such as *Beyond the Hoax* and *Fashionable Nonsense*.

However, as for continental philosophy, American academics have tended to label it "postmodernist", especially practitioners of "French Theory". Such a trend might derive from U.S. departments of Comparative Literature.[40] It is interesting to note that Félix Guattari, often considered a "postmodernist", rejected its theoretical assumptions by arguing that the structuralist and postmodernist visions of the world were not flexible enough to seek explanations in psychological, social and environmental domains at the same time.[41]

Philosopher Daniel Dennett declared, "Postmodernism, the school of 'thought' that proclaimed 'There are no truths, only interpretations' has largely played itself out in absurdity but it has left behind a generation of academics in the humanities disabled by their distrust of the very idea of truth and their disrespect for evidence, settling for 'conversations' in which nobody is wrong and nothing can be confirmed, only asserted with whatever style you can muster."

9.4 CONCLUSION

Modern approaches and related concepts to Paradigms viz Qualitative paradigm, behavioral revolution, perception and cognition, mental mapping are various dimentions of human contemplation. Marxism the theory of classlessness and post modernism is the concept of ever growing thinking of human beings.

9.5 SUMMARY

A qualitative paradigm is an investigation process of understanding a social or human problem based on building a complex, holistic picture, formed with words, reporting detailed views of informants and conducted in a natural setting. On the other hand a quantitative study, consistent with the quantitative paradigm is an inquiry into a social or human problem based on testing a theory composed of variables, measured with numbers and analyzed with statistical procedures in order to determine whether the predictive generalizations of the theory hold true. Behavioral revolution is a process that attempts to understand human activity in space, place and

environment by studying it at the disaggregate level of analysis—at the level of the individual person. This process analyze data on the behavior of individual people, recognizing that individuals vary from each other. A key principle of behavioral geography holds that models of human activity and interaction can be improved by incorporating more realistic assumptions about human behavior. Perception is to understand how stimuli from the world interact with our sensory systems, forming visual, auditory, tactile, olfactory and gustatory representations of the world. Cognition is a process of understanding how people mentally represent their experience and then use these representations to operate effectively. **A** mental map is a person's point-of-view perception of their area of interaction. Mental maps are an outcome of the field of behavioral geography. Marxism is a method of socio-economic analysis originating from the mid-to-late 19th century works of German philosophers Karl Marx and Friedrich Engels, that analyzes class relations and societal conflict using a materialist interpretation of historical development and a dialectical view of social transformation. Postmodernism is a late-20th-century movement in the arts, architecture and criticism that was a departure from modernism. Postmodernism articulates that the world is in a state of perpetual incompleteness and permanent unresolve. Postmodernism promotes the notion of radical pluralism; that there are many ways of knowing and many truths to a fact. From a postmodern perspective knowledge is articulated from perspectives, with all its uncertainties, complexity and paradox.

9.6 GLOSSARY

Paradigm shift - Changing of concepts or thought patterns
Hierarchical values - Traditional values adopted from ancesters
Homogenous landscapes - Landscape created by same elements
Neuroscientific - Science related to neurology

9.7 ANSWER TO CHECK YOUR PROGRESS

1. What is paradigm? Define it in detail.
2. Define Behavioral revolution, Perception, Cognition and Mental map in detail.
3. Explain in detail, the theory of Marxism and Post Marxism.

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9.10 TERMINAL QUESTIONS

1. What is paradigm? Discuss it in detail.
2. Define Behavioral revolution, Perception, Cognition and Mental map in detail.
3. Explain in detail the theory of Marxism and Post Marxism.

UNIT 10 : POST STRUCTURALISM AND POST COLONIALISM

10.1 OBJECTIVES:

After reading this unit you will be able:

- To understand the concept of Structuralism.
- To understand and discuss Post Colonialism
- To know the impact and consequences of Structuralism and Post Colonialism.

10.2 INTRODUCTION:

Post-structuralism refers to the intellectual developments in continental philosophy and critical theory that were outcomes of twentieth-century French philosophy. The prefix "post" refers to the fact that many contributors such as Jacques Derrida, Michel Foucault and Julia Kristeva were former structuralists who, after abandoning structuralism became quite critical of it. In direct contrast to structuralism's claims of culturally independent meaning, post-structuralists typically view culture as inseparable from meaning.

Post-structuralism is a label formulated by American academics to denote the heterogeneous works of a series of mid-20th-century. French and continental philosophers and critical theorists who came to international prominence in the 1960s and '70s. Existential phenomenology is a significant influence; Colin Davis has argued that post-structuralists might just as accurately be called "post-phenomenologists".

Structuralism was an intellectual movement in France in the 1950s and 1960s that studied the underlying structures in cultural products (such as texts) and used analytical concepts from linguistics, psychology, anthropology and other fields to interpret those structures. It emphasized the logical and scientific nature of its results.

10.3 POST-STRUCTURALISM

Post-structuralism is defined by its relationship to its predecessor, structuralism, an intellectual movement developed in Europe from the early to mid-20th century. Which argued that human culture may be understood by means of a structure—modeled on language that differs from concrete reality and from abstract ideas—a "third order" that mediates between the two Post-structuralist authors all present different critiques of structuralism but common themes include the rejection of the self-sufficiency of the structures that structuralism posits and an interrogation of the binary oppositions that constitute those structures.

Post-structuralism offers a way of studying how knowledge is produced and critiques structuralist premises. It argues that because history and culture condition the study of underlying structures, both are subject to biases and misinterpretations. A post-structuralist approach argues that to understand an object (e.g., a text), it is necessary to study both the object itself and the systems of knowledge that produced the object. Post-structuralists generally assert that post-

structuralism is historical and they classify structuralism as descriptive This terminology relates to Ferdinand de Saussure's distinction between the views of historical (diachronic) and descriptive (synchronic)reading. From this basic distinction, post-structuralist studies often emphasize history to analyze descriptive concepts. By studying how cultural concepts have changed over time, post-structuralists seek to understand how those same concepts are understood by readers in the present. For example, Michel Foucault's *Madness and Civilization* is both a history and an inspection of cultural attitudes about madness. The theme of history in modern Continental thought can be linked to such influences as Georg Wilhelm, Friedrich Hegel, Friedrich Nietzsche's *On the Genealogy of Morals* and Martin Heidegger's *Being and time"*

Post-structuralism emerged in France during the 1960s as a movement critiquing structuralism. According to J.G. Merquior a love–hate relationship with structuralism developed amongst many leading French thinkers in the 1960s. Post-structuralism offered a means of justifying these criticisms by exposing the underlying assumptions of many Western norms.

Two key figures in the early post-structuralist movement were Jacques Derrida and Roland Barthes. In a 1966 lecture "Structure, Sign and Play in the Discourse of the Human Sciences", Jacques Derrida presented a thesis on an apparent rupture in intellectual life. Derrida interpreted this event as a "decentering" of the former intellectual cosmos. Instead of progress or divergence from an identified centre, Derrida described this "event" as a kind of "play."

Although Barthes was originally a structuralist, during the 1960s he increasingly favored post-structuralist views. In 1967, Barthes published "The Death of the Author" in which he announced a metaphorical event: the "death" of the author as an authentic source of meaning for a given text. Barthes argued that any literary text has multiple meanings and that the author was not the prime source of the work's semantic content. The "Death of the Author," Barthes maintained, was the "Birth of the Reader," as the source of the proliferation of meanings of the text.

Post-structuralist philosophers like Derrida and Foucault did not form a self-conscious group but each responded to the traditions of phenomenology and structuralism. Phenomenology, often associated with two German philosophers Edmund Husserl and Martin Heidegger, rejected previous systems of knowledge and attempted to examine life "just as it appears" (as phenomena).[13] Both movements rejected the idea that knowledge could be centred on the human knower and sought what they considered a more secure foundation for knowledge.

In phenomenology this foundation would be experience itself; in structuralism, knowledge is founded on the "structures" that make experience possible: concepts and language or signs. Post-structuralism, in turn, argues that founding knowledge either on pure experience (phenomenology) or systematic structures (structuralism) is impossible. This impossibility was meant not a failure or loss but a cause for "celebration and liberation

History

Post-structuralism emerged in France during the 1960s as an antinomian movement critiquing structuralism. The period was marked by political anxiety, as students and workers alike rebelled against the state in May 1968, nearly causing the downfall of the French government. At the same time, however, the French communist party's (FCP) support of the oppressive policies of the USSR contributed to popular disillusionment with orthodox Marxism. As a result, there was increased interest in alternative radical philosophies, including feminism, western Marxism, phenomenology and nihilism. These disparate perspectives, which Michel Foucault later labeled "subjugated knowledge's," were all linked by being critical of dominant Western philosophy and culture. Post-structuralism offered a means of justifying these criticisms by exposing the underlying assumptions of many Western norms.

Two key figures in the early post-structuralist movement were Jacques Derrida and Roland Barthes. In a 1966 lecture "Structure, Sign and Play in the Discourse of the Human Science"[3], Jacques Derrida presented a thesis on an apparent rupture in intellectual life. Derrida interpreted this event as a "decentering" of the former intellectual cosmos. Instead of progress or divergence from an identified center, Derrida described this "event" as a kind of "play."

American Roots:

Some of the ideas of post structuralism were anticipated by the philosophy of the school of New Criticism, a group of twentieth century literary critics who sought to read literary texts removed from historical or biographical contexts. New Criticism dominated American literary criticism during the forties, fifties and sixties. The crucial New Critical precept of the "Intentional Fallacy" declares that a poem does not belong to its author; rather, "it is detached from the author at birth and goes about the world beyond his power to intend about it or control it. The poem belongs to the public." William Wimsatt and Monroe C. Beardsley wrote this in 1946, decades before Barthes' essay. ("The Intentional Fallacy." *Sewanee Review* 54, 1946, 468-488). Revised and republished in *The Verbal Icon: Studies in the Meaning of Poetry.* (University of Kentucky Press, 1954, 3-18.) New Criticism differs significantly from Post structuralism, however, in that it attempts to arrive at more authoritative interpretations of texts.

Post-structural practices generally operate on some basic assumptions:

- Post-structuralists hold that the concept of "self" as a singular and coherent entity is a fictional construct. Instead, an individual comprises conflicting tensions and knowledge claims (e.g., gender, class, profession, etc.). Therefore, to properly study a text, a reader must understand how the work is related to his or her own personal concept of self. This self-perception plays a critical role in one's interpretation of meaning. While different thinkers' views on the self (or the subject) vary, it is often said to be constituted by discourse(s). Lacan's account includes a psychoanalytic dimension while Foucault stresses the effects of power on the self.

- The meaning the author intended is secondary to the meaning that the reader perceives. Post-structuralism rejects the idea of a literary text having a single purpose, a single meaning or one singular existence. Instead, every individual reader creates a new and individual purpose, meaning and existence for a given text. To step outside of literary theory, this position is generalizable to any situation where a subject perceives a sign. Meaning (or the signified, in Saussure's scheme which is heavily presumed upon in post-structuralism as in structuralism) is constructed by an individual from a signifier. This is why the signified is said to 'slide' under the signifier and explains the talk about the 'primacy of the signifier'.
- A post-structuralist critic must be able to utilize a variety of perspectives to create a multifaceted interpretation of a text, even if these interpretations conflict with one another. It is particularly important to analyze how the meanings of a text shift in relation to certain variables, usually involving the identity of the reader.

Destabilized meaning

In the post-structuralist approach to textual analysis, the reader replaces the author as the primary subject of inquiry. This displacement is often referred to as the "destabilizing" or "decentering" of the author, though it has its greatest effect on the text itself. Without a central fixation on the author, post-structuralists examine other sources for meaning (e.g., readers, cultural norms, other literature, etc.). These alternative sources are never authoritative and promise no consistency.

Deconstruction

A major theory associated with Structuralism was binary opposition. This theory proposed that there are certain theoretical and conceptual opposites, often arranged in a hierarchy, which structure a given text. Such binary pairs could include male/female, speech/writing, rational/emotional.

Post-structuralism rejects the notion of the essential quality of the dominant relation in the hierarchy, choosing rather to expose these relations and the dependency of the dominant term on its apparently subservient counterpart. The only way to properly understand these meanings is to deconstruct the assumptions and knowledge systems which produce the illusion of singular meaning.

A good example of this is a close reading of the Dylan Thomas poem, "A Refusal to Mourn the Death, by Fire, of a Child in London," that incorporates the line "After the first death there is no other." A deconstructionist will view this as widely open. Since there is a "first death," there is the implication that there *will* be another, yet Thomas contradicts himself in the line by saying "there is no other." Deconstructionists assert that this shows "discontinuity" in the line. This discontinuity points out that the language has a "slipperiness" which makes precise interpretation impossible. Meaning, therefore, is equally in the hands of the reader and the author.

Metalanguage

Although many may have felt the necessity to move beyond structuralism, there was clearly no consensus on how this was to occur. Much of the study of post-structuralism is based on the common critiques of structuralism. Roland Barthes is of great significance with respect to post-structuralist theory. In his work, *Elements of Semiology* (1967), he advanced the concept of the "metalanguage." A metalanguage is a systematized way of talking about concepts like meaning and grammar beyond the constraints of a traditional (first-order) language; in a metalanguage, symbols replace words and phrases. Insofar as one metalanguage is required for one explanation of first-order language, another may be required, so metalanguages may actually replace first-order languages. Barthes exposes how this structuralist system is regressive; orders of language rely upon a metalanguage by which it is explained and therefore deconstruction itself is in danger of becoming a metalanguage, thus exposing all languages and discourse to scrutiny. Barthes' other works contributed deconstructive theories about texts.

Structuralism vs. Post-structuralism

Post-structuralism may be understood as a critical response to the basic assumptions of structuralism. Structuralism was a fashionable movement in France in the 1950s and 1960s that studied the underlying structures inherent in cultural products (such as texts) and utilizes analytical concepts from linguistics, psychology, anthropology and other fields to understand and interpret those structures. Although the structuralist movement fostered critical inquiry into these structures, it emphasized logical and scientific results. Many structuralists sought to integrate their work into pre-existing bodies of knowledge. This was observed in the work of Ferdinand de Saussure in linguistics, Claude Lévi-Strauss in anthropology and many early twentieth-century psychologists.

The general assumptions of post-structuralism derive from critique of structuralist premises. Specifically, post-structuralism holds that the study of underlying structures is itself culturally conditioned and therefore subject to myriad biases and misinterpretations. To understand an object (e.g., one of the many meanings of a text), it is necessary to study both the object itself and the systems of knowledge which were coordinated to produce the object. In this way, post-structuralism positions itself as a study of how knowledge is produced.

Historical vs. descriptive view:

Post-structuralists generally assert that post-structuralism is historical and classify structuralism as descriptive. This terminology relates to linguist Ferdinand de Saussure's distinction between the views of historical (diachronic) and descriptive (synchronic) theories of language. From this basic distinction, post-structuralist studies often re-introduce the historical element to analyze descriptive, diachronic concepts. The re-introduction of the historical element serves to destabilize the fixed meanings applied by structuralist categories. Michel Foucault's works, such

as Madness and Civilization, *which examines the history and cultural attitudes about madness, is a good example of poststructuralist analysis.*

Scholars between both movements:

The uncertain distance between structuralism and post-structuralism is further blurred by the fact that scholars generally do not label themselves as post-structuralists. In some cases (e.g., Claude Lévi-Strauss and Roland Barthes), scholars associated with structuralism became noteworthy in post-structuralism as well. Along with Lévi-Strauss, three of the most prominent post-structuralists were first counted among the so-called "Gang of Four" of structuralism par excellence: Jacques Lacan, Roland Barthes and Michel Foucault. The works of Jacques Derrida, Gilles Deleuze and Julia Kristeva are also counted as prominent examples of post-structuralism.

Many of those who began from the perspective that texts could be interpreted based solely on the cultural and social structures came to believe that the reader's culture and society shared an equal part in the interpretation of a piece.

10.4 POST COLONIALISM

Postcolonialism or postcolonial studies are an academic discipline featuring methods of intellectual discourse that analyze, explain and respond to the cultural legacies of colonialism and imperialism. Post colonialism responds towards the human consequences of controlling a country and establishing settlers for the economic exploitation of the native people and their land. Drawing from postmodern schools of thought, postcolonial studies analyze the politics of knowledge (creation, control and distribution) by analyzing the functional relations of social and political power that sustain colonialism and neocolonialism—the how and why of an imperial regime's representations (social, political, cultural) of the imperial colonizer and of the colonized people.

As a genre of contemporary history, post colonialism questions and reinvents the modes of cultural perception—the ways of viewing and of being viewed. As anthropology, post colonialism records human relations among the colonial nations and the subaltern peoples exploited by colonial rule. As critical theory, post colonialism presents, explains and illustrates the ideology and the praxis of neocolonialism, with examples drawn from the humanities—history and political science, philosophy and Marxist theory, sociology, anthropology, and human geography; the cinema, religion and theology; feminism, linguistics, and postcolonial literature, of which the anti-conquest narrative genre presents the stories of colonial subjugation of the subaltern man and woman.

Colonialism was presented as "the extension of Civilization", which ideologically justified the self-ascribed superiority (racial and cultural) of the European Western World over the non-Western world. This concept was espoused by Joseph-Ernest Renan in *La Réforme*

intellectuelle et morale (1871), whereby imperial stewardship was thought to effect the intellectual and moral reformation of the coloured peoples of the lesser cultures of the world. That such a divinely established, natural harmony among the human races of the world would be possible, because everyone (colonizer and colonized) has an assigned cultural identity, a social place and an economic role within an imperial colony; thus:

The regeneration of the inferior or degenerate races, by the superior races is part of the providential order of things for humanity. . . . *Regere imperio populos* is our vocation. Pour forth this all-consuming activity onto countries, which, like China, are crying aloud for foreign conquest. Turn the adventurers who disturb European society into a *ver sacrum*, a horde like those of the Franks, the Lombards, or the Normans and every man will be in his right role. Nature has made a race of workers, the Chinese race, who have wonderful manual dexterity and almost no sense of honour; govern them with justice, levying from them, in return for the blessing of such a government, an ample allowance for the conquering race, and they will be satisfied; a race of tillers of the soil, the Negro; treat him with kindness and humanity, and all will be as it should; a race of masters and soldiers, the European race. . . . Let each do what he is made for, and all will be well.

From the mid to the late-nineteenth century, such racialist group-identity language was the cultural common-currency justifying geopolitical competition, among the European and American empires, meant to protect their over-extended economies. Especially in the colonisation of the Far East and in the Scramble for Africa (1870–1914), the representation of a homogeneous European identity justified colonisation. Hence, Belgium and Britain and France and Germany proffered theories of national superiority that justified colonialism as delivering the light of civilisation to benighted peoples. Notably, *la mission civilisatrice*, the self-ascribed 'civilising mission' of the French Empire, proposed that some races and cultures have a higher purpose in life, whereby the more powerful, more developed and more civilised races have the right to colonise other peoples, in service to the noble idea of "civilisation" and its economic benefits.

As an epistemology (the study of knowledge, its nature and verifiability), as an ethics (moral philosophy) and as a politics (affairs of the citizenry), the field of postcolonialism address the politics of knowledge—the matters that constitute the postcolonial identity of a decolonised people, which derives from: (i) the coloniser's generation of cultural knowledge about the colonised people; and (ii) how that Western cultural knowledge was applied to subjugate a non–European people into a colony of the European Mother Country, which, after initial invasion, was effected by means of the cultural identities of "coloniser" and "colonised".

Postcolonial identity:

A decolonised people develop a postcolonial identity from the cultural interactions among the types of identity (cultural, national, ethnic) and the social relations of sex, class and caste; determined by the gender and the race of the colonised person; and the racism inherent to the

structures of a colonial society. In postcolonial literature, the anti-conquest narrative analyses the identity politics that are the social and cultural perspectives of the subaltern colonial subjects—their creative resistance to the culture of the coloniser; how such cultural resistance complicated the establishment of a colonial society; how the colonisers developed their postcolonial identity; and how neocolonialism actively employs the Us-and-Them binary social relation to view the non-Western world as inhabited by The Other.

The neocolonial discourse of geopolitical homogeneity conflates the decolonised peoples, their cultures and their countries, into an imaginary place, such as "the Third World", an over-inclusive term that usually comprises continents and seas, i.e. Africa, Asia, Latin America and Oceania. The postcolonial critique analyses the self-justifying discourse of neocolonialism and the functions (philosophic and political) of its over-inclusive terms, to establish the factual and cultural inaccuracy of homogeneous concepts, such as "the Arabs" and "the First World", "Christendom" and "the Islamic World", actually comprise heterogeneous peoples, cultures and geography, and that realistic descriptions of the world's peoples, places and things require nuanced and accurate terms.

Characteristics:

Post colonialism is the critical destabilization of the theories (intellectual and linguistic, social and economic) that support the ways of Western thought—deductive reasoning, rule of law and monotheism—by means of which colonialists "perceive", "understand" and "know" the world. Postcolonial theory thus establishes intellectual spaces for subaltern peoples to speak for themselves, in their own voices and thus produce cultural discourses of philosophy, language, society and economy, balancing the imbalanced us-and-them binary power-relationship between the colonist and the colonial subjects.

As a contemporary-history term, post colonialism occasionally is applied temporally, to denote the immediate time after colonialism, which is a problematic application of the term, because the immediate, historical, political time is not included to the categories of critical identity-discourse, which deals with over-inclusive terms of cultural representation, which are abrogated and replaced by postcolonial criticism. As such, the terms *postcolonial* and *postcolonialism* denote aspects of the subject matter, which indicate that the decolonised world is an intellectual space "of contradictions, of half-finished processes, of confusions, of hybridity, and of liminalities".

In *Post-Colonial Drama: Theory, Practice, Politics* (1996), Helen Gilbert and Joanne Tompkins clarified the denotational functions, among which:

The term *post-colonialism*—according to a too-rigid etymology—is frequently misunderstood as a temporal concept, meaning the time after colonialism has ceased, or the time following the politically determined Independence Day on which a country breaks away from its governance by another state. Not a naïve teleologica lsequence, which supersedes colonialism, *post-colonialism* is, rather, an engagement with, and contestation of, colonialism's discourses, power

structures and social hierarchies. . . . A theory of post-colonialism must, then, respond to more than the merely chronological construction of post-independence, and to more than just the discursive experience of imperialism.

Post colonialism critically destabilizes the dominant ideologies of the West, by challenging the "inherent assumptions . . . [and the] material and discursive legacies of colonialism", by working with tangible social factors such as:

- Anthropology, by means of which Western intellectuals generated knowledge about non-Western peoples, which colonial institutions then used to subjugate them into a colony to serve the economic, social and cultural interests of the imperial power.
- Colonialist literature, wherein the writers ideologically justified imperialism and colonialism with cultural representations (literary and pictorial) of the colonised country and its people, as perpetually inferior, which the imperial steward must organise into a colonial society to be guided towards European modernity.
- Postcolonial literature, wherein writers articulate and celebrate the postcolonial identity of the decolonised, native society (an identity often reclaimed from the coloniser) whilst maintaining the independent nation's pragmatic connections (economic and social, linguistic and cultural) with the Mother Country.
- Native cultural-identity in a colonised society and the dilemmas inherent to developing a postcolonial national identity after the de-colonisation of the country, whilst avoiding the counter-productive extremes of nationalism.

Post Colonial Nations:

As a literary theory, post colonialism deals with the literatures produced by the peoples who once were colonies of the European imperial powers (e.g. Britain, France and Spain); and the literatures of the decolonised countries engaged in contemporary, postcolonial arrangements (e.g. *Francophonie* and the British Commonwealth) with their former mother countries.[32][33] Postcolonial literary criticism comprehends the literatures written by the coloniser and the colonised, wherein the subject matter includes portraits of the colonized peoples and their lives as imperial subjects. In Dutch literature, the Indies Literature includes the colonial and postcolonial genres, which examine and analyze the formation of a postcolonial identity and the postcolonial culture produced by the diasporas of the Indo-European peoples, the Eurasian folk who originated from Indonesia; the peoples who were the colony of the Dutch East Indies; in the literature, the notable author is Tjalie Robinson.

To perpetuate and facilitate control of the colonial enterprise, some colonized people, especially from among the subaltern peoples of the British Empire, were sent to attend university in the Imperial Motherland; they were to become the native-born, but Europeanized, ruling class of colonial satraps. Yet, after decolonization, their bicultural educations originated postcolonial criticism of empire and colonialism and of the representations of the colonist and the colonized. In the late twentieth century, after the dissolution of the USSR (1991), the constituent soviet

socialist republics became the literary subjects of postcolonial criticism, wherein the writers dealt with the legacies (cultural, social, economic) of the Russification of their peoples, countries and cultures in service to Greater Russia.

Postcolonial literary study is in two categories: (i) that of the postcolonial nations, and (ii) that of the nations who continue forging a postcolonial national identity. The first category of literature presents and analyses the internal challenges inherent to determining an ethnic identity in a decolonized nation. The second category of literature presents and analyses the degeneration of civic and nationalist unities consequent to ethnic parochialism, usually manifested as the demagoguery of "protecting the nation", a variant of the Us-and-Them binary social relation. Civic and national unity degenerate when a patriarchal régime unilaterally defines what is and what is not "the national culture" of the decolonised country; the nation-state collapses, either into communal movements, espousing grand political goals for the postcolonial nation; or into ethnically mixed communal movements, espousing political separatism, as occurred in decolonized Rwanda, the Sudan and the Democratic Republic of the Congo; thus the postcolonial extremes against which Frantz Fanon warned in 1961.s

Post-Colonialism: Definition, Development and Examples from India

Definition: Post-colonialism is an intellectual direction (sometimes also called an “era” or the “post-colonial theory”) that exists since around the middle of the 20th century. It developed from and mainly refers to the time after colonialism. The post-colonial direction was created as colonial countries became independent. Nowadays, aspects of post-colonialism can be found not only in sciences concerning history, literature and politics but also in approach to culture and identity of both the countries that were colonized and the former colonial powers. However, post-colonialism can take the colonial time as well as the time after colonialism into consideration.

Development:

- The term “decolonization” seems to be of particular importance while talking about post-colonialism. In this case it means an intellectual process that persistently transfers the independence of former-colonial countries into people’s minds. The basic idea of this process is the deconstruction of old-fashioned perceptions and attitudes of power and oppression that were adopted during the time of colonialism.

First attempts to put this long-term policy of “decolonizing the minds” into practice could be regarded in the Indian population after India became independent from the British Empire in 1947.

- However, post-colonialism has increasingly become an object of scientific examination since 1950 when Western intellectuals began to get interested in the “Third World countries”. In the seventies, this interest lead to an integration of discussions about post-colonialism in various study courses at American Universities. Nowadays it also plays a remarkable role at European Universities.

- A major aspect of post-colonialism is the rather violent-like, unbuffered contact or clash of cultures as an inevitable result of former colonial times; the relationship of the colonial power to the (formerly) colonized country, its population and culture and vice versa seems extremely ambiguous and contradictory.

This contradiction of two clashing cultures and the wide scale of problems resulting from it must be regarded as a major theme in post-colonialism. For centuries the colonial suppressor often had been forcing his civilized values on the natives. But when the native population finally gained independence, the colonial relicts was still omnipresent, deeply integrated in the natives' minds and were supposed to be removed. So decolonization is a process of change, destruction and in the first place, an attempt to regain and lose power. While natives had to learn how to put independence into practice, colonial powers had to accept the loss of power over foreign countries. However, both sides have to deal with their past as suppressor and suppressed. This complicated relationship mainly developed from the Eurocentric perspective from which the former colonial powers saw themselves: Their colonial policy was often criticized as arrogant, ignorant, brutal and simply naïve. Their final colonial failure and the total independence of the once suppressed made the process of decolonization rather tense and emotional.

- Post-colonialism also deals with conflicts of identity and cultural belonging. Colonial powers came to foreign states and destroyed main parts of native tradition and culture; furthermore, they continuously replaced them with their own ones. This often lead to conflicts when countries became independent and suddenly faced the challenge of developing a new nationwide identity and self-confidence.

As generations had lived under the power of colonial rulers, they had more or less adopted their Western tradition and culture. The challenge for these countries was to find an individual way of proceeding to call their own. They could not get rid of the Western way of life from one day to the other; they could not manage to create a completely new one either.
On the other hand, former colonial powers had to change their self-assessment. This paradox identification process seems to be what decolonization is all about, while post-colonialism is the intellectual direction that deals with it and maintains a steady analysis from both points of view.

- So how is this difficult process of decolonization being done? By the power of language, even more than by the use of military violence. Language is the intellectual means by which post-colonial communication and reflection takes place. This is particularly important as most colonial powers tried to integrate their language, the major aspect of their civilized culture, in foreign societies.

A lot of Indian books that can be attached to the era of post-colonialism, for instance, are written in English. The cross-border exchange of thoughts from both parties of the post-colonial conflict is supported by the use of a shared language.

- To give a conclusion of it all, one might say that post-colonialism is a vivid discussion about what happened with the colonial thinking at the end of the colonial era. What legacy arouse

from this era? What social, cultural and economical consequences could be seen and are still visible today? In these contexts, one examines alternating experiences of suppression, resistance, gender, migration and so forth. While doing so, both the colonizing and colonized side are taken into consideration and related to each other. The main target of post-colonialism remains the same: To review and to deconstruct one-sided, worn-out attitudes in a lively discussion of colonization.

The post-colonial experience in India and History of Indian colonialism:

- In the 16th century, European powers began to conquer small outposts along the Indian coast. Portugal, the Netherlands and France ruled different regions in India before the "British East India Company" was founded in 1756. The British colonialists managed to control most parts of India while ruling the key cities Calcutta, Madras and Bombay as the main British bases. However, there still remained a few independent regions (Kashmir among others) whose lords were loyal to the British Empire.
- In 1857, the first big rebellion took place in the north of India. The incident is also named "First war of Indian Independence", the "Sepoy Rebellion" or the "Indian Mutiny", depending on the individual perspective. This was the first time Indians rebelled in massive numbers against the presence and the rule of the British in South Asia. The rebellion failed and the British colonialists continued their rule.
- In 1885, the "National Indian Congress" (popularly called "Congress") was founded. It demanded that the Indians should have their proper legitimate share in the government. From then on, the Congress developed into the main body of opposition against British colonial rule. Besides, a Muslim anti-colonial organization was founded in 1906, called the "Muslim League".
- While most parts of the Indian population remained loyal to the British colonial power during the First World War, more and more Muslim people joined the Indian independence movement since they were angry about the division of the Ottoman Empire by the British.
- The non-violent resistance against British colonial rule, mainly initiated and organized by Mahatma Gandhi and Jawaharlal Nehru, finally lead to independence in 1947.
- At the same time, the huge British colony was split into two nations: The secular Indian Union and the smaller Muslim state of Pakistan. The Muslim League had demanded for an independent Muslim state with a majority of Muslims.
- India became a member of the British Commonwealth after 1947.

Post colonial development in India:

- The Partition of India (also called the "Great Divide") led to huge movements and an ethnic conflict across the Indian-Pakistani border. While around 10 million Hindus and Sikhs were expelled from Pakistan, about 7 million Muslims crossed the border from India to Pakistan. Hundreds of thousands of people died in this conflict. Ever since these incidents, there have been

tensions between India and Pakistan which lead to different wars particularly in the Kashmir region.

- For decades the Congress Party ruled the democratic country which had become a republic with its own constitution in 1950. In 1977 the opposition gained the majority of votes. In 1984, after the Congress Party had regained the majority, conflicts with the cultural minority of the Sikhs lead to the assassination of the Indian Prime Minister Indira Ghandi.
- Today, apart from the significant economic progress, India is still facing its old problems: Poverty, overpopulation, environmental pollution as well as ethnic and religious conflicts between Hindus and Muslims. Additionally, the Kashmir conflict has not come to an end yet, while both Pakistan and Indian are threatening each other with their arsenals of atomic weapons.
- Concerning post-colonial literature, Edward Said's book "Orientalism" (published in 1978) is regarded as the beginning of post-colonial studies. In this book the author analyses how European states initiated colonialism as a result of what they called their own racial superiority.
- The religious-ethnic conflicts between different groups of people play an important role in the early years of post-colonialism. Eye-witnesses from both sides of the Indian-Pakistani conflict wrote about their feelings and experience during genocide, being confronted to blind and irrational violence and hatred. The Partition is often described as an Indian trauma.
- Furthermore, there are many different approaches to the topic of intercultural exchange between the British and the Indian population. Uncountable essays and novels deal with the ambiguous relationship between these two nations. One particularly interesting phenomenon is that authors from both sides try to write from different angles and perspectives and in that way to show empathy with their cultural counterpart.
- Concerning the integration of Western values in the Indian population and culture, one can say that the British influence is still omnipresent in the Asian subcontinent. The reason for this can be also found in the persistence of the English language. Many Indians are conversant with the English language, because the British colonialists intended to export their values and culture by teaching the Indian population their language. This was regarded as the basic fundament for further education.

10.5 CONCLUSION

Post-structuralism offers a way of studying how knowledge is produced and critique structuralist premises. It argues that because history and culture condition the study of underlying structures, both are subject to biases and misinterpretations. A post-structuralist approach argues that to understand an object (e.g., a text), it is necessary to study both the object itself and the systems of knowledge that produced the object. Post-structuralists generally emphasize that post-structuralism is historical and they classify structuralism as explanatory. As an epistemology (the study of knowledge, its nature and verifiability), as an ethics (moral philosophy) and as a politics (affairs of the citizenry), the field of post colonialism address the politics of knowledge—the

matters that constitute the postcolonial identity of a decolonized people. Post colonialism is the study of impact and consequences of colonism.

10.6 SUMMARY

Post-structuralism provide a method of studying how information is created critiques structuralist premises. A post-structuralist approach argues that to understand an object it is necessary to study both the object itself and the systems of information that produced the object. Post-structuralists generally assert that post-structuralism is historical and they classify structuralism as descriptive. This terminology relates to distinction between the views of historical (diachronic) and descriptive (synchronic)reading. From this basic distinction, post-structuralist studies often emphasize history to analyze descriptive concepts. By studying how cultural concepts have changed over time, post-structuralists seek to understand how those same concepts are understood by readers in the present. Post-colonialism is an intellectual direction that exists since around the middle of the 20th century. It developed from and mainly refers to the time after colonialism. The post-colonial direction was created as colonial countries became independent. Nowadays, aspects of post-colonialism can be found not only in sciences concerning history, literature and politics, but also in approach to culture and identity of both the countries that were colonised and the former colonial powers.

10.7 GLOSSARY

Post-structuralism - refers to the intellectual developments in continental philosophy and critical theory that were outcomes of twentieth-century French philosophy.

Post-colonialism - is an intellectual direction that exists since around the middle of the 20th century.

10.8 ANSWER TO CHECK YOUR PROGRESS

1. Explain the Concept of Post-structuralism and Concept of Post colonialism.

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10.11 TERMINAL QUESTIONS

1. What is Post Structuralism? Discuss it in detail.
2. Discuss the concept of Post Colonialism in detail.

BLOCK 4 : DICHOTOMIES IN GEOGRAPHY

UNIT 11 : DICHOTOMIES BETWEEN HUMAN VS. PHYSICAL

11.1 OBJECTIVES

On the completion of this unit you would be able to:

- Know and understand the origin of dichotomy in the discipline.
- Have a comprehensive understanding of the meaning of physical and Human Geography
- Understand the views expressed by different scholars across the world.
- Have a proper insight into the subject that would help form Independent perspective on the discipline.

11.2 INTRODUCTION

Dichotomy means a division or contrast between two things that are opposed or different. Dualism or dichotomy in geography is not a new feature. It was present even in Greek times when some of the earliest work of intellectual enquiry began to surface. Works of Hecateus, Herodotus, Strabo and host of other Greek thinkers depict their orientation towards different strands of geography. This is not limited to the case of geography alone as a look at the evolution of other disciplines brings a similar picture of presence of dualism in them. As a discipline advances contradictory arguments emerge and it also gives rise to a legion of emerging thinkers who align themselves along conflicting arguments. But such divergent views always extend the domain of knowledge and provide a new perspective to the thinkers. Geographers have for long shown disagreements among themselves with regard to its content and methodology.

In the mid seventeenth century and particularly after the publication of '*Geographia Generalis'* of BerhnardVarenius the dichotomy between Regional and Systematic and Physical and Human were formally recognised. Thereafter, divergent views on the core and methodology of the subject have been expressed regularly by different geographers across different nations. The question of subject matter of geography whether it is only a physical study or a study of different human aspects has drawn many thinkers into this debate who from time to time have provided their arguments backed by various logics.

11.3 DICHOTOMIES BETWEEN HUMAN VS. PHYSICAL

The Dichotomy between physical and human was vaguely present even in the Greek times. Some of the thinkers through their works have stated clearly their predilections towards a particular stream of geography. Hecateus of Miletus has gathered information not just of Miletus but from the world beyond it. It is likely that he gathered the information of other parts of the world from the accounts of travellers and traders who met him. His book (*Gesperidos*)is divided into two parts, one part deals with Europe and the other with Libya (that includes Asia and Africa). His European knowledge was only confined to the Greek colonies in Mediterranean. His major focus was to provide information about location of different places in the world which proves his inclination towards physical geography though he also mentions about few tribes inhabiting different parts of the world.

Another Greek thinker Herodotus who is also known as a great historian focused more on human aspects. A lot other scholars of those times carried out their studies and put forward their views as per their preferences. Such divergent views progressed through centuries and across different regions.

The publication of Bernhard Varenius '*Geographia Generalis*' in1650 was a watershed in Geography as it clearly recognised the dualism present in Geography. He presented his opinions and laid down the principles of geography. His book is divided into three parts namely absolute, relative and comparative (Holt- Jensen,2009).

a) **The Absolute or Terrestrial part** : This section is concerned with the study of shape and size of earth and the physical geography of continents, seas and atmosphere.
b) **The Relative or cosmic part** : The second division deals with the study of the earth with other celestial bodies with specific focus on the influence of the sun on world climate.
c) **The Comparative part** : The third section discusses the distinct regions and their locations in relation to each other.

Varenius stated that his *Geographia Generalis* should be followed by the study of *special geography*. In this special description of particular places be based upon :

a) Celestial conditions (includes climates)
b) Terrestrial conditions (includes description of relief vegetation and animals)
c) Human condition (includes economic activity , settlement, govt. etc)

While he included human geography as a subject matter, he did not show much enthusiasm in its study as it seemed very difficult to study human geography in the same manner as other studies.

In the eighteenth century in Germany Immanuel Kant (1724 – 1804) provided a philosophical foundation for the belief that the subject has significant contribution to make (Holt-Jenson,2009). Immanuel Kant delivered lectures on physical geography in Konigsberg and those lectures proved very significant for the development of geography in later years.

Humboldt, a person of immense knowledge and learning, known for his extensive travels to understand the complexities of the universe through his work reflected his bend of mind towards physical and systematic geography. His earlier works on plants and later his monumental work *Kosmos* shows he followed the methodology of sciences. His work largely focussed on physical features, climate and vegetation. He also included human beings in his study and made it an important part of his study as he believed in unified universal science. He was advocate and believer in the unity of nature.

Oscar Peschel was one of the leading geographers in Germany. His works reveal his bend towards physical geography. He worked on fjord coast and looked for the processes that lead to its formation and also advocated scientific methodology for research in geography. He was critical of Ritter's methodology of comparing entire continents and went on to state that this comparison is not sound rather a geographer should begin comparison by identifying certain specific features such as landforms, climate or vegetation. He held the view that physical and human geography are two different spheres and geography should only focus on physical phenomena. Despite his orientation towards physical geography and a scientific

method of research, he authored the book entitled 'The Races of mankind' their geographical distribution (1876) which was an excellent work showing distribution of different races and their cultures.

George Gerland, a professor of geography at Strasbourg, maintained the same line of thought as Oscar Peschel and pushed further the view of the existence of dichotomy between physical and human geography. He stated that the method followed to study the physical geography cannot be applied to the study of human geography. Thus human geography is taken outside the domain of geography.

Albrecht Penck made invaluable contribution in the field of Physical geography. He is credited with the first use of the term 'Geomorphology'. He emphasised on the processes that create and shape the landform and suggested formulation of physical laws.

Among the French geographers Elisee Reclus (1830 – 1905) is a popular name who never held any university position in France, lived in exile and produced works which became popular not just in France but outside his country. *La Terra*(1866) is a well-recognised work on systematic physical geography. His other work *Nouvelle Geographic Universalis(1875 – 94)* earned him immense accolades and popularity. It became a model for other prospective works in geography of the world. (Holt–Jensen, 2009).Despite his work on physical geography he showed interest in human geography which is clearly reflected in his work where he focussed on social conditions poverty and inequality.

Another well-known geographer who concentrated on physical geography was Emmanuel de Martonne, he published his work on coastal morphology of Britanny. He held physical geography as an essential part of the geographical study of areas and was also a supporter of American geographer W.M. Davis and his methods of study.

Mary Somerville (a British geographer) produced a book 'Physical Geography' in 1848 which contained the physical description of the continents, oceans, atmosphere, plants and animals. A J Herbertson also emphasised on the importance of Physical geography in his delimitation of regions.

W. M. Davis a well-known American geographer who put forward his idea of cycle of erosion laid greater emphasis on the evolution of landforms.Another American geographer Ellen Churchill Semple accorded a dominating role to the physical environment that shapes human civilisation. Ellsworth Huntington too put climatic changes as the determining factor in the movement of nomadic people and their attack on India and Eastern Europe.

To understand the dichotomy of physical vs human geography it is imperative to study and understand the course of development of human geography. The Greek thinkers particularly Herodotus instead of following the mathematical tradition of Anaximander followed literary/historical tradition. He worked on the human aspects. His travels across Black sea, Persian Empire and Russia provided him an opportunity to interact with people of different cultures bearing different traits. He portrayed these people of varied cultural traits in his works which shows his preference to study human culture and their associated aspects.

Paul Vidal de la Blache is a prominent name in French geography who shaped French school of thought. His perspective on human geography in those times when man was considered a passive agent was a bold move which patterned the development of geography in France. He laid the foundation of human geography in France which was recognised and endorsed not just in France but in different parts of the world. He emphasised man as an

active agent which brings about major transformation in the landscape he inhabits. He regarded man as an inseparable part of study of geography and said study of geography is incomplete if humans are not included in it. It is unreasonable to keep natural and cultural phenomena divided as it will always be an artificial division.

His book 'Principles of Human Geography' was published posthumously in 1921. The influence of Vidal de la Blache was immense in French geography that the dichotomy of physical versus human could never take roots there. His disciple Jean Brunhes advanced the views and methodology of his master and gave a classification of facts of human geography which he divided into three parts.

In Germany, Ritter is among the first geographers who recognised man as an important component of study of geography as he is the one who brings about changes in the region. Another geographer of repute Ratzel particularly after the publication of second volume of Anthropogeographie(1891) had shown a bend towards human geography where he did not regard human as passive agent rather he recognised the active role man plays in natural environment. Ratzel had a zoology background and his initial work reveals the imprint of Darwinian Theory of Evolution. In course of time his approach of study from physical environment as a dominating force changed and he focused more on the study of human groups and their cultural aspects.

In America Mark Jefferson emerged as an important voice in support of man centred study of geography. He maintained that geography should be a study of 'man on earth' .He accorded more importance to man and his creative abilities.

11.4 CONCLUSION

The nineteenth century saw the process of institutionalization of geography as a discipline in universities when new departments of geography were being established and chairs in geography were created. The impetus was provided by politicians who saw it a potential subject that would help in governance and foster the idea of nation state. Earlier academicians did not consider it as a true science discipline and their argument was that it lacked the philosophy and methodology of science.Later the emerging geographers were drawn more towards physical geography as they found that the methodology followed by sciences can be easily applied to the study of geography and this would establish the discipline as science. In course of time some geographers emerged who argued for inclusion of study of human aspects in the geography which would give completeness to the discipline.

Argument of physical geography as core of the geography got support from geographers in different countries. Some geographers like Oscar Pechel and George Gerland advocated very forcefully in favour of physical geography and argued to keep human geography outside the domain of geography. Their contention that the study of cultural or social phenomena cannot be put to scientific scrutiny as other sciences therefore they must be kept outside the purview of geography. Even though BerhnardVarenius included study of human aspects as a part of geographical study, his lack of enthusiasm to its study speaks of his bend towards physical conditions.

The philosophy of the followers of human geography was to establish man- nature relationship in which both are interdependent (Hussain, 2001). Despite the disagreement of geographers on the subject matter of geography it is amply clear that physical and human geography complement each other. Both of them are very intimately interrelated, studying only one and leaving out the other from its domain would render the subject incomplete. Geography aims to study both the physical and social or cultural phenomena in terms of their interdependence where the effect of physical factors on man and impact of human activity on nature be understood.

In the words of Hartshorne (1939) 'Since geography, in particular, must examine phenomena in the actual complexes in which they are found, it is impossible for it, in practice, to separate natural and human phenomena.'

11.5 SUMMARY

Study of geography pre-dates the formal recognition of the discipline in the university. Evolution of the discipline saw the dualism between physical and human. There were several arguments put forward by geographers while some were strong advocates of study of physical phenomena others strongly put the case to study human and cultural aspects as man is an important agent who brings transformation in the nature and also gets affected by it. Some argued to keep human geography outside the domain of geographical study as including human geography would weaken the case of geography as science. They also stated that human geography cannot be studied like physical geography which can be studied using the methodology of natural science. Over time geography has overcome the crisis and it is accepted that this dichotomy is false as both physical and human components accord completeness to the subject and drawing any forcible boundary would hinder the growth of the discipline.

11.6 GLOSSARY

Physical Geography: A branch of geography focussing on the study of process, form and occurrence of natural features and phenomena associated with the earth.

Human Geography: This is a sub-field of geography that focuses on human and their activities. This branch of geography has seen a rapid expansion in modern times.

Teleology: Explanation of phenomena by the underlying purpose or goal it serves rather than by efficient causes.

11.7 ANSWER TO CHECK YOUR PROGRESS

1. What was the view of French geographer Vidal de la Blache on the dichotomy between Physical and Human Geography?

2. The publication of Bernhard Varenius' *Geographia Generalis* marks the formal origin of the dualism in geography.Discuss

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11. 10 TERMINAL QUESTIONS

1. 'The study of Physical Geography as the subject matter of geography has elevated the discipline to the status of science'. Comment.
2. Give the names of two geographers who have advocated removal of human study from the domain of geography.
3. Study of Human Geography cannot be separated from Physical Geography. Discuss.

UNIT 12 : SYSTEMATIC VS. REGIONAL GEOGRAPHY

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12.1 OBJECTIVES

On the completion of this unit you would be able to

- Assess the true nature of geography while studying the course of its evolution through debates and discussions.
- Understand the issues geography has faced in its establishment as a properly recognised university discipline.
- Have an understanding of the divergent views expressed by geographers in different parts of the world regarding status of geography as a regional or systematic study.
- Develop your own viewpoint regarding the core and methodology of the discipline

12.2 INTRODUCTION

Geographical works of Greeks and Romans and later Arabs provided a vision to European explorers as they embarked on the exploration keeping in mind the maps and geographical description provided by the ancient and medieval geographers. Their quest has enhanced the geographical knowledge of the earth and also overthrew the long established erroneous views by some of the great thinkers of the past. Geography as a discipline was recognised in the 19th century and it followed opening up of new departments in universities where geography could be formally taught. Varenius and his publication of *Geographia Generalis* in 1650 was a step towards the identification and delimitation of the nature of geography (Holt-Jensen, 2009). He separated geography from cosmography. It was his work which formally recognised the division of Geography into General and Special. The dichotomy or dualism was always present in the geographical studies but it became more discernible in the modern period.

12.3 DICHOTOMIES BETWEEN SYSTEMATIC VS. REGIONAL GEOGRAPHY

Within Geography, the distinction between a concern with the individual and the general is not new. It was reflected in Ptolemy's separation of geography from chorography and in the 17th century in Varenius' distinction between general geography and special geography. From the 19th century, though, it found direct expression in the distinction between regional and systematic geography (Unwin 1992).

Geography as regional or systematic study has been a subject of debate for long. Systematic geography follows the methodology of natural sciences and is concerned more with formulations of general laws and theories which have universal applicability. It assumes the entire world as a unit and studies the distribution, process and character of the phenomenon/element across the world and emphasises on the formulation of law or theory. On the other hand regional geography strictly adheres to the description and study of specific regions in the world. The size of region may vary but the focus of regional geography is to study and describe different phenomena/elements that occur in close interrelationship in a

region. Formulation of laws or establishment of theories is not a necessary aim of regional geography. However, regional study has contributed immensely in the formation of universal laws and principles.

Regional Trend in Geography:

The first half of the 20th century saw an increasing number of geographers across the world drawn towards regional geography. The regional study reached its culmination in the views of Hartshorne and Alfred Hettner when they expounded on the concept of geography as chorology and areal differentiation. The views and works of few geographers who gave primacy to regional approach in the study of geography have been discussed here.

Carl Ritter (1779 – 1859) a geographer of eminence became first professor of geography in Berlin and produced works on regional geography in several volumes. His early training in a school in Schnepfenthal was based on the principles of Rousseau. At a very early stage Ritter began observing the relationship that exists between man and his environment. He believed and propagated the idea of unity of nature. This belief became the cornerstone of his philosophy. His methodology of study did not differ from Humboldt's as he too was an advocate of empirical method of investigation. According to him he taught a new scientific geography that moved beyond the collection of unrelated facts. Ritter's concept of unity in diversity of phenomena was a derivation from Kant's view of the world as organic whole. Ritter insisted that geography should be an empirical science rather than one derived from *a priori* theories or axiomatic statements. In the first volume of his book 'Erdkunde' Ritter said we must ask the earth itself for its laws. He reaffirmed the need for the field observation to gather knowledge about the earth even though he himself is known as an arm chair geographer. Most of his accounts area a compilation of information gathered from other's work. He is known as a pioneer of regional approach where he conceived region as a unit of interacting diverse phenomena that characterise it. Rather than viewing systematic geography competing with the regional geography. He acknowledged its need in analysing and identifying the distribution pattern of phenomena which helps formulating laws and principles necessary for the advancement of the knowledge. "Ritter regarded regional and systematic geography as the two sides of the same coin. i) general geography dealt with character, typology, location and extent of different categories of terrestrial phenomena throughout the world and ii) special or regional geography described the content and nature of particular areas as organic entities (Dikshit, 1997). 'He expressed the conceptual framework of both regional and worldwide geography. He lacked the data in his time to reach worldwide generalisation about areas, though he urged that they should be the geographer's ultimate goal (Dickinson, 1969). His *Erdkunde* gave a regional description of Africa and parts of Asia. This description was not mere a collection of facts. Since he was a firm believer in the unity of nature he advocated a study of geography incorporating organic, inorganic, human and non-human components as an interactive whole which characterise a region. He combined his scientific perspective with his teleological belief (Holt-Jensen, 2009) and reiterated the eminence of facts over philosophical arguments.

Ferdinand von Richthofen's (1833 – 1905) method of studying geography was to a large extent influenced by Humboldt. He himself stated that he was the true inheritor of the tradition

set forth by his predecessors- Humboldt and Ritter. According to Richthofen geography is the science of the earth's surface that studies phenomena that are causally interrelated. He was geologist by training and spent time in research in Alps. His interest was not confined to the study of geological structure alone but he looked for the causes of the origin of landforms. Thus study of landforms remained his focus for a long period of time. As said earlier he admitted he followed the methodology of his predecessor in his study. He tried to identify the common ideas and methodology of Humboldt and Ritter though they also had minor differences in their views. His background in geology and work on landforms and Humboldt's work on climate, vegetation and physiography puts him closer to Humboldt than Ritter. The geographical study of earth's surface according to Richthofen should begin by first focusing on the description of the physical features, after which one should move ahead to study the interrelationship of other features of the earth's surface to the physical geographical framework described at the outset. He underlined that the highest goal of geography was the exploration of the relationship of man to the physical earth and to the biotic features associated with it (Dikshit, 1997). On the question whether geography is a regional or systematic study Richthofen believed that the ultimate purpose of systematic geography was the understanding of causal relations of different phenomena occurring in areas which can be easily expressed in the form of laws or principles that can be applied in the interpretation of individual regions, called chorology or regional geography (Dikshit 1997). Richthofen distinguished between chorography (which is a non explanatory description providing material for systematic geography) and chorology, a final step, the explanatory study of region which is based on systematic geography (Adhikari, 2015).

Hartshorne (1939) said "Richthofen, like Humboldt saw no objection to a single science considering different kinds of things that exist together and are bound together by causal connections." Richthofen was of the view that mere description cannot be the end purpose of geography and geographer should move ahead to formulate laws and principles that explain the observations made in the region.

Alfred Hettner (1859 - 1941) was the first professor after Carl Ritter who was trained as a geographer. Hettner defined geography as chorology- a scientific explanation of the total causal relationships of an assemblage of phenomena that are mutually coordinated, but not subordinated in places (Holt-Jensen, 2009) . He discussed in detail the significance of regional geography. Hettner studied physical geography and his research is on climate and geomorphology. He has done extensive field studies and has many publications. Some of them are 'Travels in the Colombian Andes' (1888), 'Surface Forms of Continents' (1921and 1928), 'Comparative Regional Geography' etc. The primary aim of geography is to study regions. The phrase 'Areal Differentiation' was introduced by Sauer in 1925 in paraphrasing Hettner's statement of his concept of geography. The concept itself stems from Richthofen's synthesis of the views of Humboldt and Ritter and has been most fully expounded in Hettner's writings (Hartshorne, 1959). Hartshorne in his book 'Perspective on the Nature of Geography' (1959) presented the statement of Hettner given in 1927: "the goal of the chorological point of view is to know the character of regions and places through interrelations among the different realms of reality and their varied manifestations and to comprehend the earth surface as a whole in its

actual arrangement in continents, larger and smaller regions and places."He strongly opposed the views of some geographers who reduced geography as merely 'a science of distribution' (Hartshorne, 1939). Spatial association of phenomena over space is what constitutes geography. This association gives an identity to that region. Geography focuses on causal interdependence of diverse phenomena. The question whether geography should give importance to the study of areas or regions as unique entities or it should look forward to the formulation of laws or theories (whether geography is idiographic or nomothetic). He did not subscribe to the view that geography can either be idiographic or nomothetic rather he resolved the prevalent dualism by stating that geography encompasses both the regional study which focuses on unique as well as systematic study which is concerned with universality.

In France Vidal de la Blache is known as the founder of modern geography. His method was inductive and was strongly against the artificial division of natural and cultural phenomena which he regarded as inseparable. He used the term 'pays' which meant an aerial unit where the relationship of man with his surroundings or physical landscape is so close that they assume a unique identity where both are fused and become one. He was of the view that study of such regions should be the primary focus of geography. He thus argued for regional geography to be the core of geography.

Vidal de la Blache had a profound impact on the emergence of regional geography in Britain. Patrick Geddes was influenced by French sociologist Frederic Le Play (1806-82) and adopted his popular formula of *Place Work and family* as *Place Work and Folk* in the study of regions. Geddes had a major impact in the development of British geography particularly in the field of regional survey and regionalisation.

British geographer A. J. Herbertson inherited the legacy of Sir Patrick Geddes. He worked with Geddes as his assistant. He gave a scheme for division of world into different regions which he called 'natural regions' as they were based on the association of surface features, climate and vegetation (Holt and Jensen, 2009). He divided the world into 15 major natural regions, later he incorporated human being and their activity into his regions. The influence of Darwinian theme was perceptible in Herbertson's regionalisation. Natural regions are associations of inorganic and organic components. Herbertson's work according to some critics was more deterministic in nature. Climate, vegetation and landforms remained his primary focus and left the cultural and social factors largely unattended. Herbertson's idea despite its criticism caught the imagination of his own students and other geographers in his own country.

M.I. Newbigin was popular as a regional geographer in Britain, her book entitled 'Man and his Conquest of Nature' (1912) shows the impact of tradition set off by Vidal de la Blache of Germany. The book explores the relationship between man and his environment. The way of living and the inherent productivity of land explain the variation in concentration of population. Her work and approach indicates her belief in the close interrelationship of man and his surrounding very much similar to the 'pays' of Vidal de la Blache. She averred that classification of regions should be based on the degree of relationship between human and his surroundings. Man was an important component and played a role in regionalisation. Her method of classification differs with A.J Herbertson..

H Fleure initiated a very new basis of classification and identification of region. The basis was the problems and difficulties posed by physical environment. He proposed seven types of regions: regions of hunger; regions of debilitation; regions of increment; regions of effort; regions of difficulty; regions of wandering and industrialised regions (Fleure, 1917).He gave primacy to human and his activity over physical factors as new inventions and technologies have altered the relation of man with his environment .

J.F. Unsteady also proposed a classification of regions but his classification was based on equal weight age he accorded to both the physical and human elements. He gave a classification which was hierarchal in nature and where lower order regions were merged to get the next higher order region. 'Feature' was the smallest unit area of the earth's surface. Features can be grouped to obtain 'stows' (first order region). They can be grouped to get next higher order region called 'tracts' which further can be grouped to get 'subregion' , 'minor region' and 'major region' at successive levels of hierarchy (Unstead, 1916). He also compared region with organism. His scheme of regionalisation suffered from certain flaws.

C. B. Fawcet's work shows that his source of inspiration was the idea and philosophy of Patrick Geddes. He did not take into account association of large number of diverse factors to demarcate his regions. Produced a book titled 'Provinces of England' in 1919. His scheme of federal structure was inspired by the principles proposed by Patrick Geddes. Some important aspects of this regionalisation was that the provincial boundaries were to be drawn as near as possible to the watersheds and the classification should also pay respect to the local sentiments of the people. Fawcet made efforts in the direction of identifying early functional regions.

The British geographers and their works clearly indicate that the roots of regional trend were very firm in Britain. The regional paradigm held sway in Britain before the Second World War and continued for a very brief period after the war. Thereafter, the study of regional synthesis was largely ignored and was slowly in the process of replacement by the studies concerned with individual phenomena more appropriately called systematic studies.

In America a group of American geographers were drawn to the regional approach in geography therefore a lot of study on regional geography is found in the 1930's. There were geographers like W. L. G. Joerg, W. Powell and N. M. Fennemen who belonged to the regional school. However, the publication of Richard Hartshorne's monograph "The Nature of Geography: A Critical Survey of Current Thought in the Light of the past" (1939) was a landmark in the direction of establishment of regional paradigm in geography. According to Hartshorne 'Geography seeks to acquire a complete knowledge of the areal differentiation of the world, and therefore discriminates among the phenomena that vary in different parts of the world only in terms of their geographic significance *i.e.*, their relation to the total differentiation of areas. Phenomena significant to areal differentiation have areal expression not necessarily in terms of physical extent over the ground but as a characteristic of an area of more or less definite extent' (Hartshorne,1939)

The regional paradigm established firmly by Hartshorne reigned in the forties but in the fifties and particularly after the publication of Schaefer's paper 'Exceptionalism in Geography' its impact began to wane.

Systematic Trend in Geography:

According to Tim Unwin (1992) 'Regional geography concentrates on special or unique, systematic geography focuses on general. This distinction was conspicuous in the approaches of Humboldt and Ritter, the former seeking to use a systematic approach to produce regional synthesis and the latter concentrating on regional analyses in order to produce systematic generalizations. Both, however, saw the two as forming an integral part of the discipline of geography as a whole'.

The above observation is true about both the geographers. The following section provides a close look at the systematic trends observed in the works of geographers in various countries.

The name of Humboldt figures amongst the earliest systematic geographers. He was an eminent scholar in geography in the eighteenth and nineteenth century who studied geography and travelled extensively. His works follow the methodology of natural sciences and are systematic in nature. Humboldt advocated empirical method of study. He emphasised the need for observation in the field and careful and accurate record of the observation. He was the master of several disciplines and a keen observer. His observations of plants lead him to produce his well-known work 'flora Fribergenis'. In his quest for the subject matter of geography he used the term 'cosmography' which he divided into uranography and geography. Uranography was descriptive astronomy which dealt with the celestial bodies while geography dealt with the terrestrial part. He was a firm believer in 'unified universal science' that encompassed physical, biological and social sciences. He believed in the unity of nature and visualised nature as an organic whole. His works were systematic in nature and largely on physical features, vegetation and climate. He always believed in causal interrelationship that is inherent in the nature.

After Humboldt, Oscar Peschel emerged as a proponent of systematic geography in Germany. He gave contemporary geography a new perspective and dimension which differed from the heritage established by his predecessors. He advocated an inductive and empirical method of investigation. He was appointed as a professor of geography in Leipzig in 1871. He produced a great work in the year 1865 entitled "Geschichte der Erdkunde'. He carried out a detailed systematic study on fjords and published a book on it. His work on fjords led many geographers concentrate on the study of morphology. His work reveals his preference to the study of physical features yet he made some investigation in the human and cultural sphere. It can be stated that Oscar Peschel devoted his intellect and skill to scientifically study the earth and its physical features.

Ratzel (1844 – 1904) with his background in natural sciences emerged as a prominent systematic human geographer. At the time when man was studied as a component part in regional geography his initiative to use the method of natural science to study human geography should be regarded as a break with the established convention. As a result he was widely recognised as a systematic geographer.

In America the publication of Schaefer's paper 'Exceptionalism in Geography' (1953) stirred a debate regarding the methodology and purpose of geography. It was the impact of this paper which produced a shift in the method of geographical research pursued in American universities.

It can be said that after the Hartshorne-Scaefer debate there was more inclination of geographer towards systematic geography. Schaefer, Edward Ullman and Ackerman were pioneers in carrying forward the new paradigm of systematic geography. The shift towards new methods of research in geography with focus on formulation of laws, models and theories began in certain specific centres in America with a group of researchers. They are discussed below in detail

The Iowa school: Schaefer belonged to this school but the leader here was Harold McCarty who with his associate made notable contribution to methodological changes in systematic studies. McCarty and his associates wanted to establish the degree of correspondence between two or more geographical patterns. They wanted to make map comparison more rigorous and generate laws of association akin to the morphological laws of accordance discussed by Schaefer (Johnston and Sidaway, 2004). The purpose of any theory is to provide explanations and according to McCarty there are two types of explanation. The first was associated with the search for the causes of observed locational patterns and the second type lays emphasis on associations. Such laws of association are built up in a series of stages (i) a statement of the problem and the necessary operational definitions (ii) measurent of the phenomena and (iii) a statement of the findings, in tabular or graphical form. These three descriptive stages precede analysis which seeks correlation between distribution. Geography, in seeking morphological laws, is thus to a considerable extent a consumer of the laws of other discipline, which may be theoretically rather than empirically derived (Johnston and Sidaway, 2004). McCarty used the multiple regression and correation in his research. The method McCarty pioneered served as the guiding principle for the future generation of researchers in geography.

The Washington School: W. L. Garrison, his associates and later E. L. Ullman emerged as the pioneers of systematic tradition in the university of Washington , Seattle. This centre saw the publication of largest volume of work which conformed to the methodology propagated by Schaefer and McCarty. Bunge (1966) was of the view that the works of Garrison show the influence of Schaefer's paper. Ullman produced remarkable research in the field of urban locational patterns and also in transport geography. He was strongly against the traditional practice of regional geography and propagated the need to follow the scientific approach. Ullman argued that spatial interaction should be the focus of work in economic geography rather than regional definition.

J. Q. Stewart and his social physics school: J. Q. Stewart was an astronomer at Princeton university, he noted that there was some regularity in the distribution of various aspects of population and explored the cause behind the distribution. He observed that laws governing the distribution are very much similar to the laws of physics. In the words of J. Q. Stewart "the dimensions of society are analogous to the physical dimensions and include number of people, distance and time. Social physics deals with observation, processes and relations in these terms".

Wisconsin: The department of Geography at the University of Wisconsin has a long tradition of research with a quantitative bent. Its early product included John Weaver's PhD. thesis on

the geography of barley production using multiple and correlation technique to identify the influences of climatic variables on barley yields. (Johnston and Sidaway, 2004)

W. Bunge's (associate of Garrison) work 'Theoretical Geography' gave geography a scientific footing. He favoured formulation of laws and theories in geography and countered many arguments of believers in regional approach. He stated that laws can easily be formulated in geography. B.J L.Berry and M .F . Dacey too made invaluable contribution to the field of systematic study in geography. Ackerman, a noted American geographer, was a staunch believer in theory development , application of quantitative methods and formation of laws and principles. He argued that these are the building blocks of the research in geography.

This shift in approach of study and research of geography was not limited to America alone but it moved beyond it and the focus on systematic study where formulation of laws, theory building and use of statistical and mathematical tools became the focus of geography. The old regional studies were slowly overtaken by systematic studies in the fifties.

In the mid twentieth century the issue of geography as a regional or systematic study snowballed into a debate between two scholars F K Schaefer and Richard Hartshorne. This is regarded as a major debate regarding the subject matter and methodology of geography.

It began with the publication of the paper 'Exceptionalism in Geography' by F.K. Schaefer in 1953 which questioned the unique status claimed by geography on account of study of unique regions. He argued in favour of adoption of philosophy and methodology of natural science. He further stated that all sciences study unique phenomena/events and strive to formulate theories and general laws (Dikshit, 1997). In order to gain the status of science, geography should give up its adherence to the claim of uniqueness and move towards formulation of laws and general principles.

In his view geography is the science of spatial arrangements and therefore there is difference between the nature of laws developed in geography and the laws developed in other sciences. The views expressed by Schaefer was in response to the concepts popularised by Hartshorne in his earlier works.

According to Hartshorne geography is concerned with study of areal differentiation. He supported chorological view of Hettner and stated that geography studies the world with the aim to describe and interpret various differences that exists among its different parts. It is a discipline that seeks to integrate different phenomena that occurs over space. It studies not just assemblage of different phenomena but their association that provides unique identity to that spatial unit. He thus emphasised geography as regional study forms the essence of discipline. After the publication of Schaefer's paper Hartshorne through numerous publications offered rebuttal to the arguments put forward by Schaefer. In his 1959 monograph entitled 'Perspectives on the Nature of Geography' he reaffirmed his earlier stand with slight modification on the subject and stated that 'geography is a discipline that seeks to describe and interpret the variable character from place to place of the earth as the world of man'. (Hartshorne 1959).

On the question raised by Schaefer regarding formulation of laws Hartshorne asserted that in geography formulation of law is not its end purpose (Hartshorne, 1959 pg 168). He further stated that we may once again modify our statement of the purpose of geography to read: the study that seeks to provide scientific description of the earth as the world of man (Hartshorne 1959 pg 172).

It is to be noted that Hartshorne neither in his 'Nature of Geography nor in 'Perspectives on the Nature of Geography' (1959) endorsed the dichotomy between regional and systematic geography rather he opposed the dualism and affirmed that both the studies are essential in geography.

12.4 CONCLUSION

A look into the history of development of the discipline brings to light that there was lack of a clear cut direction to which it can progress. There were various issues which confused the geographers from time to time like what should constitute its subject matter? What methodology is adopted? And how the man-nature relationship be conceptualized? There was no one generally accepted solution to all these issues. These issues delayed the establishment of geography as a true science which resulted in the delay of opening new departments in universities (Unwin, 1992)

Geographer studies individual phenomena and observes its distribution over space. He may find some pattern and can formulate law or give hypotheses. He also observes and studies the same phenomena in association with other phenomena which together characterises a region. The first study is systematic geography while the latter is regional study.

Rather than appearing opposed to each other they stand in symbiotic relationship and complement each other. Such a nature of relationship was observed both by Varenius and Hartshorne. In the words of Hartshorne (1939) "The ultimate purpose of geography, the study of areal differentiation of the world is most clearly expressed in regional geography; only by constantly maintaining its relation to regional geography can systematic geography hold to the purpose of geography and not disappear into other sciences. On the other hand regional geography in itself is sterile, without the continuous fertilisation of generic concepts and principles from systematic geography it could not advance to higher degrees of accuracy and certainty in interpretation of its findings".

This observation leaves little doubt that the attempt to divide it into two different parts is useless as both the studies are indispensable for the discipline. Together they enrich it and expand its domain.

Hartshorne viewed both the systematic and regional geography as essential parts of the discipline and not against each other. Unwin (1992) noted that 'paradoxically *The Nature of Geography* has subsequently been interpreted as the standard bearer of regional geography and the unique'.

12.5 SUMMARY

Regional geography studies the interrelationship of a number of phenomena occurring in a spatial unit. The interacting phenomena characterise a region. Systematic geography focuses on a particular phenomenon and studies its occurrence and distribution over space. This may lead to formation of laws and theories. The evolution of geography has seen debates and arguments as to its methodology and subject matter. The Hartshorne – Schaefer debate in the mid-twentieth century as observed by Gregory(1978) was "their disagreement about ends and not means". While Schaefer emphasised on the explanation rather than mere description in

geography, Hartshorne on the other hand viewed geography as "the study that seeks to provide scientific description of the earth" (Hartshorne, 1959 , 172) .

About the Hartshorne - Schaefer debate Johnston(1991) said that 'Hartshorne's was a positive view of geography- geography is what geographers have made it – whereas Schaefer's view, on the other hand, was a normative one, of what geography should be'.

Despite all the debate and arguments regarding systematic and regional geography it is observed and also accepted by geographers that both systematic and regional geography is complementary to each other. Hartshorne stated that both of them are essential parts of the discipline forming the two different ways of organising geographical knowledge.

12.6 GLOSSARY

Regional Geography: Study of a spatial unit that contains various interrelated phenomena that occur together and give a distinct characteristic to it. In other words it is a study of areal unit in totality.

Chorology: A Study of interrelationship of phenomena occurring together at a place. It constitutes the core of regional geography.

Cosmography: A science concerned with the study and description of the universe.

Systematic Geography: Study of a particular phenomenon and its distribution over different regions. It seeks to formulate laws governing its occurrence or distribution following methods of sciences.

Law: A statement considered as universally true formulated through empirical testing of hypotheses**.**

12.7 ANSWER TO CHECK YOUR PROGRESS

1. What is Regional Geography? How is it different from Systematic Geography?

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2. Elaborate the divergent views expressed by geographers in different parts of the world regarding status of geography as a regional or systematic study. --

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12.10 TERMINAL QUESTIONS

1. What are the views of Hartshorne on the nature of geography?
2. Is geography qualified to be called a science?
3. How regional and systematic geography complement each other?
4. Discuss the origin of the dichotomy between Regional and Systematic Geography.

UNIT 13 : APPLIED VS. QUANTITATIVE

13.1 OBJECTIVES

After reading this unit learners will be able to know about the systematic development of applied and Quantitative Geography and contribution of the Geographers in this field.

13.2 INTRODUCTION

In the previous units, you have already learned about the concept of dichotomies and some of the prominent dichotomies in the discipline of geography such as human vs. physical geography and systematic vs. regional geography. In this unit, we would learn about the dichotomy of applied vs. quantitative geography. You would recall that we already dealt with various aspects of quantitative revolution in Unit-7. We also learned about various techniques, methodologies and theoretical developments under quantitative revolution in geography. Based on that understanding, this unit would deal with two major topics: firstly we would learn about applied geography in detail and secondly, we would learn about the dichotomy of applied vs. quantitative geography.

DEVELOPMENT OF APPLIED AND QUANTITATIV GEOGRAPHY

Geography as a discipline got recognition in the early decades of the 19th century, initially in German universities and later on in other universities based in France, Britain and other countries. However, geography, like all other social science disciplines, had to face many philosophical and methodological problems and went through various phases of paradigm shifts. Geography, up to the Second World War was regarded as a discipline providing general information on various aspects of earth's surface and its human occupation. In the recent past, however, geographers adapted to a more humanist approach developing the discipline around the pertinent themes of social welfare. Through these efforts, the subject of geography became that is the principal source of awareness about the local surroundings, regional milieu and world environment. Here it would be interesting to discuss James and Martin (1972, p. 10; quoted in Adhikari 2010, p. 355) who identified five different kinds of questions of geographic character:

"i) There are 'generic' questions that have to do with the content of earth space but that cannot be effectively answered without a framework of concepts to guide the separation of the relevant form the vast complexity of the irrelevant.

ii) There are 'genetic' questions that have to do with the sequences of events leading from past situations through geographic changes to present condition; these are studied by the methods of historical geography.

iii) There are 'theoretical questions' that deal with the formulation of empirical generalizations or general laws, perhaps even with basic theory and with the methods of drawing logical deductions.

iv) There are 'remedial' questions that have to do with the application of geographic concepts and skills to the study of practical economic, social or political problems.

v) There are 'methodological' questions that have to do with experiments in new methods of study, new techniques of observation and analysis or new cartographic methods."

The fourth 'remedial' questions of geographic character are of great significance here as they point out the necessity of the application of geographical knowledge and skills to the practical problems of human welfare and social justice. In very simple words, this application of geographical knowledge and skills to the solution or the resolution of real problems existing within society is the domain of 'Applied Geography'. Applied geography reflects the ways in which geographers have used their knowledge and skills to contribute to a resolution of a variety of societal problems. The relevance and value of applied geography has become more and more apparent with the escalating number of problems in modern societies- ranging from natural disasters (such as droughts, floods, earthquakes, hurricanes and so on) through environmental concerns (such as deforestation, global warming, desertification etc.) to human issues (such as poverty, hunger, inequality, crime and others). An applied geographical approach has the potential to illuminate the nature and causes of such problems and inform the formulation of appropriate responses. Some of the recent research issues in contemporary applied geography are provided in Table- 13.1.

Some relatively recent definitions of applied geography are discussed here. Hornbeck (1989, p. 15) reviewed several definitions of applied geography and pointed out two common factors in that applied geography "takes place outside the university and it deals with real world problems". This definition reflects the situation in many parts of the world where applied geographers employ their skills beyond academics and into the real world. Sant viewed applied geography "as the use of geographic knowledge as an aid to reaching decisions over use of the world's resources" (1982, p. 1; quoted in Pacione 2011, p. 9). Frazier considered that applied geography "deals with the normative question, the way things should be, a bold but necessary position in dealing with real world problem resolution. In the process, the geographer combines the world of opinion with the world of decision" (1982, p. 17).

Table 13.1: Examples of Contemporary Research Issues in Applied Geography

NATURAL AND ENVIRONMENTAL HAZARDS	**TECHNIQUES OF SPATIAL ANALYSIS**
Global Warming	Remote Sensing and Environmental Change
Acid Precipitation	Computer Cartography
Extreme Weather Events	Geodemographics
Extreme Weather Events	Global Positioning Systems
Landslides	Computer Simulation
Floods	Modelling Urban Structure
Coastal Erosion	Modelling Urban Structure
Physical Problems of Urban Environments	
ENVIRONMENTAL CHANGE AND MANAGEMENT	**CHALLENGES OF THE HUMAN ENVIRONMENT**
Water Supply and Management	Urbanization and Counter-urbanization
Water Quality and Pollution	Boundary Disputes
Irrigation	Political Spaces and Representation Within States
Desertification	Housing Problems in the Developed World
Deforestation	The Geography of Poverty
Maintaining Biodiversity	Segregation and Discrimination

Landscape Evaluation	Socio-spatial Variations in Health
Environmental Impact Assessment	Crime and Fear of Crime
Countryside Recreation Management	Retail Location Analysis
De-intensification of Agriculture	Urban Transport and Traffic
Wetlands Conservation	Rural Accessibility
Land Use Conflict	City Marketing
Derelict and Vacant Land	Low Income Shelter in the Third World
Sustainable Tourism	Informal Sector Activity in the City
Townscape Conservation	Social Polarisation and Exclusion

Source: Pacione, M., 1999: *Applied Geography: Principles and Practice*, Routledge, London.

One important aspect of understanding applied geography is to examine whether it constitutes a subfield of geography or an approach to the subject. As Pacoine puts it, "applied geography is best viewed not as a sub-field of geography but as an approach which can bring together researchers from across the range of subfields in geography either in the prosecution of a particular piece of research or in terms of an enduring commitment to the ethos of the approach" (2011, p. 10). The unifying concept in applied geography is not a specific model or theory, but the fundamental philosophy that it is relevant or useful to the society. This fundamental aspect is the 'core' of applied geography and extends beyond the confines of any single sub-field within the discipline. Thus, it would be appropriated to consider applied geography as a specific approach within geography. Applied geographers often borrow and apply relevant theories or techniques from other disciplines. Consequently applied geography is often interdisciplinary in nature and it is a positive strength of the applied geography approach.

Applied geographers are making important contributions in all the systematic branches of geography. These include both physical and human geography and at the interface between the two. Applied geographers are also doing important applied work outside of traditional stronghold of geography (i.e. USA and England). Applied geographic research is being done in countries as diverse as Australia, Estonia, Portugal and Pakistan. Applied geographers, due to the fact that they are trying to bring a "resolution" to problems, make use of a variety of geographic tools. These include remote sensing, geographic information systems and statistical analysis. Problems by definition are there to be solved and whether that "problem" is finding the best location for a retail outlet, understanding the activity space of criminals, predicting the geographic diffusion of a potentially deadly virus or identifying a more effective adaptation mechanism in response to climate change, applied geographers have an important contribution to make.

APPLIED GEOGRAPHY: HISTORICAL DEVELOPMENT

In this section, we would try to trace the historical development of the approach of applied geography. At the same time, we would also examine few available definitions of applied geography that can help us in understanding the nature and content of this approach. "It was as early as 1896 that Hugh Robert Mill, one of the contemporaries of Sir Helford J. Mackinder, drew up a plan for using the sheets of ordinance survey (1 inch to the mile) as a basis to plot categories of land quality and land use for all of the British Islands" (Adhikari

2010, p. 355). He provided two sample sheets in the year 1900 to prove the utility of such detailed field-mapping. This can be considered as the first such attempt to apply geographical skills to provide solutions to real problems. Mill's work greatly influenced the much celebrated work of Dudley Stamp in the field of applied geography during the 1930s. British sociologist Sir Patrick Geddes (1854-1932) further developed on the works of Mill and applied these techniques to expand the area of regional studies in Britain. He contributed in developing the areas of regional survey, regionalisation and applied geography with the help of field survey (observation and recording in the field). He also emphasised the importance of regional filed surveys in regional planning which is the major focus of applied geography even today.

In another such earliest statements on applied geography, A. J. Herbertson in 1899 defined applied geography as "a special way of looking at geography, a limitation and a specialisation of the study of it from one point of view. For the business man this point of view is an economic one, for the medical man a climatic and demographic one, for the missionary an ethic and ethical one" (quoted in Pacione 2011, p. 9). The works of Geddes paved the way for many significant attempts in the area of applied geography. Charles B. Fawcett (1833-1952), in his book 'The Provinces of England', tried to incorporated Geddes' ideas and made one of the first identifications of 'functional regions'. At the same time, Herbertson (1865-1915) provided with a scheme for the division of the world into 'natural regions' which was also based on the ideas of Geddes (Holt-Jensen 1981, p. 34). The ideas and works of Mill and Geddes (as discussed earlier) were further developed by Dudley Stamp and he turned their ideas into a workable framework for the regional survey of potential land quality and land-use. "He organised and carried out the first British land utilisation survey during the 1930s, employing some 22,000 school children in the mapping of land-use on a scale of 1/2500 in their home districts under the supervision of school and university teachers" (Ibid, p. 35; quoted in Adhikari 2010, p. 356).

Till here, we have discussed the developments in the field of application of geographical knowledge for regional studies and regional planning. Now we would take upon the other major field of applied geography that was the application of geographical concepts to politics during the inter-war period. This led to the emergence of the field of 'geopolitics' (geopolitik in German). Karl Haushofer, who pioneered in geopolitik in Germany, defined it as "the art of using geographical knowledge to give support and direction to the policy of a state". Geopolitics was later envisioned as applied political geography. The emergence and development of geopolitics in Germany became a real manifestation of the remedial character of geography that sought to apply geographical skills to the study of political problems of inter-war Germany with regards to its political space (Adhikari 2010, p. 356). This gave birth to the concept of 'lebensraum' which was basically the application of geographical principles to the acquisition of more territories in order to serve national interest. During the World War II, applied geography gained even more attention as a large number of geographers were called into military and civilian services to provide their expertise. Consequently, geography was made a necessary university discipline in all the universities across Germany and many other countries with an emphasis on the practical use of geographical knowledge.

APPLIED AND PURE GEOGRAPHY: VARIOUS CYCLES OF DEVELOPMENT

There are two types of outside influences on the development of any discipline. Grano (1981) explained these influences as: i) within academics, geographers had to provide intellectual foundations of the subject to satisfy intellectual peers; and ii) in the outside world, geography had to be justified as a useful subject that deserves public funding. These two different approaches produced 'pure' and 'applied' geographies. The long term survival of the discipline depends on the success of both the above-mentioned approaches. However, it should be pointed out here that the dichotomy of 'pure' and 'applied' in any discipline is a myth based on a theory of knowledge that claims a separation of knowledge from society (Adhikari 2010, p. 358). A 'pure' science is supposed to be independent product of researches that generates theoretical knowledge. It cannot be directly applied in solving any particular problems. On the contrary, 'applied' research is explicitly problem-oriented. Applied research, however, is based on the theoretical developments of the pure science. 'Pure' research presents a set of intellectual concepts that provide the theoretical foundations of a discipline. "Geographers conducting 'pure' research define the discipline's place in the world of knowledge and promote its status within academics. They produce the necessary core of ideas to justify the existence of geography. 'Applied' geographers accept these ideas and may use them to solve problems" (Taylor 1985, p. 100; Adhikari 2010, p. 359).

All disciplines try to emphasise their problem solving capacity and general relevance to the actual society. Geography is no exception in this case which is reflected in the increasing research in 'applied' geography in recent years. The balance between pure and applied research within a discipline varies over time in relation to the prevailing socio-political environment. In times like this, when disciplines are expected to provide solutions to actual social problems, applied research would get increasing validity within the discipline. On the other hand, if the pressure from academics increases, any discipline would have to once again solidify its theoretical foundations. This scenario would inevitably lead to the burst of 'pure' research. When external pressures are at their greatest disciplines will tend to emphasise their problem-solving capacity while during periods of national economic expansion "more academic" activity may be pursued in comfort. Since the creation of geography as a university discipline, there have been constant efforts to strike a balance between pure and applied research. "Taylor (1985) equated these cycles with the long waves of the world economy, and identified three periods in which applied geography was in the ascendancy (in the late nineteenth century, inter-war era, and mid-1980s) separated by two periods of pure geography (in the early twentieth century and during the post-1945 economic boom)" (Pacione 2011, p. 13). More recently, the global recession of 2009 has led to demands from the governments and research funding bodies for academic research to demonstrate its (applied) beneficial impact for the nation's economy and society.

Geography was created as an applied discipline by the Prussian state at the beginning of late 19th century. During this period, the discipline was very much inclined towards its applied aspects. Geography became the tool of nationalism and imperialism, both political and economic. However, the seeds of pure geography were also culminating during the methodological debates within the discipline. Region and regional synthesis became the core of new geography in the early 20th century. This remained the theoretical basis of the first pure geography throughout the first half of 20th century. Things began to change during the

inter-war period of depression when pure concerns were kept aside to prove the real world relevance of the subject. Geography was transformed into geopolitics in Germany. Geographers were engaged in the massive land-use surveys in Great Britain and contributed in the growth of planning movement in many countries. During this time, "Hartshorne (1939) in his 'Nature of Geography' attempted to attack those who seek to reform the nature of geography by making the discipline more problem-oriented, more scientific and more in tune with national interests" (Adhikari 2010, p. 360).

Geography entered the post-war era of economic prosperity and social optimism as an academic anachronism. "With the social sciences fully established as specialized disciplines of social enquiry, geography's holistic pretensions were becoming intellectual liability" (Adhkari 2010, p. 360). Many scholars criticised the concepts of regional synthesis as intellectual rhetoric and sought to the closing of various departments. Hence, geography was again forced to provide theoretical developments. It was at this stage that the famous Hartshorne-Schaefer debate took place. Regional geography was discarded in favour of nomothetic task of finding morphological laws. This development of new model-based geography was the second pure geographical period. However, the recession saved geography when the attention was diverted back to applied geography. Applied geography even reached the status of a new paradigm in USA (Frazier 1978). The pressures for more applied work built up in the late 1970s and through the 1980s, as a reaction to the economic recession that afflicted many countries during that period. However, there have been instances when pure and applied geography have developed side by side and even complemented each other.

Table 13.2: Cycles of Pure and Applied Geography

First Applied Period (late nineteenth century)	Geography created as an applied discipline to serve the political, military and commercial interests of the Prussian state.
First Pure Period (early twentieth century)	Based around the holistic philosophy encompassing both physical and human phenomena and focused on the core concept of the region and regional synthesis.
Second Applied Period (inter-war)	A period of war, followed by Depression and war again demanded geography demonstrate its usefulness in fields such as land use planning.
Second Pure Period (post 1945 boom)	Rejection of ideographic, regionalism replaced by spatial science and the quantitative revolution; demise of holistic approach and emergency of subfields within the discipline.
Third Applied Period (mid 1980s)	Extension of the concept of useful research into new areas of concern relating to social, economic and environmental problems; applied geographers working both in academic and in public and private sectors. Applied geography as an approach rather than a subfield crosscuts the artificial boundary between physical and human geography and emphasises the dialectic relationship between pure and applied research. Acknowledgement of the role of human agency and values in research and environmental change, and the need for a pluralist view of science.

Third Pure Period	Characteristics unknown but speculatively - a return to a more holistic philosophy reflecting the growing importance of environmental issues and the combinatory perspective of applied geography.
Fourth (emerging) Applied Period (post-2009 Global recession)	Increasing demands from governments and research funding councils for researchers to demonstrate the applied beneficial impacts of their research for contemporary economy and society.

Source: Pacione, M., 2011: *Applied Geography: Principles and Praxis*.

13.3 : DICHOTOMIES BETWEEN APPLIED VS QUANTITATIVE

Geographers not working in the field of applied geography point out that applied geography sometimes present a certain opposition in the discipline. Applied geography represents the view that some kinds of research are more useful than other kinds. Pacione points out, "this is not the same as saying that some geographical research is better than other work- all knowledge is useful - but some kinds of research and knowledge are more useful than other kinds in terms of their ability to interpret and offer solutions to problems in contemporary physical and human environments" (2011, p. 10). Applied geographers argue that their research is more relevant to the society than other purely academic works. For example, it is more important to study topics such as the optimum location for health centres rather than the iconography of landscapes. Hence, the underlying principle that determines the usefulness of various studies is a commitment to improving existing social, economic and environmental conditions. However, there will always be divergent views on the content and value of geographical research. This healthy debate raises a number of important questions for the discipline and for applied geography in particular. The concept of "useful research" poses the basic questions of useful for whom?, who decides what is useful? and based on what criteria? All of these issues formed a central part of the "relevance debate" of the early 1970s (Chisholm, 1971; Prince, 1971; Smith, 1971; Dickenson and Clarke, 1972; Berry, 1972). The related questions of values in research and the nature of the relationship between pure and applied research are also issues of central importance for applied geography.

The development of applied geography has accompanied the debate over the relative merits of pure and applied research. Scholars like Cooper (1966) and Kenzer (1989) criticised the development of applied research in geography. They warned that such application of geographical methods pose a threat to the intellectual development of the discipline. On the contrary, many geographers favoured applied geography over pure geography. Applebaum (1966) pointed out that "geography as a discipline has something useful to contribute to man's struggle for a better and more abundant life". Geographers should "stand up and be counted among the advocates and doers in this struggle" (1966, p. 198). In the words of Kasperson: "the shift in the objects of study in geography from supermarkets and highways to poverty and racism has already begun and we can expect to continue for the goals of geography are changing. The men see the objective of geography as the same as that for medicine- to postpone death and reduce suffering" (1971, p. 13). Zelinsky (1970) pointed out

similar views about the growing disillusion within geographic circles about the future directions of the subject. He directed his criticism against scientists as well who have failed to avert the oncoming crisis. Zelinsky (1970) pointed out that social sciences cannot live up to the axioms of natural sciences for multiple reasons and the natural science models are irrelevant to the study of society. Zelinsky further explained that, "the natural science approach adopted by positivist spatial scientists helps to describe the world but not to understand it (1970, p. 141).

It was claimed that geographical works should be more relevant to major social problems. These claims raised questions about the relevance of the discipline and soon it was apparent that there was no consensus about the nature or subject-area of geography. Geographers traditionally advised governments in the roles of information-gatherers and masterful synthesizers. But they were not involved in the final stages of decision-making. As pointed out by Chisholm (1971), the major challenge to human geography was to define such norms that would make geographers the decision-makers. He also criticised empirical science and pointed out that it fails to provide guidance as to which option should be taken by the researcher. It was increasingly felt that the focus of any research should be to challenge the spatial and social inequalities and the basis for the policies aimed at redistributing resources. By 1970s, many geographers were frustrated by a sense of failure to deal with major social issues. However, there were some scholars who were taking notice of the sufferings of the outside world. Smith (1971) mentioned that the American geographers deliberately ignored the conditions of human welfare and social justice. Therefore, American geography was bound to undergo another revolution where societal issues would come at the forefront of geographical studies. Smith, in his book 'Geography and Social Justice' (1994), urged that social justice should be placed at the heart of geography. It was felt that 'pure' or 'academic' geography should provide a knowledge-base for policy making which meant that geographers would have to closely work with future policy makers. Harvey (1973), pointing out the current mode of geography offered that, "there is an ecological problem, an urban problem, an international trade problem and yet we seem incapable of saying anything of depth or profundity about any of them. When we do say anything, it appears trite and rather ludicrous…. It is the emerging objective social conditions and our patent inability to cope with them which essentially explain the necessity for a revolution in geographic thought". In some recent instances, Abler (1993) considered that "too many geographers still preoccupy themselves with what geography is; too few concern themselves with what they can do for the societies that pay their keep" (1993, p. 225). According to Palm and Brazel "applied research in any discipline is best understood in contrast with basic or pure research. In geography, basic research aims to develop new theory and methods that help explain the processes through which the spatial organisation of physical or human environments evolves. In contrast, applied research uses existing geographic theory or techniques to understand and solve specific empirical problems" (1992, p. 342)

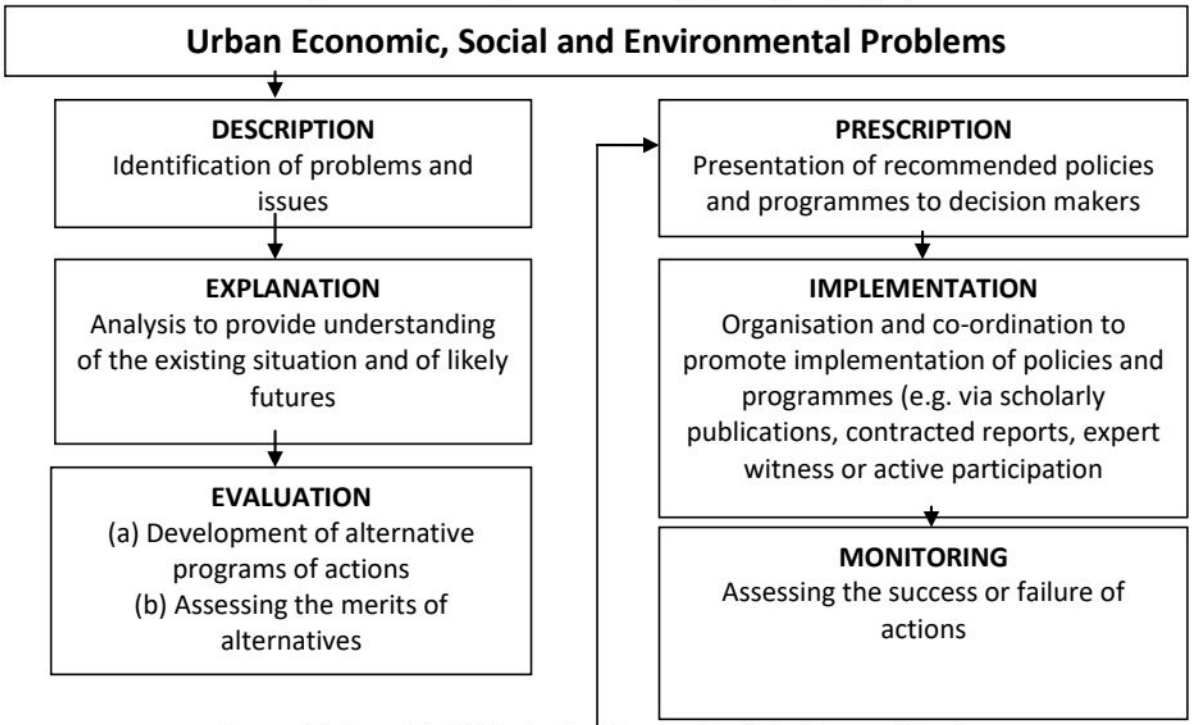
Interrelations between Applied and Pure Geography:

There are also instances where an individual researcher contributed in both pure and applied research. "The eminent geographer C. Sauer was both a "scholar" who conducted research on agricultural origins and dispersals and an "applied geographer" who developed a land classification system for the State of Michigan" (Pacione 2011, p. 12). Hence, pure and

applied geography should be seen as the ends of a continuum rather than unrelated polar opposites. There are close interrelations between pure and applied geography, which are more correctly seen as two sides of the same coin. As Frazier puts it "applied geography uses the principles and methods of pure geography but is different in that it analyses and evaluates real-world action and planning and seeks to implement and manipulate environmental and spatial realities" (1982, p. 17). Hence, applied geography not only utilises pure geography but also contributes in its further development through providing real-life examples. Theory and praxis are clearly essential companions for the development of any discipline. Theories and methods provide the framework for addressing any problem. They help us in asking the right questions while approaching any issue at hand. At the same time, applied research provides the opportunity to use theories and methods in real-world problems, thus, providing proof of their validity in real world scenarios.

It can be concluded that there is no use in pursuing this hypothetical dichotomy between pure and applied research. Rather, it would be more appropriate to recognise and distinguish the various stages of research. Pure geographers develop theories and applied geographers are more involved in the later stages of application and post-analysis (Figure 13.1). As Pacione puts it, "the applied researcher has a greater interest than the pure researcher in taking the investigation beyond analysis into the realms of application of results and monitoring the effects of proposed strategies" (2011, p. 12). Researcher participation in the implementation stage may require a variety of degrees of engagement, including acting as expert witnesses at public enquiries, dissemination of research findings via the media, field involvement in, for example, landscape conservation projects and monitoring the effects of policies and strategies enacted by governmental and private sector agencies.

Figure 13.1: A protocol for applied geography



Source: Pacione, M., 2011: *Applied Geography: Principles and Praxis*.

Positivist Approach and Applied Geography:

Most of the applied works in geography in the 1970s and 1980s followed the empiricist-positivist approach. The works carried out before and after the World War II also reflected positivist trends. Applied geography has a long-time record of positivist bias, starting with Stamp's Land Utilization Survey of Britain in the 1930s and his later involvement in post-war planning. Various aspects of land-use planning became the area of interest for many geographers during 1930s and 1940s in Britain and USA. Geographers made many contributions in applied research during and after World War II. Especially after World War II, land-use planning was established on a large scale and many trained geographers were involved in this area of research. Many academic geographers remained active in applied works. Developments in remote sensing and GIS during the1980s and 1990s paved the way for substantial increase in mapping and enumerations. Smith (1985) observed, "the predominance of remote sensing (and associated digital mapping) reflects a view of geography as a technologically sophisticated means of gathering and displaying information in the tradition of geographers as map-maker linked to the contemporary preoccupation with information technology" (quoted in Adhikari 2010, p. 366). Other than these developments, various policies were evaluated such as those aimed at changing the distribution of industrial activity. Similarly, much of the entropy maximising system modelling was intended to provide procedures for the joint activities of land-use and transport planning.

Geographers were perceived to have valuable skills in the collection and ordering of data as used in land-use surveys. Such data presentation frequently assumed the existence and desirability of maintaining certain causal relationships. For instance, agricultural land-use planning often assumed a clear causal link between the physical environment and agricultural productivity; and industrial location assumed the need for efficiency via the minimization of total travel costs. "As positivist work on the allocation of land-use and traffic flow increased, so the potential for geographic inputs to spatial planning was promoted and many people who initially trained as geographers became professional planners" (Adhikari 2010, p. 366). There were also some attempts to evaluate policy impacts and to develop a theory of decision-making. Geographers continued to make advancements in the empiricist-positivist works in response to the perceived need for data due to economic and social crises.

Although, there were many scholars who stressed the need for a greater commitment to applied geography in the empiricist/positivist mould. Many other scholars argued that it is not the best way of responding to the pressing societal problems. They argued for re-evaluating geographers' role in studying the root causes and providing solutions to those problems. "Since, applied works requires being self-explanatory in nature and predictive in character, they cannot be successful without using empiricist/positivist approach. Applied research involves the collection and reporting of information to produce particular form of explanations that necessitates the use of positivist led methodology because the results ought to be law-specific" (ibid, p. 366).

A lot of research work conducted under the empiricist/positivist approach during the 1960s and 1970s was under the general title of factorial ecologies, application of multi-variate statistical procedures to large area matrix as means to represent spatial variations in population characteristics. Smith (1973) and Knox (1975) had adapted factoral ecology procedures for mapping social welfare in the 1970s. "Knox (1975) promoted the mapping of

social and spatial variations in the quality of life as a fundamental objective for geography to provide both an input to planning procedures and a means of monitoring policies aimed at improving welfare" (ibid, p. 366). Smith (1973) identified territorial social indicators to measure the level of social well being in American context. "These two works represented the geographer as delver and dovetailer producing information on which more equitable social planning could be based" (Chisholm 1971; quoted in ibid, p. 367). Harries (1974) studied the spatial variations in crime rates and the administration of justice and argued that empirical models of criminal patterns can help in police work. Bunge (1971) prepared a 'geobiography' of his home town in Detroit's black ghetto through mapping variations in human welfare. Cox (1973) studied the urban crisis in USA including the racial tensions and riots, municipal bankruptcies and the role of government in urban economy. He presented his analysis that these crises are the result of conflict over access to sources of power. All these works reflect the fact that positivist/quantitative approach were very influential in the advancement of applied research in geography.

13.4 CONCLUSION

Applied research in geography developed as an answer to the unprecedented pressure on the discipline to prove its significance for the society and actual world. During the spatial science paradigm (based on positivist approach), geographers were busy with developing grand theories, models and general laws that can explain spatial variations on earth's surface. At the same time, they completely ignored the important debates and burning issues of the wider world such as racial discrimination, gender discrimination, social exclusion and marginalisation, poverty and inequalities and so on. As the dissatisfaction among geographers grew, the spatial paradigm was replaced by humanist approach, critical social theory, Marxist and radical approaches. At the same time, geographers were increasingly asking questions regarding their actual contributions in solving these societal problems. As a response, applied research developed exponentially within our discipline. Geographers discarded the earlier positivist approach for its inadequacies in providing solutions and contributing in the betterment of human kind. As Zelinsky puts it, "the natural science approach adopted by positivist spatial scientists helps to describe the world but not to understand it" (1970, p. 141). At the same time, Smith (1971) urged American geographers to make 'social justice' the heart of human geography. Harvey (1973), while criticising the then mode of analysis, pointed out geography's inability to provide solutions to any of the problems faced by society. All this introspection and consequent debates led to the growth of applied research in geography that was aimed at providing better understanding of social problems and coming up with particular answers to those problems.

13.5 SUMMARY

The development of applied and/or pure geography was determined by the external forces working on the discipline. When the discipline is under pressure from the academic circles to provide with the theoretical foundations of the discipline, pure geography tends to flourish. On the contrary, applied research develops when the discipline needs to prove its relevance to

the actual world which usually happens in the times of economic/social crises. There is kind of cause and effect relationship between cycles of pure and applied geography and cycles of economic prosperity and recession. As Hagerstrand puts it, "when the world is stable and/or unhampered liberalism prevails, then there is probably not much to do for geographers except surviving in academic departments trying to keep up competence and train school teachers in how wisely arranged the world is" (1977, p. 329). Applied geography witnessed unprecedented growth during 1970s as the discipline was required to prove its relevance to the real world. There was a lot of pressure to justify the discipline in terms of utility to economic goals and geographers started looking for all kinds of research projects. Attempts were made to promote the discipline that emphasized its utilitarian aspects. Pressure for developing applied geography is still very, especially in western countries, where departments are not provided with enough funding from state apparatus. Cycles of applied and pure geography induced varying debates regarding the nature and direction of the subject. Many scholars favoured pure geography as a prerequisite to the long run development of the subject. On the contrary, many scholars favoured applied works saying that applied research provides real solutions to real life problems, thus, it is much more useful for society. However, there have been instances when a researcher contributed in both the areas. It is also pointed out by several scholars that pure and applied geography actually complement rather than oppose each other. Pure geography comes up with new theories and methods which are then used and applied in the real world by applied geographers. This application then provides either validation of the theory or brings out its shortcomings. Either way, applied works greatly contribute in the further development of the theory and methods through providing a real life testing grounds. Hence, both applied and pure research is necessary for the long term survival of the discipline. Geographers have greatly contributed in the field of applied geography and now it is time to move on to pure research and solidify the theoretical foundations of the discipline.

13.6 GLOSSARY

Applied Geography (Stamp 1947): It is the application of geographical knowledge and skills to the solution or resolution of the problems of society.

Empiricism : A philosophy of science which accords a special privilege to empirical observations over theoretical statements. Especially, it assumes that observational statements are the only ones which make direct reference to phenomena in the real world.

Lebensraum : Literally meaning 'living space' or the 'geographical area within which living organism develops'. Ratzel in his book on political geography equated a nation to with a living organism and argued that a country's search for territorial expansions was similar to a growing organism's search for space.

Geopolitics: Geopolitics is the study of the effects of geography (human and physical) on international politics and international relations. Geopolitics is a method of studying foreign policy to understand, explain and predict international political behavior through geographical variables. These include area studies, climate, topography, demography, natural resources and applied science of the region being evaluated. Geopolitics focuses on political power in relation to geographic space. In particular, territorial waters and land territory in

correlation with diplomatic history. Topics of geopolitics include relations between the interests of international political actors, interests focused to an area, space, geographical element or ways, relations which create a geopolitical system.

Welfare Geography: An approach to human geography emphasizing the question of human welfare and social justice. It developed as a reaction to quantitative models.

13.7 ANSWER TO CHECK YOUR PROGRESS

1. What is applied geography?

2. Provide a brief account of the historical development of applied geography.

3. What were the major cycles of pure and applied geography?

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13.9 SUGGESTED READINGS

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13.10 TERMINAL QUESTIONS

1. What are the major aspects of the dichotomy between pure and applied geography?
2. What are the major points of contestations between applied and quantitative (positivist) approaches in geography?
3. In what ways, pure and applied works complement each other?

UNIT 14 : ANCIENT INDIAN GEOGRAPHY AND SCIENTIFIC OUTLOOK

14.1 OBJECTIVES

After reading this unit you will be able to:

- To gain a deeper knowledge about the Ancient Indian Geography.
- To know about the immense contributions made by the Indian Geographers in this discipline.
- To know their scientific importance and application.
- To know about the importance of old literature and epics in the field of geography.
- To know the changes that occurred through time in the discipline of geography.

14.2 INTRODUCTION

India, home of one of the world's earliest civilizations has a long-standing intellectual tradition. The geographical studies in India began with the dawn of Indian Civilization in ancient times. Occupying a strategic location in Asia, Indian history is at crossroads of cultures from China to Europe. The contributions of Indian scholars in the ancient period are parallel to that of Chinese, Greeks and Romans. In this geographically diverse subcontinent of Eurasia, discoveries on nature and humanity from ***Upnishads*** and ***Vedas*** led the development of various indigenous knowledge systems. The vast galaxy of seers-scientists, philosophers, poets and sages left behind a wealth of history of thought. In fact several inventions and discoveries believed to have originated in the western world have been studied centuries earlier by our ancestors. Looking back at the roots of Indian geography reveals very rich and strong Indian intellectual heritage, a legacy of over 2000 years old. However, the formal foundations of academic geography in India were laid in the colonial period as late as 1920s. Beginning in the 8th century, India was exposed to Islamic geographical concepts and ideas; and Muslim geographers began to take place beside Hindu scholars in contributing to the maturing of geographical study in India. The arrival of the British and other European colonial powers in the 17th century forced an adjustment in Indian intellectual circles. Indian geography's progress in the modern times has been spectacular after Independence.

14.3 DICHOTOMIES BETWEEN ANCIENT INDIAN GEOGRAPHY AND SCIENTIFIC OUTLOOK

THE GEOGRAPHY OF ANCIENT INDIA

'Geography' in Hindi is called *"Bhugol"*; **'bhu'** meaning *'the Earth'* and **'gol'** meaning *'round'*, i.e. **'the study of round earth'**. Indian astronomers propounded the theory that the earth is a sphere. The ancient Indian scholars were adepts in all fields known to humanity. Some of these scholars are listed below with their major field of study (Table 14.1). This interdisciplinary knowledge lies at the root of geographic development. Acharya Kapil contributed to the science of cosmology. Acharya Bharadwaj is known for outstanding discoveries in aviation science.

Baudhayana was an Indian mathematician, noted for writing the earliest "*Sulba Sutra"*, for the texts dealing with geometry and mathematical principles. Acharya Charak, crowned as the 'father of Medicine' produced "*Charak Samhita"* as his most renowned work in which he has described the functions and medicinal properties of some hundred thousand plants. Acharya Kanad, a genius in philosophy was the pioneer expounder of realism, law of causation and the atomic theory. Acharya Sushrut, with his "*Sushruta Samhita"* was another giant in the arena of medical science and his is an unparalleled work of the medical science of ancient India, popular as Ayurveda. Siddhartha Gautama was a spiritual teacher who founded Buddhism. Panini is known for his Sanskrit grammar and his "*Ashtadhyayi"* is the foundational text of the earliest known grammars of Sanskrit that stands at the beginning of the history of linguistics. Nagarjun was an extraordinary wizard of science whose research produced maiden discoveries and inventions in the faculties of chemistry and metallurgy.

Table 14.1 The Earliest Known Indian Scholars Name Field

S No.	Name	Field of Expertise
1.	Acharya Kapil (3000 BC)	Cosmology
2.	Acharya Bharadwaj (800 BC)	Aviation technology
3.	Baudhayana, (800 BC)	Mathematics
4.	Acharya Charak (600 BC)	Medicine
5.	Acharya Kanad (600 BC)	Physics (Atomic Theory)
6.	Acharya Sushrut (600 BC)	Medicine (Surgery)
7.	Gautama Buddha (563 to 483 BC)	Philosophy
8.	Panini (400BC)	Sanskrit Grammar
9.	Nagarjuna (100 AD)	Chemistry & Mathematics
10.	Âryabhatta I (476–550 AD)	Mathematics & Astronomy
11.	Varahamihir (499-587 AD)	Astrology & Astronomy
12.	Brahmagupta (598-668)	Mathematics & Astronomy
13.	Bhāskara I (600 - 680)	Mathematics & Astronomy
14.	Adi Shankara (788 AD - 820 AD)	Philosophy
15.	Aryabhata II (about 920)	Mathematics & Astronomy
16.	Sridharacharya (AD 991)	Mathematics
17.	Brahmadeva (1060- 1130)	Mathematics & Astronomy
18.	Bhaskaracharya (1114-1183 AD)	Algebra

The Indian scientists, like Aryabhatta-I, Varahmihira, Brahmagupta, Aryabhata-II, Sridhara and Bhaskaracharya, have shaped the course of mathematics and astronomy for the world to marvel upon. Aryabhatta's "*Magnum Opus*", "*Aryabhatiyam*" (498 B.C.), was the summary of Hindu mathematics up to the time. It was recognized as a masterpiece and through its translation European mathematicians got enriched by the facts that Aryabhatta discovered 1,000 years before Copernicus and Galileo. Adi Shankara was an Indian philosopher who

stressed the importance of *Vedas* and his efforts helped Hinduism to regain strength and popularity. Ancient Indian contribution to geography came through various fields of learning as Philosophy, Cosmology, Mathematics, Astrology and Astronomy, Physics, Chemistry and Metallurgy, Science and Technology, Medicine and Linguistics. In fact, the Indian scholars contributed significantly in the growth and development of geography and its allied sciences. Although, the classical Indian scholars have richly contributed to the various fields of geographical study as **physical geography, regional geography, climatology, mathematical** and **practical geography**. Their knowledge, particularly in **astronomy** *(Khagol Shashtra),* was fascinating.

The philosophy in India developed from the common reservoir of Upanishadic ideas. This philosophic thought is classified into two broad categories viz. Orthodox *(astika)* and heterodox *(nastika).* Orthodox systems are those which accept the authority of *Vedas*, while the heterodox systems are those which reject it. **The ancient Indian scholars dealt with many problems pertaining to Cosmology (the science of Universe), Cosmogony (the origin of Universe) and Cosmography (the description of Universe).** Today scientists rely on powerful telescopes and sophisticated computers to formulate cosmological theories. In former times, people got their information from traditional books of wisdom and the ancient schools of philosophy. Followers of India's ancient culture, for example, learned about the cosmos from scriptures like the *Srimad Bhagavatam,* or *Bhagavata Purana* and the *Sankhya School of Thought*. The *Srimad Bhagavatam* presents an earth-centered conception of the cosmos. In India, mathematics has its roots in nearly 4000 years old Vedic literature.

Astronomy was one area which has fascinated all mankind from the beginnings of history. In Indian language, the science of Astronomy was called as *Khagola-shastra*. The word *Khagola* is derived from the famous astronomical observatory at the University of Nalanda which was called Khagola. The Nalanda University was the center of education for scholars from all over Asia. Many Greek, Persian and Chinese students studied here. The lack of a telescope hindered further advancement of ancient Indian astronomy. Though it should be admitted that even with their crude instruments, the astronomers in ancient India were able to arrive at near perfect measurement of astronomical movements.

The ancient scholars like Aryabhatta-I, Bhaskaracharya, Brahmagupta and Varahamihira were associated with Indian astronomy. They developed their views regarding the planetary positions, planetary movements and planetary forces and also made the related astronomical calculations. What Copernicus and Galileo propounded was suggested by Aryabhatta nearly 1500 years ago.

From the Vedic times, Indians (Indo-Aryans) had classified the material world into four elements viz. Earth *(Prithvi)*, Fire *(Agni*), Air *(Maya)* and Water *(Apa).* To these four elements was added a fifth one viz. Ether or *Akasha*. These five elements or *Pancha Mahabhootas* were identified with the various human senses of perception; earth with smell, air with feeling, fire with vision, water with taste and ether with sound. Since very ancient times Indians had

perceived the material world as comprising these five elements and believed that these elements were physically palpable and hence comprised miniscule particles of matter.

Although geography was not then developed as a formal discipline, early Indian scholars had a well developed geographical sense and clearly understood spatial relationships. The main sources of ancient Indian geographical works are the Vaidikas, the Ramayana, the Mahabharata, the works of Buddhists, Jains and the Puranas. The earliest mention of geography as a discipline is traced to *Bhagwat Purana*, the 8th century puranic text when **Bhugol**, or **Bhoogol**, a vernacular term for geography in most Indian languages, is derived from Sanskrit, firstly used in *Suryasiddhanta*. In the *Padma Purana,* however, a difference has been made between *Bhugol* (Geography), *Khogol* (the science of space) *and Jyotishakra* (Astrology). A large amount of geographical information is contained in the Mahabharata and Ramayana; the two great epics still unsurpassed in the classical Indian literature. In the *Ramayana,* the inventory of mountains, rivers, plateaus and important places has been made, while the epic of *Mahabharata,* may serve as an encyclopedia of geographical knowledge. The *Bhuvankosa* deals amongst other things, with climatology and meteorology in detail. The *Satapatha Brahamana* furnishes a systematic description of the various branches of geography. The earth studies of ancient Indian scholars dealt with its origin, sphericity, eclipses, size and dimensions, latitudes, longitudes and local time, directions or cardinal points, earthquakes and volcanoes, atmosphere and seasons and its physical divisions.

Earth:

The concept of *prithvi* (earth) is the most basic concept in the study of geography. The word has been profusely used in the *Vedas* and the *Puranas*. The use of the term *'Bhugol'* for the discipline of Geography is the most appropriate and it clearly suggests that the ancient Indians endorsed the earth being a sphere and not a flat disc as believed by some of their parallel civilizations. The spherical shape of the earth was visualized in the *Aitareya Brahmana.* In the *Aitareya Brahmana* one may find the materials regarding the regional geography of India. It also states that the sun neither sets nor rises. We feel that it sets but in reality at the end of the day it goes to the other side. Thus, it makes night on this side and makes day on the other side. There is other evidence also like the shadow of the earth during lunar eclipse which is circular. From this, it is inferred that the earth is in spherical shape.

Origin of Earth:

As far as the origin of the earth is concerned, many of the facts as put forward by the ancient Indian scholars were more or less accurately known. They believed in the solidification of earth from gaseous matter. The earth's crust, according to them, is made of hard rocks *(Shila)*, clayey material *(Bhumih)* and sandy material *(Asma)*. The *Puranas* mention the earth to be apparently floating on the water like a sailing boat on the river. They were also aware of the fact that there is more land surface in the Northern Hemisphere. The facts related to the size and dimension of the earth were quite near to accuracy.

Eclipses

The ancient Indian scholars were also conscious of the causes of *grahanas* (eclipses). It was because of this knowledge that they advocated performing of some rituals and ceremonies on the days when eclipses occurred. The Aryan considered an eclipse in auspicious and a herald of disaster. It was also believed that if a solar and a lunar eclipse occurred in the same month, it becomes more disastrous. Varahmihira has considered the effects of the eclipse month-wise and emphasized the fact that eclipse in *Posa* (December) leads to famine and its occurrence in April and May results in good rainfall, while an eclipse in *Phagun* (March) and *Asadh* (June) are inauspicious.

Size of the Earth:

About the size of the earth, no definite information was given in Vedic and Puranic literature but later literature of the 5th and 6th centuries A.D on astronomy gave some convincing information about the dimensions of the earth which is as follows:

Dimensions of the Earth

Source	*Yojanas*	*Miles*	*Kms*
Pancha Siddantika (verse-18)	1018.6	8148.8	13038
Aryabhatta (verses)	1050.0	8400.0	13440

These dimensions were based on crude estimations. But still these dimensions were very close to the established facts of today.

Latitudes and Longitudes (Akshansh and Deshantar):

It was well known to the ancient Indian scholars that the earth is an oblate spheroid slightly flattened at the poles. *Akshansh* and *Deshantar* are the terms used for 'latitudes' and 'longitudes' respectively in the ancient Indian literature. *Puranas* have a reference of three imaginary lines of latitudes passing through Equatorial belt, North Pole and South Pole. Accordingly, three major regions have been identified in the Literature, viz. Equatorial *(Nirakshadesha)*, Northern Polar *(Meru)* and Southern Polar *(Bhadvanala)*. The North Pole has been called as Zenith and the South Pole as Nadir. The South Pole was truly considered as the antipode of the North Pole, i.e. diametrically opposite to it. However, the world was not believed to exist beyond Equator, as the region here was compared to hell of the earth. The Eastern part, on the other hand, was believed to be 'the land of Gods'. This thinking is in consonance with that of the Europeans in the Early Medieval period, when the Dark Ages prevailed and the East in 'T-in-O' Maps was assumed to be the place of Adam and Eve.

The ancient Indian scholars have also drawn Prime Meridian. The longitude of Ujjain passing through Lanka *(Nirakshadesha, as it was in the equatorial region)* and Mt. Meru *(the northern pole)* was taken as the prime meridian by the Indian Astronomers.

Cardinal Points:

These imaginary lines, the position of Sun and various stars have helped them to determine local time at various places. In Rigveda, there is formulated idea of four main directions, viz. *Purva* (East), *Paschim* (West), *Uttar* (North) and *Dakshin* (South). By adding *Zenith* (Meru) and *Nadir* (Bhadvanala) it was raised to six. But, afterwards, ten directions have been frequently mentioned in the Puranic literature. The designation of these directions in the *Puranas* and subsequent literature *Saptapadarthi* is significant in the sense that it bears concept of the Gods dominating in each of these directions. The ten directions and the ruling deity of each are mentioned below (Table 14.2).

Table 14.2 Cardinal Points and the Ruling Deities as per Puranic Literature

Direction	Ruling Deity
Purva (East)	Indra (The God of Rain)
Agneyay (Southeast)	Agni (The God of Fire)
Dakshina (South)	Yama(The God of Death)
Nairitya (Southwest)	Niriti(The God of Disaster)
Paschim (West)	Varuna(The God of Water)
Vayavya (Northwest)	Marut/Vayu(The God of Air)
Uttar (North)	Kubera(The God of Wealth)
Isana (Northeast)	Isa(The God of Power)
Urdhava (Zenith*)	Brahma(The Creator of Universe)
Adhoh (Nadir^)	Sesa-naga(The Universal Ocean)

**The point directly above the observer*

^ The point directly below the observer

Earthquakes and Volcanoes:

The knowledge regarding the earthquakes in this period is excellent. For 'earthquakes' the term *bhukamp* has been used in *Puranas*. It was assumed that the deities of Air, Fire and Water, i.e., *Vayu, Agni, Indra and Varun* cause the earthquakes. The *rishis* and scholars had a fairly good knowledge about the origin of earthquakes. Similarly they had good knowledge about the origin of volcanoes *(jwalamukhis).*

Atmosphere, Weather, Climate and Seasons:

The evidence of *Vedas* and *Puranas* clearly states tht the Aryan were familiar with atmosphere, weather, climate and seasons. According to the ancient Indian scholars, they have identified the vacuum between the earth and the heaven as *Antariksha,* by which the earth was surrounded. They were also aware of its vast extent and the occurrence of various weather phenomena here, as rain, winds, clouds, lightening, fog and frost etc. The *Rigveda* mentions that the thickness of the atmosphere cannot be transverse by birds. Bhaskaracharya has conceived the thickness of this *Antariksha* around the earth to be 12 *yojanas* (or 154 kms). All the weatherly and climatic activities occur here.

As far as the knowledge about the seasons is concerned, it is based largely on the studies in India. *Rigveda* mentions five seasons. In Valmiki Ramayan, however, six seasons have been identified, viz. *Basant* (Spring), *Grishma* (Summer), *Prourit/ Varsha* (Rainy), *Sharad* (Autumn), *Hemant* (Winter) and *Shishir* (severe Winter).

Continents (Dwipas):

In the ancient period, the knowledge about various parts of the world was limited. It was due to the poor means of communication and transportation. Even then, the attempts were made to divide the world into several regions on the basis of available information. Such descriptions exist in *Puranas*. Although incorrect, the term *Dwipa* has been used to designate various realms (continents) of the earth. Accordingly, the known world during the Puranic period was divided into **seven Dwipas or 'regions'**. These Puranic divisions exclude the American Continents, Greenland, England and Antarctica since they were discovered only during the Age of Discovery in the late medieval period. The regions seem to have derived their names from the existing popular trees or grasses here. These seven regions were known as **Jambu Dwipa, Krauncha Dwipa, Kusha Dwipa, Plaksha Dwipa, Pushkara Dwipa, Shaka Dwipa and Shalmali Dwipa.**

Jambu dwipa formed the centre of all these continents. In relation to the present day context, Jambu covered present Central Asia from North to South including India or the region north of Salt Sea. Jambu, in fact, is a bush found in Himalayan region.

Kusha dwipa extended over present Middle East and most of Africa. The name is taken from a sacred grass, **Kusa** which is used in brahmanical ceremonies.

The present Eastern Asia and adjoining lands constituted *Pushkara dwipa*.

The present Mediterranean region formed *Plaksha dwipa*.

Shalmali dwipa represented the region of Eastern Africa and Madagascar Island. This region is rich in Salmala, the silk-cotton tree found on the margins of Equatorial regions of monsoon lands with moderate rainfall. Most of present Europe was *Kraunca dwipa* and Lastly, *Shaka dwipa* formed South-East Asia and adjoining Island groups. Hot and moist climate and thick evergreen forests characterize the region.

Bharatvarsha :

The geographical knowledge of ancient period about Indian Sub-Continent is related to its identification, people and culture and relief and drainage. In Vedic and Puranic literature, the entire country from Himalayas to Kanyakumari has been referred to as **"Bharatvarsha"**. This name has both geographical and historical significance. Bharata is construed by many historians as having been an Indo-Aryan king; As king he unified the entire Indian subcontinent with the Dravidian peoples and other indigenous peoples as his subjects. According to the Mahabharata, Bharata's empire covered the entire Indian subcontinent, Afghanistan and Persia. The Republic of India is also known as Bharat after *Bharata*. Although, this Bharatvarsha, in ancient times was subdivided into several regions certain parts of the country are very distinctively mentioned in the ancient Indian literature. They are, e.g. *Sapta Sindhu* (Punjab Plains), *Aryavarta* (the Aryan domain) and the region of Indus valley or the Upper Gangetic Plains.

Mountain and Rivers:

The *Vedas*, Epics and *Puranas* make mention of a series of mountains in Bharatvarsha. They are, for instance, Himalayas (Himavat), existing like a bow in its northern part and divided into Antagiri (Inner Himalayas) and Bahyagiri (Outer Himalayas); Kailash Parbat, the abode of Apsaras (nymphs) and Devas (Deities) and rich in diamonds, minerals and other precious stones; Vindhayans, the extensive mountains with hundreds of peaks, variegated trees and creepers; Mahendra Mali, the Eastern Ghats; Sahyadri, the Western Ghats; Rika, the mountain range from Ken to Ton rivers north of Vindhayans; and Suktiman, the mountains of Khandera, Ajanta and Golkunda. The descriptions are also available for a number of Himalayan and other Inland rivers. Rigveda has mentioned various rivers originating from Himalayas, viz. Ganga, Yamuna, Brahamputra, Saraswati, Satudri (Sutlej), Asikni (Chenab), Vitasta (Jhelum), Arjikeya (upper part of Indus), Susoma (Savan), Sindhu (Indus), Kubha (Kabul), Gomati (Gomala), Krumu (Kurrum), etc. Among the inland river the important ones are Narmada, Tapti (Tapi), Godavari, Krishna, Cauvery and Tungbhadra. However, the most elaborate descriptions exist about Ganga and Brahamputra. The religious flavour is very strong in these descriptions, as the rivers have been considered sacred to be worshipped as Goddesses in Hindu mythology.

CHANGING WAYS OF GEOGRAPHY AND SCIENTIFIC OUTLOOK

India posed out to have great contribution to the geographical stream. Most of this knowledge is gained through the books and writings in the Epics, *Vedas* and *Puranas.* It all states that the Indian scholars had great intellect to find all these things about the earth and beyond at that time without any technological help. However, it does not mean that the study didn't have a scientific outlook. Although there was no technical assistance like we have now but the whole discoveries and knowledge obviously had a scientific face in them. However, there were many thinking and practices which were beyond this outlook.

The whole scenario of knowing of eclipses was for the various ceremonies and gatherings. There were beliefs of bad omens and disasters related to occurrence of eclipses, which had no scientific meaning. Superstitions were another factor that led to a no scientific look of this knowledge. Other than this caste system was a rigid kind of a trend of society which deterred the other sections to know or show that they know something about the geographical field. It was considered ominous that these people would come and take or grant any type of knowledge, which makes it a far of subject from scientific point of view. Apart from all this, all the origins, places, symptoms and activities that happens are related to the menace or blessing of God. They are either taken as sacrifices of people or gifts by God. No scientific explanations of all these activities are found. They are based on some explanations of moral tales which explains what is good, bad and evil; how the world work and how it should work; what are the different phenomenas that occur, etc. But these are not much of scientific disposition and logical, they are rather social and cultural. However, with time, changes took place and geography changed out to be a much scientific discipline as it is social.

After the ancient era, the development in geography took place largely. During this period the Indians efficiently applied the knowledge of geography to trade, commerce and colonisation. India started having contact with the Arabs in 712 AD when they came into Sind but it was not until 1206 that Muslim rule started in Delhi and the geographic thought of the Arabs made an impact on the Indian society. In 1030, the Arab geographer Al-Biruni wrote the geography of India. The Arab geographical work was based on the development of the methods for making observations and using these for inventory of soil, products and economic aspects of the area. From the 9th to the 15th century important new data were collected through direct observation by Arab and Indian geographers. After the 15th century geographical information and ideas began to emanate from Europe. These ideas were brought by the British colonialists to India.

From the very beginning, geography as a field of scientific learning has occupied an anomalous status between natural and physical sciences focused on particular types of natural processes or circle of facts on the one hand and the social sciences – focused on particular types of societal functions and phenomena on the other. Thus, as a discipline focused on the study of man's relationships with nature in particular segments of the earth surface, geography represented a cross-breed discipline that belonged neither to one nor to other. The result was that geography remained completely isolated from the mainstream intellectual discourse both in natural and social sciences. Since the intellectual climate of the 18th and 19th century Europe which later resulted in the same influence to Indian Geography as it got influenced by the Europe.

Geography, like all other social sciences was historically and socially conditioned during the colonial period (i.e. until 1947). In the colonial milieu, geography developed to meet primarily the needs of the administrators in the process of expansion and consolidation of the colonial empire. One of the major goals of geographic research carried on in India under the protective umbrella of colonial authorities was to provide descriptive accounts of the land, people and products of different parts of the Indian subcontinent to colonial administrators. Maps and gazetteers were produced to acquaint the colonial civil service with basic geographic information. Geography was introduced into Indian universities during the 1920s. During this decade a number of Indian geographers pioneered in establishing geography as an academic discipline and took the initiative to organise geographical societies to promote research. The arrival of the Europeans on Indian scene marked a novel and vigorous approach to the geography of this land. Europeans were strangers of this land and after the initial skirmishes with the regional rulers they were able to establish their foothold in India. As the prospects of territorial expansion appeared in sight, the most successful of the European powers, the British, struggled to know and learn more about India, its territory, regions, places, physical features and its resources on the one hand and its people and their social and economic life on the other.

A comparative study of the concept, sources and methodology of geographical studies in the pre-colonial and colonial period shows that the aspect common to the points of view of both the periods is the centrality of space, place or region as a theme. The description of the earth has

been the sheer anchor of both the periods. The Colonial geography had to its advantage, far more authentic information of places and people based as this information was and accurate surveying, based on extensive fieldwork and reports. Secondly, the concept and content of geography also changed from one of mere accumulation of facts and their description to one of systematic description and interpretation¸ a scheme in which the character of place and pattern of distribution of specific elements in the landscape demanded explanation. Initially in the colonial period, the emphasis in Indian geographical study was on the collection and presentation of information to illuminate the various regions of the country and to a much lesser extent, the continuing geographical analysis of classical Indian literature. The regional cataloguing of information was later encouraged by British colonial administrators' perceived need for detailed information on areas within their responsibility. The magnificent collection of Indian district and other gazetteers was an outgrowth of such efforts. These reference books are as useful today as they were over a century ago when they first appeared. Nevertheless, these works remain primarily encyclopedic in nature with virtually no methodological or conceptual basis. Similarly, the Indian Census reports have made an excellent contribution to the advancement of Indian geographical knowledge and study.

14.4 CONCLUSION

We can say that today geography has gained great heights as a subject but before it as even recognized as a subject or an independent field, many scholars contributed to its development and discovered the various parts of this field. They were not possessing today's technology and outlook but they still played their role in diversifying its nature. They also planted new steps for different other contributors to look upon and work accordingly. However, their approach was more social and cultural than scientific and logical but still the work they did casted a milestone for many and a framework were casted to look upon.

14.5 SUMMARY

- **'Geography'** in Hindi is called *"Bhugol'*; **'bhu'** meaning *'the Earth'* and **'gol'** meaning *'round'*, i.e. **'the study of round earth'**.
- **Acharya Charak**, crowned as the 'father of Medicine', produced "*Charak Samhita"* as his most renowned work in which he has described the functions and medicinal properties of some hundred thousand plants.
- **Acharya Sushrut**, with his "*Sushruta Samhita"*, was another giant in the arena of medical science and his is an unparalleled work of the medical science of ancient India, popular as Ayurveda.
- **Panini** is known for his Sanskrit grammar and his "*Ashtadhyayi"* is the foundational text of the earliest known grammars of Sanskrit that stands at the beginning of the history of linguistics.

- The ancient Indian scholars dealt with many problems pertaining to Cosmology (the science of Universe), Cosmogony (the origin of Universe) and Cosmography (the description of Universe).
- The ancient scholars like ***Aryabhatta-I, Bhaskaracharya, Brahamgupta*** and ***Varahamihira*** were associated with Indian astronomy. They developed their views regarding the planetary positions, planetary movements and planetary forces and also made the related astronomical calculations.
- The classical Indian scholars have richly contributed to the various fields of geographical study as **physical geography, regional geography, climatology, mathematical** and **practical geography**, their knowledge, particularly in **astronomy** *(Khagol Shashtra),* was fascinating.
- In Indian language, the science of Astronomy was called as ***Khagola-shastra***. The word *Khagola* is derived from the famous astronomical observatory at the University of Nalanda which was called Khagola.
- The earliest mention of geography as a discipline is traced to ***Bhagwat Purana***, the 8th century puranic text when **Bhugol**, or **Bhoogol**, a vernacular term for geography in most Indian languages, is derived from Sanskrit, firstly used in *Suryasiddhanta*.
- In the ***Padma Purana,*** however, a difference has been made between *Bhugol* (Geography), *Khogol* (the science of space) *and Jyotishakra* (Astrology).
- In the ***Ramayana,*** the inventory of mountains, rivers, plateaus and important places has been made, while the epic of ***Mahabharata,*** may serve as an encyclopedia of geographical knowledge.
- The ***Bhuvankosa*** deals amongst other things, with climatology and meteorology in detail.
- The ***Satapatha Brahamana*** furnishes a systematic description of the various branches of geography.
- The spherical shape of the earth was visualized in the ***Aitareya Brahmana***. In the *Aitareya Brahmana* one may find the materials regarding the regional geography of India. It also states that the sun neither sets, nor rises.
- The use of the term *'Bhugol'* for the discipline of Geography is the most appropriate and it clearly suggests that the ancient Indians endorsed the earth being a sphere and not a flat disc as believed by some of their parallel civilizations.
- It was well known to the ancient Indian scholars that the earth is an oblate spheroid slightly flattened at the poles. ***Akshansh*** and ***Deshantar*** are the terms used for 'latitudes' and 'longitudes'.
- Six seasons have been identified in Indian Literature, viz. *Basant* (Spring), *Grishma* (Summer), *Prourit/ Varsha* (Rainy), *Sharad* (Autumn), *Hemant* (Winter) and *Shishir* (severe Winter).
- Indian scholars have identified the vacuum between the earth and the heaven as ***Antariksha,*** by which the earth was surrounded. They were also aware of its vast extent and the occurrence of various weather phenomena here as rain, winds, clouds, lightening, fog and frost etc.

- The known world during the Puranic period was divided into **seven Dwipas or 'regions'**. These seven regions were known as Jambu Dwipa, Krauncha Dwipa, Kusha Dwipa, Plaksha Dwipa, Pushkara Dwipa, Shaka Dwipa and Shalmali Dwipa.
- In Vedic and Puranic literature, the entire country from Himalayas to Kanyakumari has been referred to as **"Bharatvarsha"**.
- All the origins, places, symptoms and activities that happens are related to the menace or blessing of god. They are either taken as sacrifices of people or gifts by god.
- They are based on some explanations of moral tales which explains what is good, bad and evil; how the world work and how it should work; what are the different phenomenas that occur etc, but these are not much of scientific disposition and logical, they are rather social and cultural.

14.6 GLOSSARY

Bhugol : 'bhu' meaning *'the Earth'* and 'gol' meaning *'round'*, i.e. 'the study of round earth'.
Khagol Shashtra : the science of space-Astronomy.
Cosmology : the science of Universe
Cosmogony : the origin of Universe
Cosmography : the description of Universe
Pancha Mahabhootas : the five elements; Earth *(Prithvi)*, Fire *(Agni*), Air *(Maya)* and Water *(Apa)* and Ether *(Akasha)*
Akshansh and Deshantar : Latitudes and Longitudes.
Dwipas : Continents
Bharatvarsha : The entire country from Himalayas to Kanyakumari has been referred as Bharatvarsha

14.7 ANSWER TO CHECK YOUR PROGRESS

1. Define what all is written in *Aitareya Brahmana.*

_____
_____
_____
_____
_____
_____

2. Mention the different cardinal points as described in *Rigveda.*

_____
_____
_____

Ans.1 Refer to section 14.3.1.

Ans.2 Refer to section 14.3.1 and Table 14.2

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14.10 TERMINAL QUESTIONS

Q.1 What do you mean by *'dwipas'*? Explain the different *'dwipas'* identified at that time.

Q.2 Write a note on "*Bhugol"* and how is it different from *"Khogol"*?

UNIT 15 : MODERN INDIAN GEOGRAPHY

15.1 OBJECTIVES

You should have learnt in the unit, the progress of geography under different stage; various themes of focus in geographical perspective and role of various Indian universities in modern India. The main objective of this unit are :

- Dichotomies on Modern Indian Geography
- Contribution of different geographers in modern geography.
- Progress of geography under the four stages in modern India.
- Contemporary trends and fields of study.
- Role of major universities.

15.2 INTRODUCTION

Modern geography was introduced in India as a cultural import from Britain, followed by France and the U.S.A. Unfortunately it heavily subsists on the foreign ideological imports which exercise mythological influence on the geographical rituals of teaching and research in our universities and counteracts the process of evolutionary thought.

15.3 DICHOTOMIES ON MODERN INDIAN GEOGRAPHY

Dichotomy or dualism means in geography, the conflict between two branches. In Indian Geography there is dichotomy in various fields of geography. The detail descriptions in all are given below:

Dichotomy between Systematic Geography and Regional Geography:

This dichotomy between 'systematic' and 'regional' was first raised by modern geographers in the second half of the 20^{th} century. In modern Indian geography general geography came to be known as systematic geography as it derived knowledge from other systematic disciplines and formulates general laws, generic laws and principles. Systematic geography, moreover, deals with the whole world as a unit. For example if we are studying according to this approach then we will describe or analysis all the component in a system at the world or any other level, demarking a boundary is not the criteria to follow this approach. In the contrast to this, Regional geography deals with the description of particular regions or state yet the entire component will also be study here. The regional approach will always followed, demarked boundary; it may be micro, macro or meso level. Regional Planning and Development R.P. Misra, V.L.S. Prakasa Rao, L.S. Bhatt, R.L. Singh's and K.V. Sundaram have made important contributions to the field and strictly support the regional approach to study the geography.

Dichotomy between Functional and Formal Geography:

The dichotomy between functional and formal geography suggests the division of geography into the geography of real places and geography of geometric places in black and white. The dichotomy came into being in order to avoid the division between regional/systematic and physical/ human geography. The believers of functional regions argue in favors of a causal relationship between the complex and heterogeneous features of a place as well as the causal relationships among phenomena such as relief, soil, land use, transport links and industrial clusters are arranged not by chance but according to a rational idea of using space in the best possible manner.

The homogenous regions formed by social groups and societies are called formal regions. These communities are organized into micro systems or part systems. A formal or uniform region represents a "discrete distribution" defined on the basis of certain specified criteria and has a homogenous character in terms of those criteria. Formal regions are defined on the basis of a single feature or a "well-defined association of several selected features".

The functional or nodal region is defined on the basis of its area of influence around a nodal centre, that is, a city or a town or several nodal centers related to each other. The most important factor for delimiting the functional region involves the spatial interaction of a node with its hinterland.

Dichotomy between Historical Geography and Contemporary Geography:

Historical geography studies the geography of a region as it was in the past decades. The basic premises of historical geography do not exactly coincide with the framework of geography; rather it exists side by side with the geography of modern times. Historical geography encompasses both regional and general geography apart from all other branches.S.M. Ali in his 'The Geography of Puranas has endeavoured to construct the geography of ancient India.

So, social geography in reality has become a part of historical geography. Historical geography can, therefore, be considered as a separate branch of study complete in itself. Contemporary geography revolves around the existing areal differentiation of phenomena which will ultimately pass into the realm of historical geography in the near future. So there is the dualism between the both branches and approaches of geography. Both are fluently opt by Indian geographers fluently.

Dichotomy between Physical Geography and Human Geography:

Dualism between physical geography and human geography is one of the major conflict topics of the geography as Indian geography is divided into two groups one support the study of physical geography where as another one stress on the study of human geography. The works in Human geography in India reflect in population, rural, urban, cultural, social, medical, and political geography. A.B. Mukherji and Kashi Nath Singh, R.N.P. Sinha, R.D. Dikshit, Majid Husain and Govind Saran Singh are the few geographer develop the branches of human geography and work

only on it. But another side A.B. Mukherji, Savindra Singh, . K.R Dikshit, R.C Tiwari are the geographers worked on physical geography and its branches as geomorphology, climatology, environment geography, oceanography, glaciology etc.

Contribution Of Different Geographers In Modern Geography:

R.L Singh successfully completed his pioneering study of "The Tarai Region of U.P. – A study in Human Geography" for the D.Phill Degree of Allahabad University under the able guidance of Professor R.N. Dubey, the doyen of Indian Geography.

Professor Gayer set up the Department of Anthropogeography at Sagar University. The Delhi School of Economics (Delhi University) started the Department of Human Geography which flourished under the leadership of Professor George Kurian who had already set up a strong Department of Geography at Madras University.

S.P. Chatterjee was essentially a natural scientist. He established a strong Department of Geography at Calcutta University. His major contributions relate to economic Geography at Calcutta University and regional planning.

S.M. Ali and Tahir Rizvi promoted the teaching and research in human geography at Aligarh Muslim University, S.M. Ali made some contributions to settlement and applied geography. His most important work is 'Geography of Puranas'. Later on he setup the Department of General and Applied Geography at Sagar University. M. Shafi is known for his pioneering work on Landuse. Later on, he made substantive contributions to agricultural geography, nutrition and food security.

P. Dayal strengthened the Department of Geography at Patna University and made substantive contributions to agricultural and industrial geography. E Ahmad made significant contributions to settlement, population and industrial geography.

R. L. Singh established a strong school of Settlement Geography at Banaras Hindu University, Varanasi. His pioneering study of "Banaras – A study in Urban Geography" (1955) acted as a catalyst for the development of urban geography in India. U. Singh, A.S. Jauhari and K.N. Singh enriched this sub – field by their contributions. Later on R.L. Singh made laudable contributions to rural settlement geography. He stressed on the geographical applications in transforming rural habitat.

S.L Kayastha's geography is basically historical and empirical. He made a perceptive study of the habitat, economy and society of the Beas Basin of the Himalayas. His contributions to population geography, resource, the cultural and clan groups in historical perspective. Rana P.B Singh contributed to settlement geography and cultural geography which M.B. Singh contributed to industrial geography.

G.S Gosal established a school of Population Geography at Chandigarh. His personal contributions to population geography are significant and path breaking. His colleagues A.B. Mukerjee, Gopal Krishna, R.C. Chandna and S. Mehta have also contributed to the development

of population geography A.B Mukherjee also made significant contributions in cultural and settlement geography.

Moonis Raza played an important role in promoting research in historical geography, economic geography and social geography. He made a substantive contribution to Indian Urban System in terms of economic base and commodity flows. C.D. Deshpande made significant mythological contributions in urban geography and cultural geography.

R.P. Mishra, V.L. Prakasa Rao, L.S. Bhatt and V. Nath have made theoretical and methodological contributions to regional development and planning in India, R.P. Mishra and K.V Sundaram have made significant contributions in urban and regional planning. R.P. Mishra stressed on quantification and diffusion models.

L.R Singh made several significant contributions to human geography, population geography, urban geography and applied geography. P.P. Karan has aptly remarked – "L.R . Singh's impact on Indain geography may be measured by his contributions to several spheres of activity. First his prolific writings on an enormous range of topics in human geography are widely read. Second, by promoting research by others in his own university department at Allahabad, he influenced the growth of the discipline. His great enthusiasm and balanced judgment served geography well at the university of Allahabad and G.B. Pant Institute. Thirdly, his greatest influence emanated from his services to the National Geographer and the Allahabad Geographical Society.

R.L. Dwivedi specialized in urban and political geography, while A.K. Chakravarti made significant contributions to agricultural geography. H.N. Misra has delineated urban systems in a regional context. B.K. Roy and P. Nag have made valuable contributions to population geography.

R.N.P Sinha, R.D Dikshit, G.S. Singh and B.S Sukhwal have contributed to the development of political geography recently electoral geography has attracted a few students.

P.Sen Gupta, V.R. Singh, B.B. Singh, Jasbir Singh, G.B. Singh, M, Quereshi, Majid Hussain, B.N. Sinha and M.R Chaudhary have made valuable contributions to agricultural geography and industrial geography.

In transport geography the contributions of Jagdish Singh, D.N. Singh and R.B. Singh have paved way for systematic studies of transport networks and their impact on economy and society. B.G Tamaskar, V.K. Srivastava and S. Banmali have made noteworthy contributions to marketing geography.

Social geography has claimed increasing attention of the Indian geographers, viz, A.K. Dutt, A. Ahmad, Anjana P. Desai and K.M. Kulkarni etc. have made explorations in social geography. M. Akthar and A.T.A Learmonth, A.K. Dutt, among others have made important contributions to medical geography.

Thus the brief resume of the contributions of Indian geographers in the development of various fields of geography reveals their strengths.

Progress Of Geography In Modern India:

Although the roots of Indian academic geography lie deep in antiquity, the discipline is now achieving maturity. Its development in modern time be viewed as contained within a series of sequential phases as (i) The Formative stage - Pre 1950s, (ii) The informative stage - The 1950s, (iii)The Confirmative stage- The 1960s and (iv) The Reformative Stage-Since 1971, Following lies a brief review of the progressive transformations in the spirit and purpose geography.

The Formative Stage: Pre-1950s - Modern geography was introduced as a British cultural import in Indian schools in the latter half of the 19th century. The outlines of a more professional and academic approach to the discipline date from the 1920s when it entered the portals of the Indian universities and was upgraded as a subject of study at the undergraduate level at Lahore in 1920, Aligarh in 1924 and at Patna in 1927. Beginning in the mid-1930s and extending up to the time of independence in 1947.

M. Shafi, R.L Singh, C.D. Deshpande, P. Dayal and George Kurian, each of these individuals, together with S.P. Chatterjee, R.N. Dubey and M.H. Rahman became closely identified with the university geography departments which evolved as the leading centres for the growth and development of the discipline.

However the pace of development was very slow in India 1947, hardly four universities (Aligarh, Calcutta, Allahabad and Varanasi) could manage to start post graduate teaching of geography and before the beginning of the 1950s only four more universities – Agra, Chandigarh, Madras and Patna could join their ranks.

The first generation of the Indian geographers was represented by those who were trained in other cognate disciplines but who opted for geography as their professional career and fought for its great cause. Among the professional geographers who made a mark during this formative period in the history of Indian geography, the names of H.L Chhibber, S.P. Chatterjee, R. N Dubey, M.B. Pithawalla, G. Kuriyan, K.S Ahmad, S.M. Ali, N.K. Bose and C.D Deshpande.

Although their wide ranging research interests covered the various fields of geography. They were mostly characterized by the descriptive ideographic style having bearing towards the gazetteer trap, heterogeneity and unevenness. The role of four geographical society as (i) the Indian Geographical Society, Madras, 1926; (ii) the Geographical Society of India, Calcutta, 1932; (iii) the Bombay Geographical Association, Bombay, 1935; and (iv) The National Geographical Society of India, Varanasi 1946 were founded and worked very vital in this period.

The Indian Geographical Journal (Madras), The Geographical Review of India (Calcutta), the Geographer (Aligarh) and the Bulletins of National Geographical Society of India were the main geographic organs. Yet, because of Inadequate physical and personnel resources, research output both in quantity and quality was very much limited.

Major contributions to Indian geography came from the workers in allied fields and organizations like the Geological Survey of India, the Indian Meteorological Department and the Survey of India.

The Informative Stage: The 1950s - The second phase (1950-60), of course an advanced form of the proceeding one, was a march towards using geography in national development. However, it followed to promote storing information mostly on the path shown under the torchlight of the British, especially Stamp and Spate. The growth and development of the Indian geography during its informative stage started with a promising note particularly with the initiation of the planning era when the role of geographers was increasingly recognized by the National Government and the Planning Commission for carrying out regional surveys preparing resource inventories and mapping. Several journals and serials also started in this period to serve the purpose.

The Sub branching of geography in both streams, physical and human took shape in the form of several publications R.L Singh's Banaras : An Urban Geography (1955) opened a new door to study city in India which later served as a base model for further studies. With the initiatives and guidance of S.P. Chatterjee, the National Atlas & thematic Organization (NATMO) was established in 1956. The year 1956 with four major events (i) International geography seminar (Aligarh), (ii) the foundation of the Indian Council of Geographers as a national forum and an associate body of the Indian Science Congress, (iii) the inauguration of the Indian Statistical Regional Survey (Geography Unit) and (iv) the establishment of the National Atlas Organization provided a great platform for the growth and development of geographical teaching and research which is well reflected in the expansion of colleges and postgraduate teaching at Universities and the increasing number of geographical publications.

By 1950 four other universities such as Agra, Punjab (Chandigarh) Madras and Patna began to offer postgraduate programmes. The next 30 years witnessed major expansion of geographic studies in India. Geographers who made major contributions to the development of the discipline during this period are S.P. Chatterjee, H.L. Chibber, M. Shafi, R.L. Singh, S.L. Kayastha etc. Geographic studies during this period reflected an awareness of the relationship between geography and other social and physical sciences.

Among the outstanding Indian geographic contributions of the 1950s, 3 deserve special mention, viz (i) O.H.K. Spate's India and Pakistan, (ii) the National Atlas of India by S.P. Chatterjee and (iii) R.L. Singh's Banaras: A Study of Urban geography. It has been the case earlier, most studies by geography still emphasized description much more than analysis. The early Germon and French influence was not long sustained and most Indian geographer up to 1960s received their advanced training in the United Kingdom. Although, the quality of teaching and research remained highly uneven with only a few strong geography departments at Aligarh, Allahabad, Banaras, Calcutta, Madras and Patna. Thus there was a perceptible re- orientation of the Indian geography in view of the end of the British colonial hegemony and new links with the

Commonwealth countries UK, Aistralia, and Canada in particular, the USA, the USSR, France and West Germany; and a new methodology introduced. After independence since 1950s, quite a few early geographers trained abroad, introduced similar courses in Indian universities. Thus informative stage accepted as a source for reformation in geography.

The Confirmative stage: The 1960s - In the history of Indian geography the 1960s may be termed as its confirmative stage. The epoch making event of the decade was the 21st International Geographical Congress held in New Delhi in 1968 under the presidentship of Prof. S.P. Chatterjee. It inspired the Indian geographic community which actively and vigorously engaged itself in research actively to conform to the international standards. As a result the number of research contributions rose. A few more geographical societies / associations came into being and started new journals of geography e.g.

i. Transactions of the Indian Geographers (Patna)
ii. Deccan Geographer (Secunderabad).
iii. Geographical Outlook (Ranchi)
iv. Indian Journal of Geography (Jodhpur)
v. Geographical Knowledge (Kanpur)
vi. Geographical Viewpoint (Agra) and the two Hindi journals known as
vii. Uttar Bharat Bhoogol Patrika (Gorakhpur)
viii. Bhoodarshan (Udaipur)

Besides, the Government of India set up a National committee for Geography. The UGC appointed a Review Committee for Geography and helped in organizing several Summer / Autumn Schools / Symposia in geography. During the 1960s the major pre-occupations of the Indian geographers were Economic geography, (agricultural geography and land use, industrial geography and geography of transport and trade); Human geography (urban geography, Rural settlements, population geography and political geography); Physical geography (geomorphology, hydrology and climatology, pedology and biogeography); Regionalisation and regional planning; Cartography; Geographical thought and methodology and Historical geography.

The phase 1960-70, marks the 'turning stage' towards the fashionable acceptance of quantitative and regional approaches with emphasis that information is the knowledge and its spatial pattern can provide the answer for any sort of explanation. Regional geography received the special attention – quite late in comparison to the western counterparts. On the occasion of International Geographical Congress at New Delhi in 1968, first time held in Asia under the editorship of R.L. Singh, the first regional work on India: "India: A Regional Geography" (1977) got released as the testimony to the devotion and integration of Indian geographers. To get geography established more widely to make geography attractive for social sciences and humanities and to make geography useful for others, the researchers took lead towards inter-

disciplinary frame and the result was also impressive and appreciable. This tendency has continued in the successive decades.

The Reformative Stage: Since 1971 (The maturing of Indian Geography) - Since 1970s the Indian geography has entered the reformative stage i.e. the stage of maturity. During the last five decades several national and international events and several summer / winter institutes in geography have advanced the cause of geography in a big way and have provided many opportunities to Indian colleagues. Three organizations viz National Geographic Society of India, Institute of Development Studies and National Book Trust in particular have made major contributions to Indian geographic literature.

The Phase, 1980-90, seen as the 'stage of speculation' marks the time of confidence among Indian geographers through proper selection of approaches, methodologies and terminologies although mostly from the British and American sources. By 1992 over 60 institutions of higher education offered courses in geography.

Among the contemporary Indian geographers, A.B. Mukherji and Moonis Raza have made significant contribution to the development of geographic education in India. Besides them, Rana P.B. Singh, Executive Editor (1985-1995) of the National Geographic journal of India is well known for his outstanding original works on social, cultural and pilgrimage geography of India.

Thus the reformative stage began by a challenge for the first time in the history of Indian geography in 1991 when the voices were raised that Indian geography must reach its own identity and roots. The phase 2000 onwards is the 'prospective stage in searching the roots and may be accepted as a technology mirage; of course this phase is in infancy.

Contemporary Trends And Fields Of Study:

In the post independence period, geography has expanded rather fast in the university education system. This is because of the efforts of and under the leadership of the geographers like George Kurian, S.P. Chatterjee, C.D. Deshpande, V.L.S Prakasha Rao, R.L. Singh, Mohammad Shafi, Muzaffar Ali, R.P. Misra and Manzoor Alam. These geographers have been academically active in the decades of 1950s to 1980s. As a consequence, geography got promoted as a popular discipline particularly in the universities of Delhi, Chennai, Kolkata, Varanasi, Aligarh , Chandigarh, Patna, Mysore, and Hyderabad. Three major institutions outside the subject but founded and led by geographers have boosted the reputation of geographers and geography in India. These are : (i) National Atlas & Thematic Mapping Organization, (NATMO, 1957, Prof. S.P. Chatterjee); (ii) Centre for the Study of Regional Development, JNU (1970s Prof. Moonis Raja); and (iii) The Institute of Development Studies, University of Mysore (R.P. Misra).A number of subfields are studied by the Indian geographers as Human Geography; Economic Geography, Physical Geography, Environmental Geography, Regional Geography, Regional Planning and Development; Cartography & Thematic Mapping and Historical geography and Geographical Thought. The studies particularly in environmental geography,

population, settlement systems, habitat ecology and applied geography have made a remarkable progress both quantitatively and qualitatively.

Here follows an acknowledgement of various themes of focus in geographical perspective of the contemporary fields of learning by Indian geographers.

Human Geography : The works in Human geography in India reflect in population, rural, urban, cultural, social, medical and political geography. The focus of studies in Population Geography is on the temporal and spatial trends of population, analysis of population distribution and density pattern, spatial dimensions of country's scheduled caste population and regional contrasts in its distribution, density and relative strength, geographical analysis of migration patterns, and examination of the validity of the demographic transition theory.

Rural Geography : A multi dimensional and multi disciplinary approach to the study of rural settlement geography in the country has led to explore the themes like the rural settlement system, rural environment etc. A genetic classification of settlements and their hierarchical order, analysis of inter village spacing, the spatial pattern of dispersion, spacing and localization of settlements, rural planning systems in terms of resources and infra -structural facilities and the spatial organization of central places / service centers in rural areas were the main thrust areas of rural geography.

Urban Geography : he Indian urban geography covers the works on the spatial analysis of urbanization, the process of urbanization , the level of urbanization correlated with socio-economic variables and work force participation rate, the role of small towns in the urbanization process, the phases of urbanization in historical perspective, the trends of urbanization, rural – urban continuum; the significance of suburbanization in its spatial, demographic functional and ecological dimensions the rank size relationships; the demographic and spatial relationships among cities. The urban structure; analysis of metropolitan systems, urbanization and planning as vehicles of modernization and development, the impact of industrilisation on urban growth, analytic study of town country relationship, market towns and their spatial development, role of small towns, use and misuse of urban land, economic base and commodity flows, the place of commercial structure in urban morphology, urban ecology and functional classification of urban centers were also the themes of urban geography in India.

Cultural Geography : A.B. Mukherji and Kashi Nath Singh laid the foundation for the study of cultural geography in India. Their work on the relationships between landscape settlement patterns and cultural features covers a wide spectrum from research on specific communities through studies that concentrate on particular social institutions and processes. Some other works can also be identified on the subject covering the themes like study of cultural landscapes, dispersal and resettlement of refugees in independent India , study of cultural patterns and

processes etc. an analytical account of accessibility and cultural stress in rural areas and the patterns of landscape religion and folk art.

Social Geography : Social geography has claimed an increasing attention of the Indian geographers. Their main themes are based for instance on the study of structural elements of Indian social organization, spatial organization of castes, religious composition of India's population and patterns of religious diversity, the social factors shaping the urban morphology, the socio economic profile of the slums a perceptive analysis of social patterns and social space in the Indian village, communal harmony and social space, spatial patterns of disease and hunger, the relationship between utilization of health care facilities and the elements of rural social structure, the state of urban poor and the impact of development programmes on the socio-economic conditions of the scheduled castes.

Medical geography : As far as the medical geography is concerned, Akthar, Learmonth and A. Ramesh have made substantive contributions to this branch in India. Their work is closely associated with the scientific upsurge of medical geography. Their research on the ecology of disease in India reveals interesting relationships with environmental and behavioral factors. Other works in the field explore the themes as the impact of colonization of malaria the diffusion and ecology of cholera, the spatial patterns of cancer; the food production efficiency, the spatial patterns of nutrition and nutritional deficiency indices, the study of food intake and deficiency diseases in rural areas, the growth and disparities in provisions of medical facilities and the spatial patterns of health care facilities in India.

Political Geography : R.N.P Sinha, R.D. Dikshit and Govind Saran Singh are best known for the development of political geography in India. The subject of studies have a focus on electoral geography, a perceptive analysis of voting behavior in the assembly election, spatial structure of administrative units and the development process, boundary problems, interstate tensions and boundary persistence, a geographical perspective on centre- state relations, the political - territorial changes in India since independence and their impact on development process, economic resource base and contemporary political patterns and socio political tensions in the north-eastern region.

Economic Geography : The study of economic geography is the analysis of spatial organization of economic activities which are directly or indirectly related to the physical or human resources of a country and its level of development. A comparison of the quality and variety of studies relating to economic geography of India reviewed in 'Progress of Geography' by S.P. Chatterjee. Though there are still descriptive accounts of the distribution of resources, industrial location, variation in land use pattern etc. and recent studies have tended toward increased application of quantitative techniques in regional economic analysis. Basic data, reports, maps and atlases

prepared by Census Organizations from 1961 onwards provide a bench mark in the analysis of spatial patterns. Studies relating to efficient use and integrated development of mineral and power, agricultural and human resources need top priority in studies of applied economic geography in India

Agricultural geography : Agricultural geography has been well received both quantitatively and qualitatively especially in the areas of study as – the trends and patterns of agricultural development, land use studies, agricultural origins and dispersals, the changing patterns of food grain production and sufficiency, the impact of Green Revolution, land use changes, arable potentials and land used development, land classification, ecological assessment of land capability, delineation of agricultural regions, spatial changes in agricultural wasteland, the patterns of agricultural colonization of wasteland, food productivity, agricultural efficiency, agricultural planning methods and techniques in delineation of agricultural typology, agricultural development, spatio temporal analysis of cropping patterns and crop associations, land use planning, agricultural change and competitive demands for agricultural land use and non agricultural land use. Jasbir Singh and N. Reddy are among the few Indian geographers to study agricultural geography.

Industrial Geography : Valuable contributions to the industrial geography of India have been made particularly in the fields of inter regional industrial structure, industrial location, location of industrial agglomeration, location dynamics of Indian manufacturing industries, industrial landscape, impact of electrification on industrial development; patterns of industrial location and environmental pollution, the impact of industrialization on rural habitat transformation, the structure of industrial employment, industrial planning and spatial analysis of industries and industrial planning in India.

Resource Geography : The research endeavors of Indian geographers in Resource Geography are focused on resource inventories, their appraisal, conservation, management and development on macro and micro levels. It is well reflected in the works of R.P. Misra and B. Thakur. NATMO has initiated a series of resource atlases featuring forest, water, agricultural and tourist areas of India. The remote sensing and GIS have provided new techniques for scientific and detailed appraisal of resources, their management and planning perspectives.

Transport Geography : Transport geography has not received due attention. H. Ramachandran has critically analysed complementarity of network efficiency and transport. Among others the works on correlation of road transport network structure with levels of urbanization; analysis on patterns of transportation links, regional analysis of road accessibility, spatiotemporal analysis of road transportation, structure of transport in the city region, metropolitan transport planning and planning of rural transportation.

Physical Geography : In physical geography perticularily Geomorphology has received increasing attention from the Indian geographers who have widened their range by studies such as in the evolution of landforms, fluvial geomorphology and applied geomorphology, polycyclic landscape and the surfaces of erosion, denudation chronology of the East and West Coasts of India, morphological classification of landforms, delineation of geomorphic sub regions, morphometric evolution of terrain types, the landscape evolution, fluvial geomorphology and morphometry, analysis of alluvial fans and explanation of the origin of landforms on a scientific basis are the basic theme of study.

A.B. Mukherji is a pioneer scholar in the study of landforms. K.R Dikshit and Savindra Singh have fully incorporated the post 1950 developments in landform studies with their swing to quantitative measurements and the application of statistical techniques. Savindra Singh and R.C Tiwari have opened up new fields of environmental geomorphology.

Climatology : Climatology has relatively lagged behind in research pursuits. However the available studies in this field are related to the themes as the climate conditions and water balance agro climatic studies in the development of Indian agriculture, areal extent of drought/flood during the south-west monsoon season, study of seasonality and regionalization in the agriculture, the patterns of radiation and evaporation distribution variations in the moisture regime of Indian arid zone, a perceptive analysis of temporal patterns of climatic fluctuations and forecasting of monsoon performance over India.

Environmental Geography, Ecology and Ecosystem Research : Geography like ecology is concerned with the distribution, organization and morphology of phenomena on the surface of the earth and has developed similar concepts and techniques to tackle similar problems. The development of ecology as a formal branch of study has led to the use of term 'human ecology' as a scientific substitute for human geography. Now Geographers began increasingly to use the ecosystem concept of their research. The ecosystem research in Indian geography is related to- (i) agro ecosystem (ii) river ecosystem (iii) Socio- technical system (iv) Settlements and (v) human populations. First glimpses of ecosystem research in Indian geography undoubtedly appeared in agricultural and land use studies. Environmental geography with a focus on ecology and ecosystem research has vigorously emerged as the new research area since 1970s. The Indian geographers have been addressing the issues of environment and development; environmental pollution, environmental degradation and hazards, environmental conservation, management and planning on different spatial scales, perceptive analysis of environment, development and quality of life, environmental problems and policies, environmental priorities and sustainable development, visualizing regional development as eco development, ecology of urban environment and environmental planning, morpho-ecological management, analysis of the contribution of science and technology for development of resources and human well being mapping of sustainable development and the environmental impact assessment since 1970.

Regional Geography, Regional Planning and Development : R.P Misra, V.L.S Prakasa Rao, L.S Bhatt and K.V.Sundaram have made important contribution to this field R.L. Singh's India: A Regional Geography' is a mile stone for the Indian geography. L.S. Bhatt has recognized three levels of planning in the national context, viz (i) the nation/macro level, (ii) the regional / meso-level and (iii) the local / micro level. The other works in this direction have dilated upon the economic development and rates of economic growth need for balanced regional development, problems pertaining to regional imbalances, identification of underdeveloped districts, provision of analytical framework and indicators of regional development.

Cartography and Thematic Mapping : Over the years and field of cartography and thematic mapping has made great strides in the country. The main players are certainly the Survey of India, the NATMO and the Indian National Cartographic Association, Indian Cartographer planning, Atlas of Andhra Pradesh (1976), Recourse Atlas of Tamil Nadu (1983), Planning Atlas of Utter Pradesh (1987) and Census Atlas of India (1981) are the hall marks of geographic contributions to cartography by Indian geographers. However the modern cartography in India exhibits the signs of integration of remote sensing and GIS as a support to mapping, decision making planning and monitoring.

Thematic maps are now playing important roles in development planning in India are being are increasingly utilized by administration, planning in India they are being increasingly utilized by administrators, planners technologists and specialists in different branches of social, physical, biological and earth sciences. While NATMO has been specially set up for the preparation of general thematic maps and several other agencies also prepare special purpose and scientific maps in India. These include such organizations as the Survey of India, the Map office of the Registrar General, National Remote Sensing Agency, Central Arid Zone Research Institute, Indian Meteorological Department, Geological Survey of India, Naval Hydrographic Office, Town and Country Planning Organization and Departments of geography in different Indian universities.

Historical Geography & Geographical Thought : The most significant contribution to historical geography is certainly Schewrzberg's Atlas of South Asia which portrays evaluation of Indian culture, society, economy and polity from the Stone Age to modern period. The geographical thought in the country is concerned the related contributions have been outlined in ICSSR. A Survey of Research in Geography. S.P. Chatterjee's "A Decade of Science in India: Progress of Geography (1963 -1972)", Recent Trends in Indian Geography by L.S Bhatt and P.P Karan's work supplements the efforts in this direction.

Role Of Major Universities In Modern India:

Now in the end of the unit we will discuss the role of different universities in the development of geography.

University of Delhi : Members of the faculty, Department of Geography, University of Delhi have collaborated with different international institutions, notably (a) on Shastri Applied Research Project (SHARP) on Role of Public, Private and Civil Sectors in Sustainable Environment Management in Collaboration with University of Manitoba and the University of Winnipeg, Winnipeg, Canada; (b) ICSSR –Indo-Dutch Programme on Alternative in Development (IDPAD) on Environmental implications and its Socio-Economic implications in Rural Urban Fringe with University of Groningen, the Netherlands; (c) CIDA-SICI partnership Project-II on Urban Development and Environmental impacts in Mountain Context, with University of Manitoba, Canada; (d) DFID Research Project on Enhancing food Chain integrity …. Pollution impact on Vegetable system in Peri-Urban Areas, Collaboration with imperial College, London, UK; and (e) a research project on Water in Delhi with the University of Koln, Germany.

Gauhati University : International Collaboration with (i) Centre for South East Asia studies, Kyoto University, Japan, and (ii) Graduate school of Asian and African studies, Kyoto University, Japan in the field of 'Agro Ecosystem and Sustainable Development in the Brahmaputra Valley Assam.

Jawaharlal Nehru University : The Centre for the Study of Regional Development has developed with the collaboration with (a) York University Toronto, Canada, on a CIDA-SICI Project on Development induced Displacement; (b) Institute of Social Sciences, Paris, Franch of Urbanisation and (c) Austria on Spatial information technology.

University of Madras : An adaptive ecosystem approach to Managing Urban Environments for Human Health (a) Study of Toronto Hamilton in Canada and Chennai in India), funded by the Social Sciences and Humanities Research Council of Canada. North Eastern Hill University.

Panjab University : The Department has an academic exchange with University of Pecs, Hungary spanning over two decades. The Department is also starting two new courses namely one year Diploma in Geoinformatics and a Two year Master degree course in Geographic information Systems and Science in Collaboration with Centre for Geoinformatics, University of Salzburg, Austria.

University of Pune : MOU signed between Department of Geography, University of Pune and Center for spatial information science, University of Tokyo, Japan in 2005.

Tripura University : Innovative research methods and technologies for the multispectral/multitemporal analysis of landslides in mountain regions, the prevention and awareness of related natural hazards and risks" with Prof. Marco Giardino of the University of Turino, Italy.

Other Major Departments of Geography : Aligarh Musilim University, Aligarh, University of Allahabad, Allahabad, Banaras Hindu University, Varanasi, University of Calcutta, Calcutta, Banglore university, Banglore are few other universities having major departments of geography doing their best in the development of geography in modern time.

15.4 CONCLUSION

Thus it concluded that in this unit you have learnt the role of Indian geographers to develop the various branches of geography and introduction of geography in different university besides it, the profile of progress under four stages as the formative stage, the informative stage, the confirmative stage and reformative stage; contemporary trends & fields of study as human geography and physical geography with various sub branches of geography. The dichotomies in major four fields such as systematic geography verses regional geography, functional geography verses formal geography, historical geography verses contemporary geography, and physical geography verses human geography.

15.5 SUMMARY

Thus it's summarized that although modern Indian geography has prepared its routes from Britain, France and the U.S.A. but the contribution of Indian Geographers tell us the hard work done by them in the form of research and establishment of department on under graduate and post graduate level in all over the country. Professor R.N. Dubey, R.L Singh, Professor Gayer, Professor George Kurian, S.P. Chatterjee, S.M. Ali and Tahir Rizvi, P. Dayal, P.B Singh Rana, R.P. Mishra, V.L. Prakasa Rao, L.S. Bhatt and V. Nath, Moonis Raza, P.Sen Gupta, V.R. Singh, B.B. Singh, Jasbir Singh, G.B. Singh, M, Quereshi, Majid Hussain, B.N. Sinha and M.R Chaudhary, L.R Singh, Dr. Savindra Singh are few of the great Indian geographers. Whereas Human geography, historical geography, rural geography, urban geography, cultural geography, Social geography, medical geography, political geography, economic geography, agricultural geography, industrial geography, resource geography, transport geography, physical geography, Climatology, Environmental geography, regional geography, cartography are the branches of geography contributed by the Indian Geographers. University of Delhi; Gauhati University;

J.N.U; University of Madras; Panjab University; University of Pune; Tripura University; Aligarh Musilim University, Aligarh; University of Allahabad, Allahabad; Banaras Hindu University, Varanasi; University of Calcutta etc. are the major universities of the country, where the departments of Geography are achieving the goals for success.

15.6 GLOSSARY

The Tarai Region : is a lowland region in northern India that lies south of the outer foothills of the Himalayas.

Anthropogeography : A branch of anthropology dealing with the geographical distribution of humankind and the relationship between human beings and their environment.

Diffusion models : Set of mathematical equations or formulas that attempts to estimate the spread of information or idea.

The Formative Stage : It is first stage of development in Indian geographical history

The Informative Stage : It is second stage of development in Indian geographical history

The Confirmative stage : It is third stage of development in Indian geographical history

The Reformative Stage : It is fourth and last stage of development in Indian geographical history

15.7 ANSWER TO CHECK YOUR PROGRESS

1. Which are the major countries from where the Geographers collect the trend and techniques for Indian geography?
2. What are the major dichotomies in Modern Indian Geography?
3. Give the name of geographers who contributed in Indian Geography.
4. How many stages of progress of geography in Indian Geography?
5. What are the contemporary trends & fields of study in Geography?
6. Give the name of major Indian universities working for the development of geography?

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15.10 TERMINAL QUESTION

1. What is Formative Stage?
2. What is Informative Stage?
3. What is Confirmative stage?
4. What is Reformative Stage?

UNIT 16 : INDIAN GEOGRAPHY: PROBLEMS, PERSPECTIVES AND PROSPECTS

16.1 OBJECTIVES

We will be able to learn in this unit:

- Problems in the path of development of Indian geography.
- Perspectives of Indian geography.
- Prospects of Indian geography.

16.2 INTRODUCTION

In the previous chapter we discuss, the development of geography in modern time and find out different stages of development with contributors, contribution role of different institution and universities. Now further we will analysis the problem in path of different branches of geography and problems facing by the Indian geography in different level. We also study the perspectives or contemporary trend, prospects or future of Indian geography.

16.3 INDIAN GEOGRAPHY: PROBLEMS

Geography in India is one of the rare examples of an established discipline in which little attention is paid to the student's training in disciplinary structure. Since around 1970 most university syllabus at the postgraduate level include a course on the history of geographical thought, essentially structured in the style of Dickinson's Makers of Modern Geography focused more on the makers than the things made. Besides this arrival of quantitative revolution, so that there is all round illiteracy in respect of the post 1970 developments in geographical theory. Indeed, at no stage in his training from the school to graduate level is the student ever taught the basic concepts and methodology of geography. The growing disparity in geographical research education and related resources personal quality, number and overall distribution. However, it is still a big challenge and acquires a greater attention, utmost care for the identity of Indian geography. The main highlights of the problems with which Indian geography is faced are over-subsistence on foreign concepts and methods, consequent impoverishment of indigenous methodological system.

Broadly, the following important areas of concern may be identified which appear to be significant from the overview of problem in Indian geography presented in detail in subsequent sections.

- Climatology, Soil Geography and Bio Geography
- Industrial Geography
- Historical Geography
- Social Geography
- Gender issues in Geography
- Political Geography
- Administrative Geography
- Physical Geography

CLIMATOLOGY, SOIL GEOGRAPHY AND BIO GEOGRAPHY

As these fields of geography thrive on links with disciplines like meteorology, soil science and life sciences and the range of non geographer's contributions to the study of climate, soil and bio resources is considerable compared to that of the geographers.

INDUSTRIAL GEOGRAPHY

In spite of tremendous potential in this field of research, particularly in the post liberalization phase, not much work appears to have been made. Very few papers have been published in this branch of geography in leading journals of India. As industry along with agriculture is the backbone of the nation's economy, the geographers neglect this field of inquiry.

HISTORICAL GEOGRAPHY

Historical geography has never been a priority area in Indian geography, though its importance can hardly be overemphasized. Most of the studies cited in the review do not come from geographers, nor can they strictly be considered as historical geographical researches.

SOCIAL GEOGRAPHY

Though this specialism is characterized by a more than desirable dose of eclecticism, the sub discipline has received adequate attention by a number of geographers during the period under review. The most important feature of the growth of the sub- discipline has been an accent on theory impinging more on epistemological issues at the cost of empirical research. More contributions have come in the form of chapters in edited volumes rather than articles in leading journals. This cannot be taken as a healthy development. The immediate cause for a shift in interest in socio-geographical research appears to be the post modern discourse that has caught the attention of Indian geographers following their western counterparts.

GENDER ISSUES IN GEOGRAPHY

Integrating gender issues into geographical research has been formidable exercise. In spite of serious efforts made by a few enthusiastic geographers in India, gender in geography has not achieved the heights it deserves. This is despite instances of inclusion gender studies in the syllabi offered by a few universities. Most works in the sub- field continue to be descriptive rather than analytical. The engagement of space with gender vice versa remains largely closed over by geographers. The larger research input into these themes has come not from geographers but sociologists or economists.

POLITICAL GEOGRAPHY

Political Geography in India has been a neglected field of inquiry in the past and continues to be marginalized even at present. This is in spite of tremendous potential of the sub discipline in contributing to varied political problems directly linked to geographical backgrounds and territorial identifications as well as external space relations. This field needs to shed its conventional mould and concentrate on issues of urgent national importance such as political implications of social and cultural pluralism and related issues of conflict as well as integration, problems of nation building, federalism and above all the political geography of under development.

ADMINISTRATIVE GEOGRAPHY

There has been world over a significant increase in the expression of concern for the neglect of policy relevant research in human geography. Only a few geographers in India have evinced interest in this vitally important area in which geographers should contribute significantly with their skills of understanding the natural and human in synthesis rather than in isolation.

PHYSICAL GEOGRAPHY

As a discipline focused on the study of the earth surface as the human habitat, geography must necessarily be concerned with both physical as well as man-made elements of the landscape, which together constitute our environment. Physical and human geography, therefore are equally essential components of the discipline. However, since the beginning of the 20th century, increasingly the problems with which geographers deal are those relating to men in society and less to those concerning the physical characteristics of the earth. So the importance of physical geography as a basic component of the discipline is neglected. It only means that the focus in research has shifted away from it. The fact remains that without a sound grounding in the knowledge about the earth environment, it is difficult for a geographer to justify fully his professional identity which is inescapably tied to the study of places and regions as well defined ecological entities, born out a series of relationships between a piece of land and a group of people who have transformed that physical entity into a human creation.

Besides it geography is today in danger of losing its identity as an environmental science and applied science. Thus we can say that the main highlights of the problems with which Indian geography is faced are over-subsistence on foreign concepts and methods, consequent impoverishment of indigenous methodological system and the growing disparity in geographical research, education in various branches and related resources, personal quality, conflicts in various field of study etc.

16.4 PROSPECTIVES AND PROSPECTS OF INDIAN GEOGRAPHY

PROSPECTIVES

It is clearly point out how the focus of Indian geography shifted from much criticized 'gazetteer approach' to relatively analytical works. So concepts and methods of study are continuous improved with the time.

Geography in India started with a strong physical bias. In fact, most of the geographers of last year's came from geology and physical streams. It was a reaction against deterministic approach as also in conformity with the shift in the discipline in England (most Indian geographers then were products of British Universities). But Indian geography moved from its physical bias and ultimately changed over to economic stream. Within the economic stream, emphasis came to be laid on British style urban geography. Thus Indian geography tried to become a pure social science.

The conceptual framework of the discipline has undergone changes during the last hundred years. A comparison of recent geographical research publications with those of the 1920s reveals a progressive change in the conceptual framework. During the 1920s and 1930s the discipline was concerned mainly with description of regions. Its objective was to provide factual information about areas to colonial administrators. British geographers promoted this imperialist paradigm designed to serve colonial interests. The scientific publications in Indian geography in those years revealed a reluctance to explore conceptual and hence epistemological premises and there was far too much reliance on descriptive methodology and relationship sometimes latent, sometimes unaware with deterministic approaches. All of these pointed to a scientific community in which the prevailing attitude was that of making geography rather than

thinking of geography. During the late 1930s and early 1940s, a small group of geographers such as R.N. Dubey, S.P, Chatterjee and M.H. Rahman whose basic concepts were deeply rooted within the possibilistic thinking generally began to opt for a more critical regional account involving explanatory description and classification. These regional studies followed a standard outline of topics, starting with surface features and climate, advancing to the organic life in relation to the physical feature and then proceeding of the human inhabitants looked at both as controlled by the environment and modifying the environment. India's independence in 1947 and the start of the process of decolonization were accompanied by dramatic changes in the role of geography. The focus of geographical studies shifted to national development. Under the leadership of S.P Chatterjee the National Atlas organization was established at Calcutta in 1950s to provide accurate maps and spatial data for development. The Indian national committee for geography set up by the Government of India organized many seminars and summer schools on a variety of topics in applied geography. Geography also began to play an important role in the work of the Census of India, the Planning Commission, Central Arid Zone Research in Jodhpur, Town and Country Planning in Delhi, Calcutta Metropolitan Project, All India Soil and Land Use Survey and the Regional Survey Unit of the Indian Statistical Institute. In these organizations geographers such as Nath, Sundaram, Misra and Roy contributed to the development of strategies for eliminating economic differences between regions, ecological disasters, energy issues, problems of urban living, land use, industrial decentralization, economic restructuring and many other issues related to development. All of these activities greatly increased the demand for spatial information and data.Chatterjiee approached the study of geography from the point of view of a natural scientist. His approach and methods were essentially of a physical scientist – field work, observation, mapping and the elucidation of the principals. He believed that for anyone who hoped to write scholarly works in geography, direct observation in the field was essential. Thus the scope of geography was continuous on progress.

During the early 1960s, the nomothetic approach began to reach India as a result of scholarly exchanges with geographers from the United States, Canada and the UK and the Indian geographers were attracted by the persuasiveness of nomothetic approach in geography. During the early 1970s, despite all the reluctance and obstacles, theoretical and quantitative geography made some progress. In Indian geography, alongside the traditional geography possibilist and descriptive in nature, there appeared a different way of 'doing' geographical, nomothetic, deductive and tending towards the theory of systems. With the introduction of quantitative techniques, the system of beliefs, methods, theories and language of geography also changed radically among the geographers who followed the new paradigm.

The Phase, 1980-90, seen as the 'stage of speculation', marks the time of confidence among Indian geographers through proper selection of approaches, methodologies and terminologies although mostly from the British and American sources. It is noted that 'a brief and largely ineffective infatuation with techniques of Marxist methodology occurred in the 1970 and 1980s. The increased circulation of ideas and concepts outside India and the participation of increasing number of Indian geographers in research conferences and symposia abroad facilitated emergency of pluralism in contemporary geographic research. In one of the surveys examining credibility and topic of concern comparison is made between 1950s and 2000s that indicated the shifting of orientation. Thus the methodological roots of contemporary geographic research in India may be traced to British, French and American geography. Links with British geography have continued through a number of Indo-British seminars and exchanges. Ties with American geography are growing stronger as many Indian geographers have visited or studied in

the US or Canada. India occupies a prominent place in world geography and geographic research and education in colleges and universities continues to increase rapidly. There has been a sharp upturn in during the past decade. Now Indian geography is moving towards progress with remarkable progress both quantitatively and qualitatively.

PROSPECTS

Indian geography claims a substantial segment of the national academic space. If one goes by the numerical strength of the geographical community in terms of students admitted to various geography programmes in different universities and colleges and strength of the faculty. Indian geography has certainly made impressive gains during the past eight decades. More geographers now attend summits, workshops, seminars, symposia and conferences in geography both at national and international level. Yet, Indian geography does not feature prominently in the international arena. This is despite attempts to include every possible change in the development of the subject into the geography curriculum. Geographers in India have been alive to every new tool and technique that has appeared on its door step.

Teaching and research in geography is channelized through a large number of geography departments spread all over the country. The period under review has witnessed establishment of many new departments of geography particularly in the North Eastern region in India. The inherent dichotomy in nature of geography continues to affect its position in the highly structured university system that treats the ways of looking at man's relationship with the environment. Thus as part of the social science fraternity, geographers are concerned to discover not only the world in which we are living but also to discover as geographers how we inhabit, reproduce and change that world.

Thus Indian geography is today at an important turning point. The foundation laid down after independence by geographers who are now in retirement is being challenged by newly developed or introduced methodologies or research techniques, such as remote sensing quantitative analysis and GIS. At the same time the Indian geographers are just now beginning to look beyond their own regional boundaries, indeed even to the rest of the world for research subjects.

Geography: focus of inquiry

In 1950s as it was	In 2000 as it is
Areal differentiation	Areal integration
Balanced regional development	Sustainability
City	City system
Climate types	Climate change
Dividing land	Sharing water
External threat	internal security
Food productivity	Food security
Industrial estates	Industrial parks
Nation state	Globalization & localization
Political boundaries	Political landscape
Population explosion	Population displosion
Rule of Majority	Role of minorities
Self sufficiency	Interdependence

The four stages of its growth sketched reveal that geography has moved away from the initial gazetteer map to a more descriptive/ analytical framework which is still in its making. There are still many gaps to be filled in the need of the hour is to develop a methodological system of Indian geography which has its distinctive traits as an intellectual and scientific discipline that can provide a meaningful synthesis of our cultural heritage and physio-technological progress, our habits and habitats as well as our opportunities and challenges and that can be more substantive, productive and satisfying. Modern Indian geography has to reach the status of life and living.

It is possible to make an advance in two directions make the already existing subfields strongly problem oriented and research for gaps that need to be filled up. In the first case, it is necessary to correct the present imbalance subfield wise in favor of physical side and we may revive our faith by nothing the contemporary studies in the USSR and Germany instead of mainly trailing the bandwagon of chrystallanized practitioners. In the second category, there appear to be many gaps that need our attention. On the physical side there is hardly much that has been done by geographers in the sub fields of ecological and environment studies as well as studies in resources and their conservation. So in the case of medical geography which spans over both the physical and human aspects. There is still a world to conquer in human geography. Identification of traditional cultural regions, social cores and the pattern of religious of languages including regional dialects are some of the themes which hold an exciting prospect. Of a great significance and urgency is the study of behavioral pattern of social and economic group in space. The interface between the physical and human is both challenging and rewarding, if we identify, through our geographical perspective, traditional regions and measure a deep impact that the forces of modern urbanization and industrialization are making on them.

The next most important step in the reconstruction of the discipline pertains to the logical restructuring of syllabi at all levels but most particularly at the Bachelor's and Master's level incorporating the latest thinking on the spirit and purpose of geography.

Concern with environment has now become so specialized, following the threat to global ecological balance in the face of overexploitation of resources beyond the natural capacity of such resources to renew themselves.

Serious attention to the student's training in theory and methodology of geography should therefore be our first priority. Another essential aspect of training of the geographer as a professing relates to toning up of his consciousness about geography as an environmental discipline focused on the study of and in society. Other specialists in the social sciences identify the geographer as some kind of man- environment specialist one with adequate appreciation of environment related problems of the day. A comprehensive course on environment appreciation prepared and imparted in collaboration with specialists in the relevant disciplines, need therefore to be urgently introduced. A third compulsory component of the postgraduate syllabi is focus on cartography, map interpretation theory and practice of social survey and field work. All these responsibilities are fully followed by the geography departments in all over the country under the guidance of UGC.

16.5 CONCLUSION

In sum, we might say that we try to identify the problems in real life first and then apply suitable methodology and techniques. It would be possible then to make a viable contribution to the solution of our social and economic problem and also to the approaches of theory building in

geography as a science. As biophysical and the social processes are integrated in an ecosystem, there is an interactive linkage and connection between human impacts on the environment and its impact on human. Geographers are better placed to understand such location specific and specific interaction.

16.6 SUMMARY

In India, environmental impact assessment is emerging as a major tool for ensuring environmental quality as an essential component of decision-making processes of any development program. Thus central objective in the study of geography should be identifying first then view to developing the ability to appreciate the problems, prospective and prospects. You have understood now, it is still a big challenge and acquires a greater attention, utmost care for the identify of Indian geography. The basic need is to make our own philosophical roots stronger.

16.7 GLOSSARY

Climatology	-	The scientific study of climate
Industrial	-	Relating to characterized by industry
Historical	-	Connected with studying or representing things from the past
Social	-	Relating to society
Gender issues	-	Any concern determined by gender based
Political	-	Relating to the government or public affairs of a country

16.8 ANSWER TO CHECK YOUR PROGRESS

1. What are different broad fields of problems in Indian geography?
2. How do you know that the prospective of Indian geography change with the time?
3. What tools are used by Indian geographers in present time to study?

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16.11 TERMINAL QUESTIONS

1. Write in detail the problems faced by Indian geography in modern time.
2. There are great possibilities for the development in Indian geography, discuss.