

Paradigmatic Shifts in Geographical Thought

Dr. Lalita Rana

¹*Associate Professor, Department of Geography,
Shivaji College, Ring Road, Raja Garden, New Delhi-110027.*

Date of Submission: 06-05-2020

Date of Acceptance: 19-05-2020

I. INTRODUCTION

In advancing disciplines, the methodological debate is a sign of health. The methodology of geography came under debate for the first time during the middle of twentieth century when F. K. Schaefer, an American scholar, published his paper entitled "Exceptionalism in Geography: A Methodological Examination". Publication of the paper brought a revolution. Shortly after this was discussed the paradigmatic shifts in a discipline by Thomas S. Kuhn, another American scholar, through his seminal work 'The Structure of Scientific Revolutions' (1962). His account of the development held that science enjoys periods of stable growth punctuated by revisionary revolutions. Kuhn called the core concepts of an ascendant revolution its 'paradigms' and the term became very popular. Since 1960s, the concept of Paradigm Shift is being used in numerous scientific contexts. In order to elucidate this process of development of science, Kuhn prepared a model - the 'Paradigm of Science' (Fig.1). Seeking inspiration from the works of both of these scholars, the present paper examines the evolution of geographical thought from the perspective of Kuhn's classic work. The model as proposed by Kuhn, aids in understanding the journey of geographic development. The historical facts of this development are well known and there is no dearth of literature in this regard. However, the methodological literature, to appreciate the philosophical background making possible this disciplinary growth, is too small. The purpose here is to explore and screen the development of Geography under sequential methodological changes in consonance with Kuhn's model. Accordingly, the work identifies eight paradigmatic shifts intercepted by eight phases of crises in the discipline. The term 'paradigm' is used here, simply, to mean an idea, concept, model or technique that is capable of generating scholarly concern for a particular period of time.

Evolution of Geographical Thought

From the past, the knowledge of geographical nature has infiltrated in the form of various fields of learning, philosophies, terminologies, concepts and techniques, as bequeathed from disparate Schools of Thought, namely, European (Greek & Roman), Indian, Chinese and Arab in Pre-Modern period; and German, French, American and British in Modern period. They refined its methodology from time to time. However, the history of development of geographical thought has not been an affair of continuous and smooth progress. Scholarly observations of the Eastern and Western civilizations had begun in Pre-historic times, approximately about 800 B.C. and earlier, in the regions often referred to as "the cradle of civilizations", viz. Mesopotamian, Chinese, Indus and Nile Valleys. These civilizations were first to explore the spaces within and outside their homelands. During ancient period (800 B.C.--500A.D.), there was greater and greater concentration of scholarly research in Europe and Asia. This was particularly under the influence of the ancient Greco-Roman, Indian and Chinese civilizations. A very long period of development in the history of geographical thought is identified with the Medieval Age commencing from the fall of Roman Empire (500 A.D.) to the beginning of Industrial Revolution (1750s). The middle age began with the onset of Dark Age in Europe (500-1100 A.D.), followed by the rise of Arab School of Thought (800-1400 A.D.) and Age of Discovery (1400-1650 A.D.). The Early Medieval phase is termed as the Dark Age in Europe, as it was a time of intellectual stagnation. When the medieval Europe had plunged into darkness, the Arab school rose to mark the end of this recession and return to more scholarly research. The voluminous work of Islamic writers was largely responsible for this. The Age of Exploration began in Europe as a renaissance in the late Medieval period and the geographic horizons were again pushed back. Enormous information of geographical nature was gathered as a result of numerous journeys and explorations commissioned by European nations. These voyages opened up new horizons and stimulated geographic writings, laying more solid theoretical foundations for the discipline. By Eighteenth century, geography came to be recognized more and more as a discrete discipline. With the rise of the German School, geography entered the Modern period of its development (1800-1950s), followed by a number of other Modern Schools of Thought, namely, French, American and British. The continued research became an essential feature

of the discipline thereafter under the influence of these distinct schools of thought. Long phase of dualistic tendencies also characterized the discipline simultaneously. However, most of the existing controversies in geography got resolved by mid-20th century, particularly after the publication of the Paper by F.K. Schaefer. With this geography is said to have entered its Contemporary (Post-Modern) Phase of development. From mid-Twentieth century onwards, the geographic research experienced a new shift in methodology, and the discipline also turned more and more anthropocentric. Within this entire phase, in fact, two major revolutions appeared to have changed the entire course of geographic development, viz. the Industrial Revolution in 1750s and the Methodological Revolution in 1950s. Accordingly, the phases of geographic development, now, may be identified as Modern, pre-Modern and post-Modern. Pre-modernism (up to 1750s), Modernism (1750-1950s), and Postmodernism (1950s onwards) may be considered as distinct philosophical systems, looking at the world in three very different ways; each of these being defined by the dominant philosophical and methodological system of the time. However, the present geographical thought is an amalgamation of the Western and Eastern philosophies since beginning.

The developments during the Ancient and Medieval phase characterize the Pre-modern period. The Ancient schools of thought represented the Greek, Roman, Indian and Chinese traditions, whereas the Arabian civilization generated the medieval tradition. Throughout Pre-modern (Ancient & Medieval) Phase of its development, geography was considered as a descriptive field of study. In general, the religion was the primary source of knowledge. The shift in power moved away from the religion during Modern period, and the politics (governments, kings etc.) and universities (scholars, professors) took over as the primary sources of authority. Two new approaches to knowing became dominant in this period, viz. 'empiricism' and 'logic'. Geography gained a new and more meaningful definition with every change. With the development of the natural sciences in the 18th and 19th centuries it became apparent that mere description would not do; it required to be followed by explanation. Since, in geography the major pattern producing variables are spatial, it came to be conceived as the science concerned with the formulation by the laws governing the spatial distribution of features on the surface of earth. Following the Greek geographers, this viewpoint is called 'chorological'. This chorological viewpoint presented geography with a problem of great methodological controversy for a long time. However, the chorological view in geography was challenged by F.K. Schaefer in mid Twentieth century through his powerful paper, bringing in the turning point in the history of geographical development. Postmodernism brought with it a questioning of the previous approaches to knowing and sought to deconstruct previous authority sources and power. Instead of relying on one approach to knowing, it advocated for multiple ways of knowing, along with the pre-modern ways (revelation) and modern ways (science & reason). Contemporary geography is an all-encompassing discipline that seeks to understand the world and all of its human and natural complexities. The perspective towards Earth studies has also changed from terrestrial to digital during post-modern period. This has been accompanied by a number of methodological changes in the discipline. The trend is now for all fields of study to come together around specific human problems. Since the basic nature of geography has been shaped by different schools of thought emerging one after the other from ancient to modern times, providing the discipline with its standard literature, the period up to Second World War is identified as the Classical Phase of development, and the one thereafter as Contemporary Phase. The general nature of geographic developments has been more 'philosophical' during its Classical (Pre-modern & Modern) Phase and more 'explanatory' in the Contemporary (Post-Modern) Phase. The Post-modern period reflects more methodological concerns than conceptual.

Paradigmatic Shifts

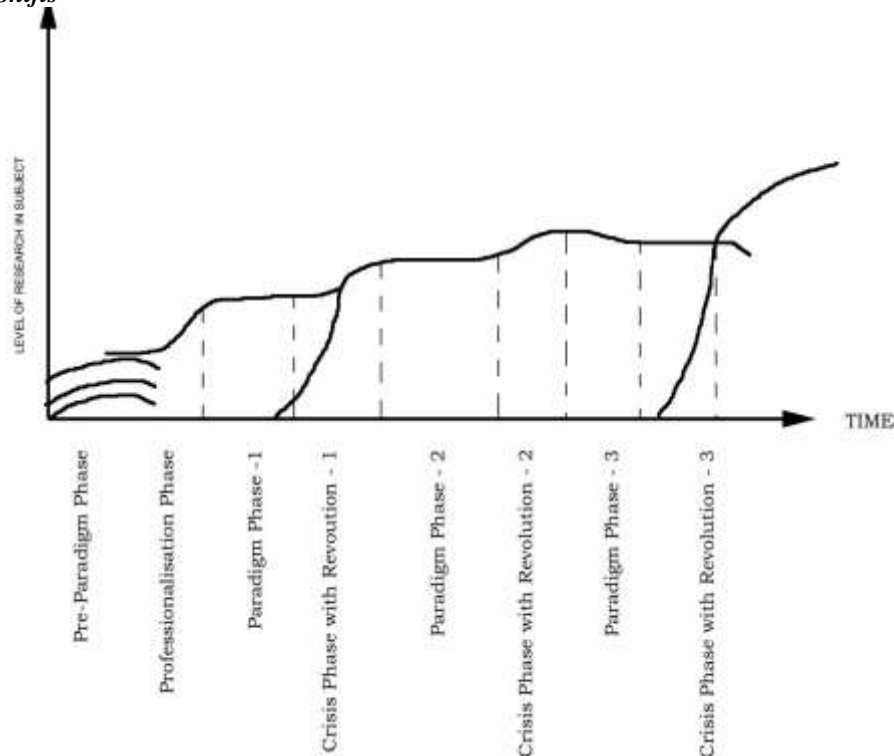
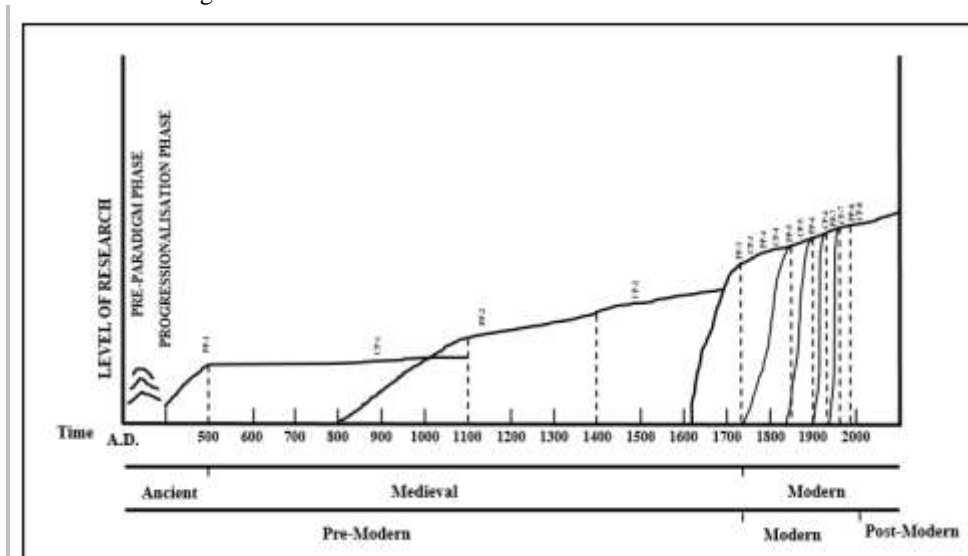


Figure -1: Paradigm of Science

Kuhn's Model (Fig.-1) is a simple cycle of progress explaining the disciplinary growth within a framework of conceptual matrices, called paradigms that focus the philosophical perspectives and methodologies in vogue. According to Kuhn, science is not a well-regulated activity. It is a process of varying tension in which peaceful periods of steady accretion of knowledge are separated by crises which can lead to breaks in continuity within discipline. Kuhn's paradigm gives a scientific explanation of the growth phases of scientific knowledge. Distinct parallels may be sought between Kuhn's presentation and the historical evolution of the discipline of geography. Kuhn used the term 'paradigm' in two different meanings. In the first one, 'paradigm' designates what the members of a certain scientific community have in common, that is to say, the whole of techniques and values shared by the members of the community. In the second sense, the paradigm is a single element of a whole, acting as a common model or an example; i.e. the paradigm is in this sense just an example, a single phenomenon, a singularity, which can be repeated and thus acquires the capability of tacitly modeling the behavior and the practice of scientists. This Model (Fig.1.) exhibits a steady progression of the accumulation of new ideas. Accordingly, the science advances by occasional revolutionary explosions of new knowledge. Each revolution is triggered by introduction of new ways of thought large enough to be called new paradigms. From Kuhn's work came the popular use of terms like "Paradigm," "Paradigm Shift," etc. Paradigm Shift is a change from one way of thinking to another, a revolution, a transformation, a sort of metamorphosis. Paradigm sets the framework within which a science proceeds; it tells researchers what they should be looking for and which methods they should use in this connection. In its established usage, a paradigm is an accepted model or pattern. Three main paradigm types have been identified, viz. the metaphysical, sociological and the artifact or construct paradigms. The meta-paradigm represents a total global view of science; the sociological paradigm is based on universally recognized scientific achievements; and the artifact, which is central to Kuhn's formulation, is textbook, an instrument, or classic work. A viewpoint becomes a paradigm if it has a large following and if it has a clearly defined theoretical and methodological base. Eventually, however, there may generate insoluble theoretical problems or experimental anomalies that expose a paradigm's inadequacies. This accumulation of difficulties triggers a crisis that arises when confidence is lost in the ability of the paradigm to solve 'anomalies'. A scientific revolution occurs when scientists encounter such anomalies that cannot be explained by universally accepted paradigm within which scientific progress has thereto been made. Since no paradigm ever solves all the problems it defines and since no two paradigms leave all the same two problems unsolved, paradigm debate is obvious. Within the new paradigm, old terms, concepts, and experiments fall into new relationships with the other. According to Kuhn, the evolution of a scientific discipline progresses through a series of phases; precisely consisting of: 'Pre-Paradigm Phase', 'Professionalization Phase', 'Paradigm Phase-1', 'Crisis Phase with Revolution', 'Paradigm Phase-2', 'Crisis Phase with Revolution-2', 'Paradigm

Phase -3', and so on (Figure-1). This sequence of crisis, revolution and paradigm continues throughout the history of science and helps in its advancement.

The first phase of scientific development in a discipline is the Pre-Paradigm period. It is a state of science at its infancy, the phase of 'immature science', lacking consensus. Since the phase is marked by conflicts between several distinct schools which grow around individual scientists, it may be labeled a multi-paradigmatic, as each school of thought develops its own model solutions, with none of these being more 'scientific' than the other. Within the multiplicity of competing schools, there exists a low level of specialization in the discipline. From the Pre-Paradigm phase, the scientific development marches into the Professionalization Phase. It takes place when new researches are undertaken and the discipline makes progress. The phase represents the stage of scientific maturing of the subject. The third phase (Paradigm Phase-1) is characterized by a dominating school of thought, which has, often in quite a short space of time, displaced others. The established paradigm leads to concentrated research within a clearly distinguishable problem area—an activity described as 'Normal Science'. A mature science, according to Kuhn, experiences alternative phases of Normal Science and Revolutions (Crisis). The period of conceptual (paradigmatic) continuity in a discipline is the phase of Normal Science. As long as there is consensus within the discipline, normal science continues. Normal Science means research firmly based upon one or more scientific achievements; achievements that some particular scientific community acknowledges for a time as supplying the foundation for its further practice. This suggests some accepted examples of actual science practice which may include law, theory, application, and instrumentation together providing models from which spring particular coherent tradition of scientific research. These are traditions which historian describes under such titles as, e.g., 'Ptolemaic Astronomy' or 'Aristotelian Dynamics' and so on. However, this period of normal science is sooner or later replaced by a crisis phase. The crisis phase is characterized by a reassessment of former observational data, new theoretical thinking and free speculation. This involves basic philosophical debates and a thoroughgoing discussion of methodological questions. The crisis phase ends when a new paradigm attracts a growing number of researchers away from the old one. When the transition is complete, the profession will have changed its view of the field, its methods and goals. The termination point of the crisis phase, owing to the acceptance of a new paradigm, becomes the inaugural point of the next revolutionary phase. Each such Revolution produces a consequent shift in the problem available for scientific scrutiny. The most obvious examples of scientific revolutions are those famous episodes in scientific development that have been the major turning points in the scientific development, as those associated with the name of Copernicus, Newton, Lavoisier and Einstein. The resulting transition to a new paradigm is Scientific Revolution. The revolution closes with a total victory for one or two opposing camps. After a given discipline has changed from one paradigm to another, this is called a Paradigm Shift. Overthrow of Ptolemaic cosmology by Copernican heliocentrism; the displacement of Newtonian mechanics by quantum physics and general relativity; and the acceptance of Plate Tectonics as the explanation for large scale geologic changes, for instance, are all examples of major paradigm shifts. Eventually the old paradigm is sufficiently replaced and the cycle then begins all over again, because our knowledge about the world is never complete. And in the Post-Revolution period, the new paradigm's dominance is established. In the light of Kuhn's Model various stages in succession identified during the whole course of geographic development are shown in Figure-2.



PP-Paradigm Phase; CP-Crisis Phase

Figure-2: The Paradigmatic Shifts in Geographic Development

As evident, Geography, during its Pre-modern period of development, passed through two paradigmatic and two crisis phases. It experienced other three paradigmatic shifts intervened by two crisis phases during Modern period of. More recently, the discipline has encountered four critical phases intervened by three paradigmatic shifts, and it is still undergoing a methodological revolution. Table-1 attempts to systematize this development.

Table-1: Methodological Development in Geography

Pre-Modern

- Scholarly observations of the Western & Eastern Civilizations (Pre-Paradigm Phase)
- Ancient Schools of Thought (Professionalization)
- Graeco-Roman School (Paradigm Phase I)
- Dark Age in Europe (Crisis Phase I)
- Medieval Thought & Rise of Arab School (Paradigm Phase II)
- Renaissance & Age of Discovery (Crisis Phase II)

Modern

- Dominance of German School (Paradigm Phase III)
- Darwinism & Dualistic Tendencies (Crisis Phase III)
- Rise of Determinism (Paradigm Phase IV)
- Paradigmatic Shift to Human Studies (Crisis Phase IV)
- Videlian Tradition and chorological View (Paradigm Phase V)

Post-Modern

- Schaefer-Hartshorne Debate (Crisis Phase V)
 - The Nomothetic Turn (Paradigm Phase VI)
 - Quantitative Revolution (Crisis Phase VI)
 - Emergence of Spatial Science School (Paradigm Phase VII)
 - Critical Revolution (Crisis Phase VII)
 - Anthropocentric Twist (Paradigm Phase VIII)
 - Digital Revolution (Crisis Phase VIII)
-

Pre-Modern Tradition

The Ancient and Medieval developments characterize the Pre-modern period. The Ancient schools of thought represented the Western, Indian and Chinese traditions, whereas the Arabian civilization generated the medieval tradition. The Pre-paradigmatic and Professionalization Stages followed by two major paradigmatic shifts and two crisis phases were witnessed during this long period of development. The two major paradigmatic shifts were related to the emergence of Greco-Roman School in ancient times and Arab School in medieval times. They were succeeded by two Crises phases, viz. Dark Age and Age of Discovery, respectively towards the beginning and the end of the Medieval period. Throughout its Pre-modern Phase, geography was considered as a descriptive field of study, religion being the primary source of knowledge. The pre-modern philosophy largely revolved around the questions pertaining to the the Universe and its understanding. The reasoning and argumentation were established as the crucial philosophical methods.

The scholarly observations of the Western and Eastern civilizations during ancient period mark the Pre-Paradigm Phase. Towards West the earliest developments took place in western Asia, Egypt and Europe. The ancient Eastern philosophy, on the other hand, represents the broad traditions that were popular in India and China. All of these had a common underlying theme of religion. The Greco-Roman people had a deep sharing of culture, knowledge, science and technology with many of the preceding civilizations that emerged successively in Mesopotamian region. These people made large advances in the techniques of agriculture and science. The origins of philosophy and reasoning, in fact, are traced back to the early Mesopotamian wisdom. An extremely large body of texts has survived on cuneiform tablets here. The main feature of Greek thought represents the mathematical and astronomical knowledge of the Mesopotamians. The pre-Greek civilizations bequeathed Greeks, particularly, the sexagesimal system of numerals, the earliest known form of writing (cuneiform) and a system of alphabet, besides a number of valuable mathematical and astronomical contributions. Ancient philosophy of the Western world is usually divided into four periods, viz. that of Naturalism, Metaphysical,

Ethical and Religious in order. Its main subjects were related to understanding the fundamental causes and principles of the universe; and questions about things that cannot be perceived by the senses, such as numbers, elements, universals, and gods;. In general, the primary epistemology of the pre-modern period was based upon direct revelation, generally assumed to come from God.

The Professionalization in the discipline had started becoming evident in the attempts of the European, Indian and Chinese scholars during ancient period itself. In spite of physical isolation, fascinating parallels were exhibited in the concepts and methods of their study. Precisely, the several fields of learning that led Geography to emerge as a discipline of scholarship, are related to the study of, for instance, Philosophy, Universe, Astronomy, Astrology, Earth, Mathematical Sciences, History, Cartography, Humanistic Aspects, Sciences, Technology and Travels & Explorations. The Universe and its origin remained a point of speculation among all and the ancient scholars dealt with many problems pertaining to Cosmology, Cosmogony and Cosmography. In consonance with each other, they advocated several theories about the origin of Universe and created a traditionally harmonious view of it, without reference to extra-natural causes. These theories lead to many technological advances in astronomy. The first references to Astronomy in ancient world are interwoven with Astrology. Using simple instruments as the gnomon, scaphion, etc., everlasting contributions to astronomy were made in synthesis with Babylonian thought. The term 'Bhugol' as used for Geography by the ancient Indians clearly endorsed the earth being a sphere. Besides, the ancient scholars also acknowledged several related phenomena as that of eclipses, the force of gravitation and the orbits of the planets as ellipses. However, the Ptolemaic explanation of the motions of the planets, i.e. Geocentric View, remained the accepted wisdom until the Polish scholar Copernicus proposed a Heliocentric View in 1543. The Earth Studies of earlier scholars, particularly of Indians, were very elaborate and dealt with its origin, cardinal points, meteorology, geomorphology, seismology and physical divisions. These scholars were aware of it being solidified from gaseous matter, it apparently floating on water like a sailing boat on the river; and there being more land surface in the Northern Hemisphere. Using the concept of imaginary lines they attempted to draw Prime Meridian and divide the Earth into different global realms. The Puranic literature formulated the idea of ten directions, designated by the ruling deities dominating in each of these directions. The ancient Indian scholars were aware of the vacuum between the earth and the heaven as 'Antariksha', its vast extent and the occurrence of various weather phenomena here. As far as the knowledge about the seasons is concerned, six seasons have been identified, viz. Spring, Summer, Rainy, Autumn, Winter and Severe Winter. The ancient Chinese are known to have prepared a number of weather reports on the basis of empirically based facts. Contributing to Seismological studies, the ancient Greeks, Indian and Chinese all provided the rational explanations alike and discounted all the related superstitions. In spite of having limited knowledge, the attempts were made to divide the known world into several regions based on natural vegetation here. The group of Mathematical Sciences was among one of the important fields of ancient scholarship. The Greeks thought that numbers are divine and believed that everything was related to mathematics. Indian mathematics, rooted in Vedic literature, made early contributions to the study of arithmetic, Calculus, algorithm, decimal number system and the concept of zero. Excavations at various sites of the Indus Valley have uncovered evidence of the use of "practical mathematics", i.e. a standardized system of ruler and weights; thereby demonstrating knowledge of basic geometry. The representation of numbers in a 'positional system' is another contribution of ancient Indians. Many of these concepts were transmitted to the Islamic world and eventually to Europe. As far as Cartography is concerned, the contribution of Greeks, particularly Ptolemy, is unparalleled. He designed a graticule and plotted the world using the concept of conical projection. On the Chinese realm, the similar attempts were made using mathematically graduated scale to a map. The Human Aspect was intelligently dealt in various Historical, Regional, Anthropological, Psychological and Linguistic studies by the scholars of antiquity. The issues related to man-nature relationships, resources and population were important in their works. As the pioneers in the field of history, the Greeks and Chinese were not only concerned with the history of human civilization, but also included discussion of various geographical factors. The Chinese also initiated new writing styles by presenting history in the form of biographies and gazetteers. The core text for linguistics in ancient times has been discovered in Pāṇini's grammar, considered as the world's first formal system, subsequently leading to the development of mathematical logic. The Sciences like physics, chemistry, botany, biology, Pharmacology, Medicine etc. are rooted in the works of ancient Greeks and Indians. Laying the foundation of physics the Greek and Indian scholars asserted that the matter is created by four 'elements': earth, air, fire and water, mixed in different combinations and proportions. The four elements correspond, at macroscopic level, with the traditional quadripartite division of the cosmos into earth, sea, air, and the fiery aether of the heavenly bodies. Exhibiting a more extensive knowledge in this regard, the ancient Indians not only classified the material world into four elements but, also added a fifth element viz. ether or the upper region of space. These five elements were identified with various human senses of perception; earth with smell, air with feeling, fire with vision, water with taste and ether with sound. These philosophers also believed that these elements were physically palpable and hence comprised miniscule particles of matter, the last miniscule particle of matter being termed as the

Atom (*Parmanu*). The life sciences of biology and botany were reflected in the works of Greeks; the most successful scientific writings in this field being those of Aristotle and Theophrastus. Aristotle's ideas led to the development of a rational theory of evolution, as put forward by Darwin 2200 years later. On the other hand, the writings of Theophrastus, regarded as the founder of botany, covered most aspects of botany, as descriptions of plants, classification, plant distribution, propagation, germination and cultivation. For pharmacology, the ancient Chinese scholars held great concern. As far as Medicine is concerned, the *Charaka Samhita* of Acharya Charak is among the earliest surviving medical manuals. It represented a major advance over the superstitious ways of treating medical problems. The ancient civilizations had also acquired proficiency in various technological fields as Metallurgy, Aviation, Civil engineering and Architecture. Particularly, the Ancient Chinese are known for their many inventions and technological advancements. Pinhole Camera, Water clock, armillary sphere, Seismograph, Clock Tower, Magnetic needle compass, Movable type printing, Odometer and South Pointing Chariot were among several such inventions. The Indians excelled in the area of Metallurgy. Besides, the discovery of urban settlements of Mohenjodaro and Harappa indicate existence of a highly precise science of civil engineering and architecture here. The Travels and Explorations fascinated the Europeans and Chinese alike. The travelers like Hanno the Navigator, Pytheas, Alexander the Great, Chang Chien, Huan Tsang, Chou Ta Kuan and Cheng Ho explored much of what was then the civilized world. These journeys had also promoted a great variety of economic and cultural exchanges among regions, and opened regular trade routes between the West and the East. Thus, with the efforts of the European, Indian and Chinese scholars, geography witnessed a great degree of professionalization, With time, however, the West became the centre of continuously increasing scholarly research.

Displacing others in a short time, the Greco-Roman School attained dominance representing Paradigm Phase-1. This phase saw the emergence of various fields of learning ranging from physical, human, historical, theoretical, political, regional, mathematical and practical - covering almost the entire gamut of geographical knowledge. The ancient Greeks were the originators of literary and mathematical traditions in geography. The knowledge of existing world of the times was related to Europe, Asia and parts of northern Africa. Where the conquests of Alexander the Great made Greeks familiar with the geography of Persian Empire, Central Asia, Afghanistan, India and coastal parts of Iran towards East, the voyages of Pytheas extended geographic horizons northwest covering parts of Western and Northern Europe. Contributing to regional studies, Strabo, the Roman scholar, tried to establish the relationship of man with what he called the natural attributes of a 'place', considering it in its astronomical (abstract) location and terrestrial (on land) perspective in his voluminous book, 'Geographie'. As the originators of mathematical tradition, the Greeks were first to develop the sound principles of mathematics and apply various geometrical concepts to practical geography. They are also credited for the introduction of Gnomon, one of the first scientific instruments ever made, making possible a variety of observations regarding noontime, duration of sunshine, time of solstices and equinoxes, the time of sunrise and sunset and so on. However, among all the scholars Ptolemy was the most influential. His attempts not only helped to prepare the first complete map of the known world, but also reformed the map of world. His works later inspired the explorers of Great Age of Discovery. Ptolemy's geocentric view of the universe remained an accepted doctrine until the Age of Discovery. Academically, these ancient Greek scholars formed strong ties of geography with history and this inter-disciplinary bond has been intensely represented in the writings of geographers till the modern times. As reflected through the work of Strabo, they considered geography essentially as an encyclopedic description of the known inhabited world. They also suggested the methods of deductive and inductive reasoning for theory building and hypothesis testing. The knowledge of Greeks in the field of physical geography, particularly in Oceanography, Plant Geography and Planetary Winds, was remarkable. Besides, the Greeks recognized four major winds, having different properties, directions and the associated weather type, viz. Boreas: the north wind – strong, cool, with clear skies; Eurus: the east wind – warm and gentle; Notus: the south wind – wet and sometimes violent; and Zephyrus: the west wind – balmy (fragrant) but with gale force. Dividing the world into: Torrid, Temperate and Frigid zones, they established a relationship between temperature and ecumene regions of the world. Resultantly, Geography, as a discipline got enriched by a number of concepts, terminologies and techniques. Various terminologies were added to its vocabulary by the ancient Greek scholars. Besides coining the term 'geography', a number of other terminologies are also credited to the ancient Greeks. The important ones include, for instance, delta, cartography, chorography, 'longitude, latitude, torrid, frigid, temperate, etc. All these terms are still in use today.

The first phase of Crisis with Revolution in geography, popularly known as Dark Age in Europe, was witnessed in the Early Medieval Period. This saw geographic horizons closing in due to theocratic slant inducted by Christianity in human thinking and writings. This kind of thinking had an adverse impact on the art of map-making, and there emerged maps which were purely fancy and unscientific, ignoring the earlier concepts of sphericity and other attempts. The Christian era was not only marked by the termination of the quest for scientific learning, instead, there was regression of the already acquired scientific knowledge. Existing concepts of the world were reshaped to conform to the teachings of Church. The image of the world was molded to fit the

Biblical references. The ideal map of this period was 'Orbis-Terrarum' or 'T-in-OMap' which originally included the Mediterranean Sea and its surrounding territories. The three divisions namely, Europe, Asia and Africa were accepted as standard. Along with the inhabited world, there were inserted the mythical places, beasts and dragons in maps. These maps were made very beautiful and extremely decorative, but with no scientific base. Also, there was vagueness in the direction. The travels undertaken were mainly missionary movements; and the descriptions made were purely aesthetic, without logic. With most of the classical correct concepts were forgotten, the old errors appeared again about the world map. Moreover, the involvement of Christians and Muslims (Arabs) in crusade wars further aggravated the problem. When Europe was plunged into darkness, the Arab School of Thought was rose to prominence and marked the end of recession. This saw geography entering in a new paradigm phase of development.

Medieval Thought represents two major philosophical trends, viz. European and Middle-Eastern. However, the Paradigm Phase-2 is associated with the latter. Medieval philosophy in the West was shaped by two pieces of the cultural legacy that survived the collapse of Roman civilization. The First was the Latin language, which provided early medieval thinkers an access to important ancient resources that gave an acquaintance with classical ideas; and the Second was Christianity, stimulating the philosophical activity, sustained by the Church and permeated with Christian texts and ideas. This, in turn, led to, First the influx into the West of a large and previously unknown body of philosophical material, and Second the emergence and growth of the great medieval universities. There was rise of Islam in Arab in 7th Century and the new zest of learning permeated through the world of Islam. The vast expanse of the Muslim Empire facilitated the coming together of intellectual and scientific traditions of various civilizations, particularly Greek and Indian. The Arab scholars and travelers presented a new outlook of the world, which later led to the onset of the Age of Discovery. The outstanding contributions of Arabs go to various fields of learning as Mathematical, Practical, Regional, Historical, Physical and Human geography. Since Greek science was the starting point, mathematical geography received the maximum attention. Besides, the factors like semi-desertic conditions, open atmosphere, clear skies and vast distances to scan that facilitated the astronomical observations also helped in the promotion of this field. There were several attempts to ascertain the size of the earth. Sea-Charts and maps based on cylindrical projection were made. Borrowing from and improving over the works of Greeks, the Arabs divided the globe of earth into Torrid, Frigid and Temperate zones. One of the greatest contributions of Arabs to the advancement of mathematical knowledge was the introduction of the Hindu invention of Zero in arithmetic (Hindsa). Before this, the Roman numerals were in use. A wealth of regional descriptions exists in the works of Arab scholars, covering both the physical and human aspects. In their description of the ecumene areas of the world, the limit of the habitable world was identified up to the end of the Mediterranean Sea in the west, Japan in the east, Siberia in the north and about 10 degrees beyond equator in the south, disclaiming the ancient Greeks that the Torrid Zone was too hot for human habitation. The physical geography finds a special place in the writings of the Arab scholars. Their important observations are related to the study of the processes shaping landforms, alluvial deposits and phenomenon of tides. Observing the phenomena of tides, they proved their cause being the gravitational pull of sun and moon. Besides, they recorded the spring and neap tides while navigating the Caspian Sea and corrected the erroneous ideas about the Indian Ocean and the Caspian Sea. The Indian Ocean was supposed to be enclosed, whereas the Caspian Sea was shown as an arm of the World Ocean in 'T-in-O' maps of Early Medieval period. However, the most notable were the contributions to climatology, made in the form of coining the term 'mausim' (Monsoon), preparation of the first Climatic Atlas, and division of the world into Climatic Regions. The studies carried under Human Geography dealt mainly with the influence of physical factors on life forms. Modern geographers are particularly impressed with their cultural interpretation of the physical environment. Ultimately, this Paradigm phase is known for laying roots for the philosophy of environmental (climatic) determinism, generating a voluminous literature on the ecumene and non-ecumene areas of the known world and presenting a new outlook of the world that later led to the onset of the Age of Discovery.

Representing the transitional phase from Medieval to Modern, the Age of Discovery began in the late 15th century and continued up to the 18th century, during which the geographic horizons were pushed back again. It was not only the age of colonization and exploration, but also a Renaissance phase (Crisis phase II) in Geography. The discovery of new lands, improvements in cartography and various scientific and technological inventions characterized it. With the improvements in the art of navigation and the use of magnetic compass the travels became very popular. Great explorers emerged in the scene and numerous journeys were commissioned by a variety of nation states in Europe. Although, most of these voyages were made for the potential commercial returns from resource exploitation, they also added significant geographic knowledge. Among these explorers most were of Italian, Portuguese and Dutch origin, few others being Spanish, Russian and English. The Italian discoverers explored the lands across the Atlantic Ocean, the colonization of Americas being the most important discovery. The Portuguese navigators are credited for discovering Brazil, finding an ocean route to India through Cape of Good Hope; and attempting to circumnavigate the Earth successfully for the first time. The

Dutch navigators explored the parts of Europe and Oceania. Among other, Juan Ponce de León was the first European to set foot in Florida; Yermak Timofeyevich was the explorer of Siberia; and Captain James Cook made several voyages to the Pacific Ocean, accurately charting many islands and coastlines on European maps for the first time. Cook's sailing around the Pacific Ocean contributed much to European knowledge of the area. Several islands such as Easter Island and the Sandwich Islands (Hawaii) were encountered for the first time. With the discovery of new lands across the Atlantic, Pacific and Indian Oceans, the Age of Exploration is said to have come to an end. Besides the discovery of new lands, the Age of Exploration was rooted in new technologies and ideas growing out of the Renaissance. Mainly the invention of printing machine and the works of the scholars like Copernicus, Kepler, Galileo and Newton brought the scientific and technological developments. These included the invention of Printing Machine by Johannes Gutenberg; numerous experiments on celestial mechanics and advancement of heliocentrism by Nicholas Copernicus; astronomical observations by Galileo Galilei; and the presentation of the Laws of Gravitation by Isaac Newton. Geography was enriched by an immense collection of facts and information about the world. The field of geography that was most benefited one during Age of Discovery was Cartography. Ptolemy's maps were unearthed and restudied, the missing details being filled in and the discrepancies removed. The shape of the earth, i.e. elliptical, was finally ascertained. With the filling up of missing details and the removal of discrepancies, the world map became almost complete. On this basis the first accurate 'globe' of the world was made by Martin Behaim, a Portuguese navigator, depicting the Earth in its true three-dimensional form. Besides, Mercator's Projection, based on the concept of the line of constant bearing, was devised for navigators.

With all the above developments, there came a scientific revolution not only in materialistic terms but also in the ideas and thinking of man. The impact of the developments during Age of Discovery on geography was tremendous. The positive gains of this period may be summarized as: the Discovery of new lands and completion of world-map; the revival of interest in geography from a scientific perspective; 'Academic Freedom' of geography, i.e. identification as an independent field of study; Accumulation of huge amount of data and knowledge of geographical nature and its publication the form of *Geographia Generalis* by Bernard Varenius; Advancements in Cartographic technique of data representation and map-making; Beginning of speculative investigations and generalizations in geography; and Emergence of various modern schools of thought. Thus, the foundations of Modern period of geographical thought were already laid before the Medieval period came to a close after the Age of Discovery. This was in the form of the writings of Bernard Varenius, a German scholar.

Modern Tradition

Modern period witnessed the period of great intellectual development with three major and rapid paradigmatic shifts. It was as a result of the rise and dominance of German School inducting the studies with Systematic and Regional approach; origin of Determinism focusing the role of environment in human affairs; and emergence of Vidalian tradition with a thrust on man in man-environment study. Major paradigms of this phase included Determinism, Possibilism and Chorological (Human & Regional) view. The intervening Crisis phases developed various dualistic tendencies addressed to these doctrines. Particularly, three modern schools of thought have been instrumental behind this development, viz. German, French and American.

The Paradigm Phase III represents the developments after Age of Discovery when the German School of thought was at its peak. Lot of research was carried on towards defining geography and deciding upon its methodology, as it was no more than encyclopedic compilations of places and their descriptions till now. The credit for establishing the principles behind spatial arrangement of phenomena, their causal connections and inter-relationships that could give geography a true scientific status goes to various German scholars. The initial impetus came from Bernard Varenius through his best known work, *Geographia Generalis*, considered to be the first modern literature on geography. Varenius brought together contemporary knowledge of astronomy and cartography and tried to provide a scientific methodology to geography by advocating two approaches for its study, viz. 'General' (systematic) and 'Specific' (regional). Geography of this period included both the general studies of particular kinds of phenomena of the earth's surface, and descriptions of many kinds of phenomena found in particular areas. The terms, 'General' and 'Specific', became standard in the discipline to be scientifically explored later by two contemporary geographers, Humboldt and Ritter, popularly known as the fathers of modern geography. They did it respectively in the form of a natural scientist and a human geographer. In the meanwhile, writings of Emmanuel Kant guided the research in Germany. For Kant, Geography was a chorographic and mainly a descriptive science, distinct from the systematic sciences. Kant proposed that there are basically two ways of classifying knowledge for various phenomena on the surface of earth, viz. Logical and Physical. The Logical Classification deals with organizing knowledge according to the type of objects studied, and accordingly covers a series of systematic or pure sciences that are devoted to the study of particular kinds. The Physical Classification, on the other hand, deals with organization of knowledge in its temporal or spatial dimensions and, therefore, includes historical and spatial sciences as History and Geography. Considering both

history and geography as descriptive in nature, Kant also regarded both as essential sciences, but standing alongside the systematic sciences. Later, Kant has been labeled as ‘the father of Exceptionalism’ for laying this exceptionalist claim for geography by F.K. Schaefer. However, in spite of all the criticisms put forward against Kantian philosophy, the chorological tradition has persisted in geographical writings. After Kant, Alexander von Humboldt and Carl Ritter revived the tradition of Bernard Varenius in their own way, Humboldt’s basic inclination being towards nature and that of Ritter towards man. Humboldt conceived man and his activities as an integral part of nature, the theme running through the ‘Cosmos’, his best-known work. While dealing with the subject matter of geography, Humboldt coined the term ‘cosmography’, the study of the Universe; and divided it into ‘Uranography’, concerned with celestial aspects and ‘Geography’ with terrestrial aspects of the phenomena that exist together in an area. Humboldt followed inductive, systematic and comparative methods of study. Carl Ritter’s work was not only contemporary but also complementary to that of Humboldt. Adopting a different methodology, contrary to and complementing Humboldt, Ritter emphasized more on human and regional aspects of study. In ‘Die- Erdkunde’, the work authored by Ritter, he envisaged the earth as a whole, an organic whole, all parts of which being mutually interdependent. He also had a vision of an ordered and harmonious universe, but, his approach was teleological. He asserted that all phenomena are spatially distributed according to the plan of God for mankind. According to him, geography deals with local conditions and embraces the attributes of a place in the form of topographical, formal and material characteristics. These three attributes constitute the basic content of Die- Erdkunde as well. ‘Die Erdkunde’ is based on the regional descriptions of the earth covering largely Asia, Africa and Europe. This work was written with a distinct theme, i.e. comparative and inter-relationships, i.e. the relation of all phenomena and forms of nature to the human race, organized within the framework of the unique geographical associations of land and man on the earth’s surface. Besides, Ritter is also popular among geographers for his Regional Concept. His division of the Earth consists of four levels in hierarchical order: Earth or Erdkunde (1st Order); Continental Units or Erdteile (2nd Order); Division of each Continent into various relief or Orographic regions (3rd Order); and Smaller Terrestrial units arrived at inductively (4th Order). His plan of study, based on the concept of regional associations of terrestrial phenomena, became the model for geographical presentations and had far-reaching influences. This classical period of German geography terminated with the death of both Humboldt and Ritter in the year 1859. Both Humboldt and Ritter worked towards providing geography the status of a scientific discipline. Their writings had a thrust on inter-relationships and spatial associations of phenomena. The Physical Geography was considered as the base of all geographical studies by them. Both emphasized on the importance of empirical method of research. Although both believed in the Unity of Nature, they differed in their philosophical approach. For Humboldt, this unity of nature was a balanced unity of the whole of nature, of which man was a part; whereas for Ritter, it was teleological, as he spoke of discovering the ‘divine secrets’. In spite of all the differences, the works of Humboldt and Ritter together, particularly ‘Cosmos’ and ‘Erdkunde’ did provide an almost complete methodology for geography. Coincidentally, both of them died in the same year. The year 1859 marked not only the death of Humboldt and Ritter but also the publication of Darwin’s “On the Origin of Species”. Charles Darwin was an English naturalist who established the theory of organic evolution.

Darwinism, dualistic tendencies and a physical bias in studies brought a turning point (Crisis Phase III) in the history of geography. In the latter half of the 19th century, the followers of Humboldt and Ritter exaggerated certain aspects of views of each of the founders, forcing Geography to enter into a phase of dualism for about hundred years. The geographical studies were basically bifurcated in two directions: Study of earth as a natural body and Study of earth as a dwelling place of man. However, in the late 19th century, the more expanding frontiers were those of physical and biological sciences than human under the impact of Darwin. The philosophy of Darwin caused considerable intellectual ferment and had a tremendous influence on geographic thought. This influence came through his theory of ‘evolution by natural selection’ and the concept of ‘survival of the fittest’. The cosmographic way of thinking was replaced by the causal explanations characteristic of natural sciences. Darwin discredited all supernatural claims and causations, making room for strictly scientific explanations of all natural phenomena. Giving rise to positivism, this intellectual ferment led to a great reappraisal of the prevalent thinking. As a result, traditional natural philosophy professed by amateurs became transformed into modern science developed by professional scientists. The dualistic tendencies that have always been part of geographical studies became more conspicuous after the death of Humboldt and Ritter. The major controversies that emerged in geography during modern period were related to its subject matter and approach to study, viz. ‘Physical versus Human’ & ‘Systematic versus Regional’ respectively. It is particularly with the writings of German scholars that physical aspect of geographical studies got greater emphasis than human. Humboldt conceived man as the part of nature, dependent upon nature-minus-man, which existed before man and which could exist independent of man, whereas the reverse cannot hold true. His ‘physical geography’ was considered directly comparable to the ‘general or systematic geography’ of Varenius. Carl Ritter, on the other hand, conceived Earth as the home of man, and the physical surroundings getting meaning only with reference to human beings. The relation between the world of man and the non-human world became prime concern in

geography. Originally the controversy between man and physical (nature) that was external to geography, entered into the discipline with the writings of German scholars, and was later supported by the rise of natural sciences and Darwinism. The terms 'General' and 'Specific', as suggested by Varenius, were caught by various geographers later and the dichotomy between the two widened to the extent that there had been periods when there existed double dualism in geography, i.e. 'Systematic & Physical' versus 'Regional & Human'. One such time was that of Emmanuel Kant himself. Kant substituted the word 'physical' for 'general', and classified all the general or systematic studies under 'physical'. It was under his influence that the geographers in the late 18th century concentrated on systematic studies at the expense of regional studies. The close of 19th century found an increased interest on physical or natural geography; and the systematic studies in their new guise were highly specialized. They were prosecuted by scientists who tended to be geomorphologists and climatologists. This was a time when 'systematic' and 'physical' became synonymous and the study of landforms emerged as the dominant and most attractive part of geography. This attracted the researchers not only from Germany but also from outside, especially U.S.A. The development that started after 1859 culminated in the works of the American Scholar, W.M. Davis. The early 20th century saw a preponderance of physically-biased studies, particularly brought in by the German and American Schools. Thus, after the death of Humboldt and Ritter in 1859 till the World War I, the emphasis of geographical studies kept on shifting. Although this shift was evident in the form of Physical and Systematic (Peschel, Gerland), to Physical and Regional (Richthofen, Penck), to Systematic and Human (Ratzel), to primarily Regional (Hettner, Schluter) and predominantly Physical (Wegener, Penck) during the late 19th and early 20th century, the physical bias was very strong in most of these works.

It was the Darwinian tradition that led geography into next phase of professionalism, Paradigm Phase IV. Rise of Determinism was the major philosophical outcome of this development in late 19th and early 20th Century. Darwin's paradigm in conjugation with that of Davis's replaced all the Old traditions. During this period of marked dualism between physical and human in Geography, Davis found the key in Darwinian evolutionary approach. He put forward the concept of 'Theory of Cycle of Erosion' representing the prevailing deterministic thinking, Davis promoted Geography as the study of relationship between the physical environment (the control) and the human behaviour (the response). He sought to classify the facts of man occupation in reference to the facts of the physical earth, respectively calling them 'Ontography' and 'Physical Geography'. Davis identified 'Ontography' as the other half of geography, the geographical description of life forms on the earth, resulting from geographical (physical) influences and controls. This viewpoint very clearly set the pattern for the pursuit of man-land relationships on a deterministic basis. Besides Davis, the contemporary thinking was also dominated by the ideas of his pupils like Ellen Churchill Semple, Ellsworth Huntington and Harlan Barrows who took up the deterministic approach in their diligent and far ranging researches. However, among all geographers influenced by Darwinism, it was Friedrich Ratzel, the German scholar, who dominantly explored the influences of physical environment on mankind, correcting the prevailing tendency of overstressing the physical aspects of geography and establishing a more balanced viewpoint. In his two most important literary contributions, *Anthropogeographie* and *Politische Geographie*, Ratzel treated human geography systematically and from Darwinian point of view. His work served to fix interest still more firmly on systematic studies, and regional geography continued to receive scant attention. Initially, in the first volume of his *Anthropogeographie* he agreed that the man and his actions are not free from the influences of surroundings in much the same way as Darwin had demonstrated the adaptation and survival of the fittest in the animal world. However, in the second volume of Book, written with more liberal views on man-nature relationships, he showed a different spirit, where he admitted that Man's reactions to nature differ sharply according to his culture and historical background. If belonging to primitive culture then nature has a stronghold; and if advanced technologically, the nature's hold becomes weaker. But, it still remains dominant, as according to him, whether man adapts or modifies the surroundings, in any case, is the creature of his environment. Because, even the act of moulding is a kind of adaptation prompted by the nature in an indirect manner. Through *Politische Geographie*, his other book, Ratzel tried to make a comparative investigation of the relation between the political state and the earth's surface. Based on this viewpoint, he postulated the 'Organic Theory of State', the concept of state as an organism, a piece of humanity on the surface of the earth. Ratzel supplemented 'classical' geographical determinism with the elements of 'Social Darwinism', a new philosophy that emerged in the second half of the 19th century to refer to various ways of thinking that tried to apply the evolutionary concept of natural selection to human society. He believed that a nation or state is not only a spatial unit, but also a human entity, and therefore it is a living unit. From these ideas, Ratzel developed the concept of 'lebensraum' or living space, and hypothesized that the state naturally seeks to increase its size. If the state's neighbors are weak, the state will grow larger and spread into other states. As evidenced, Ratzel believed that space was a great political force. Because of his postulations, Ratzel became very popular and his views persisted up to the World War II in one form or the other. Thus, the maximum influence of deterministic thinking was exercised after the popularity of Darwin's Theory. The pre-Darwinian views on Determinism were

found relatively more modest in comparison to that in post-Darwinian period, when they attained more extreme form. Gradually the term 'environmental influence' was replaced by the 'environmental control', i.e. the environment does not simply influence but determines. The followers found environment to be superior to man and mastering all of his actions. Such generalizations were called 'extreme' and not as the result of 'cause and effect' relationship between man and environment. Consequently, there emerged extreme form of determinism in the late 19th century. The scientific milieu in the later half of the 19th and the early 20th centuries was dominated by Darwin's idea and the deductive approaches. Fitting well into this intellectual environment, the theme of environmental determinism was prevailing view not only in Germany but also in American geography. In spite of its vigorous criticism the school of Determinism did not die away completely, its central theme continued to survive in the form of Neo-Determinism or 'Stop-Go-Determinism'. The supporters of this new school of determinism basically believed in determinism but not to the extent as earlier determinists did. They were more careful, and applied theoretical and empirical examination of the facts with the help of modern techniques.

Geography encountered another crisis phase in early 20th century when there was widespread criticism to Determinism. Resultantly, there took place a paradigmatic shift to Human from Physical. Largely as a reaction to the exclusive concentration on systematic studies on the part of the physical geographers, the interest began to shift towards human geography. However, this turned out to be relatively a very short period in transition as the discipline soon witnessed the next Paradigm phase. By 1900, the philosophy of determinism had become particularly widespread in Germany and the thinking also percolated in U.S.A. But, from the beginning of 20th century this doctrine came under attack. The determinists were blamed for over-emphasizing the role of physical environment in human affairs. Such works of man were overlooked for which environmental forces alone give no satisfactory explanation. In spite of the emergence of Neo-determinism later, the move towards human studies continued to grow stronger. Largely, the attempts of French Scholars proved instrumental in bringing a humanistic tilt in geographical studies. Interestingly, along with the French, the German and American schools also showed a gradual inclination towards the use of humanistic viewpoint in geography. Particularly, the Berkeley School of Carl Sauer, for instance, is based on areal characterization, rather than on environmental relationships, which he considered too general and wider field to be enfolded within the content of geography. All the above scholars in modern period have contributed to human studies with regional approach, particularly emphasizing on the historical, economic, political, colonial and electoral aspects. Their attempts have been successful in bringing a shift in geographical studies from physical to human, to the extent that a new paradigm was established, getting popularity as 'Vidalian Tradition'.

Paradigm Phase V was devoted to research in human and regional studies in the Second quarter of 20th Century. With the fusion of these two approaches, Vidal de La Blache, the leader of French School, was able to put forward three interrelated doctrines, viz. 'Possibilism', 'Genre de Vie' and 'Paysage', the viewpoints together constituting the 'Vidalian Tradition'. The main theme of 'Possibilism' is that the physical surroundings provide a range of possibilities to man and man makes a choice. This choice depends on his needs, aspirations and capacities. Viewing this relationship to nature through the prism of his culture, man creates his own habitat, a distinct landscape formed as a result of man's occupancy, of the local modified environment within which he lives, works or acts. This landscape has been termed as 'pays' at micro level and 'paysage' at macro level. Hence, the possibilistic approach to the study of man-environment relationships demands a three-fold interpretation - spatial, cultural and historical. In other words, the present ways of life of a society, its cultural, socio-economic and overall development, is the result of the history of its occupation of the physical surroundings. The idea of region was promoted through 'Paysage' in France, and it was further strengthened by its usage in two other parallel forms, viz. 'Landschaft' in Germany (Otto Schluter) and 'Landscape' in America (Carl Sauer). The climax of this tradition was witnessed in the views of Richard Hartshorne and Alfred Hettner, when the concept of geography as a chorological science was advocated by full force. As a regional geographer, Blache preferred to view man within a physical milieu, or 'pays', and within his cultural milieu, or 'genre de vie'. A 'pays' is considered as a natural region with some homogeneous physical characteristics. A 'genre de vie', on the other hand is a way of living or local culture. He drew attention to the fact that the same environment may lead to different responses from people with different Genres de Vie, since the complex of institutions, traditions, attitudes and technical skills which make up a Genre de Vie, largely determine which of the many possibilities offered by nature in any given area shall be selected for development. Blache was opposed to the concept of dichotomy between 'natural' and 'cultural' aspects of the earth's surface. It is because, he reasoned, in every inhabited part of the earth's surface, the original landscape is significantly transformed as a result of human habitation, and such changes are greater in the case of culturally advanced societies. Possibilism continued to grow and spread in and outside France. According to possibilists it is man who is the primary architect of his environment. It depends on the choices he makes among the numerous possibilities offered by the environment. In spite of the fact that man has numerous possibilities in a given physical setting, he cannot go against the directions laid by the physical environment. On this ground, the

possibilistic approach was also criticized, and the possibilism, too, did not hold for many years. But, as part of Videlian tradition, the major concern of geographers to study region, continued. For a long time, geographers kept on stressing the central position of Region in geography. Regional geography flourished in France and other European countries. Hettner and Hartshorne, both, regarded the regional geographical synthesis as central to geography, arguing for geography to be regarded as a chorological science. The French School produced scientific works that served as exemplars for a large group of students, and thus could be said to have functioned as a paradigm. In the writings of the modern geographers, geography emerged as the 'integrating science', completely different from other disciplines; and was labelled as 'chorological' or 'chorographic one'. The goal of the chorological point of view was to know the character of regions and places through comprehension of existence together and interrelation among the different realms of reality and their varied manifestations, and to comprehend the earth surface as whole in its actual arrangement of continents, larger and smaller regions and places. Hartshorne used the term 'areal differentiation' to characterize the way in which geographers dealt with the wide variety of physical, economic and social phenomena, which exist together in the area and distinguish them from other areas. Regional geography flourished in France and got diffused in its neighbouring countries. But later on this approach also became inadequate to explain the regional personality and therefore, a period of crisis in the discipline emerged again.

Post-Modern Tradition

Postmodernism brought with it the questioning of previous approaches of knowing, and introduced new methods of study. Geography has witnessed the maximum number of critical phases with revolution one after the other since 1950s, resulting in faster paradigmatic shifts in comparison to earlier phases of development. The nomothetic, spatial (locational) and anthropocentric twists have been instrumental in bringing about this change. The crises in the discipline, on the other hand, developed due to Schaefer-Hartshorne Debate, Quantitative Revolution, Critical Revolution and Digital Revolution. Interestingly, the Post Modern period in Geography began with a Crisis Phase and the discipline is still undergoing another one.

Post modernism in geography commenced with the criticism to chorological view and installation of more systematic and nomothetic perspective. The methodology of geography was intensely debated in the writings of two American scholars, namely, Richard Hartshorne and Fred K. Schaefer, during mid 20th century. Where Schaefer advocated the use of spatial laws as a basis for geographic explanation, Hartshorne, promoted chorological (regional) approach. However, dissatisfaction developed with the latter's view and the new generation of geographers was increasingly drawn to the former. Main reason was that the chorological viewpoint was encouraging the concept of uniqueness of areas, neglecting theory and generalizations. The paradigm had become sterile and was not yielding laws and theories. Schaefer criticized the claim made for geography as a chorological science, and put forward a strong case for the discipline to adopt the methodology of scientific positivism. The essential difference between the positions taken by Hartshorne and Schaefer was that former's was a positive view of geography, i.e. what geographers have made it; and that of latter a normative one, i.e. what geography should be irrespective of what it had been in the past. Geographers in increasing numbers had, by the end of 1950s, turned to Schaefer's view of geography as a spatial science. For this they used methods of other systematic sciences and were increasingly concerned with quantification and development of theory. The net outcome of Schaefer-Hartshorne Debate was that geography, by the end of the 1950s, had come increasingly to be viewed as a science requiring the use of the 'scientific method' like other sciences. This brought about a distinctive shift in emphasis from 'regional' to 'systematic' studies; 'areal' to 'locational' studies; 'absolute' to 'relative' locations; and from 'areal differentiation' to 'spatial interaction'. Thereafter geography began increasingly to be viewed from a nomothetic standpoint, i.e. developing the habit of seeking the general in the particular. The mechanistic approach of environmentalism, which dominated much of the 19th century, was soon replaced by a more nomothetic and scientific one.

Since 1950s various objections were raised against the prevalent idiographic view. In the light of vast geographical knowledge accumulated by the end of Age of Discovery, it proved inefficient to handle this information. The Nomothetic method was, therefore, proposed as the key to the problem, advocated for the study of that aspect of science which can be expressed in universals. It was agreed upon that geography 'like other sciences' can develop 'the knowledge of principles, laws, and general truths'-and thus lay claim to the name of science.

The Quantitative Revolution began under the banner of the scientific method during 1950s and 1960s marking a rapid change in geographical research. It sought to develop a more rigorous and systematic methodology for the discipline that later lead to a switch over to a new Paradigm. Adopting the philosophy of positivism from natural sciences, the geographers turned to mathematics, especially statistics, to find solutions to their problems. All these efforts were devoted to the fundamental conception of geography as a spatial science. Although, this movement is over now, it did lead to mathematization of much of our discipline. The main claim for the Quantitative Revolution was that it led to a shift from a descriptive (Idiographic) geography

to an empirical law making (Nomothetic) geography. Nomothetic aspects of geography heightened in importance and quantitative methods were applied to virtually all investigation and experimentation. The changes introduced during this phase initiated the ever increasing use of computer-based practices that improved precision, and theory-based practices to conceptualize location and space in geographical research. By the mid-1960s the quantitative revolution had successfully displaced regional geography from its dominant position and the paradigm shift was evident by the myriad of publications in academic journals and textbooks of geography. However, the greatest impact of the quantitative revolution was not the revolution itself but the effects that came afterwards in the form of spread of post-positivist thinking and counter-positivist responses.

The theoretical approaches and quantitative methodologies evolved in mid 20th century lead to the evolution of Spatial Science School of Geography by 1970s setting the discipline in new Paradigm. The School emphasized the study of spatial patterns within clear theoretical frameworks, using quantitative methods to evaluate models and hypotheses. The Spatial science approach dealt with aggregate patterns in space and their generating processes. However, within two to three decades of the beginning of Quantitative Revolution, the overwhelming focus on statistical modeling itself eventually became responsible for the undoing of this revolution, and there was a downturn in the popularity of such methodologies. Their relevance to real life was widely questioned. The critics argued that quantification removed the human dimension from a discipline that always prided itself on studying the human and natural world alike. The geographers began to expose the inadequacy of quantitative methods to explain and address issues regarding race, gender, class and war. This again proved as one of the major turning points (Crisis Phase-7) in the history of geography and saw another phase of transformation since 1970s. The counter-positivist response came in the form of Critical Revolution and geography experienced 'anthropocentric turn' splitting into a range of modes of thought.

The development Critical geography (Paradigm Phase 8) lead to three main schools of thought, viz. Behavioralism, Radicalism and Humanism. The basic philosophy of behaviouralism is that man and environment are dynamically interrelated. As an approach, it looks at man-environment relationships with a new and sharp outlook, replacing the simplistic and mechanistic conception that previously characterized man-environment theory with a new version. The behaviouralist views the human, subjects of his studies, as thinking beings whose actions are intervened by mental processes. The 'environmental perception' and 'mental maps' are recognized as the basic concepts of Behavioural Geography. Radical geography is suggested as an approach to geographic research that seeks to understand social and spatial problems, and advocate solutions. Radical geographers are interested in the issues of relevance to everyday social life: the lived experiences of members of society. Most of the radicalists have a strong Marxist base. Radical geographers reject the spatial determinism implicit in spatial science; instead they seek to place questions of geography within broader social and political contexts. They emphasize relationships between places and people and broaden the geographical research agenda by considering previously neglected issues including poverty, hunger, urban decay, and social inequality. The basic objection of humanists against quantitative revolution, on the other hand, is that its tools and assumptions do not adequately explain human world and human issues. Humanistic geography studies human awareness and human agency, human consciousness and human activity. It, therefore, deals with the meaning, value and human significance of life events. The Humanists are not in favour of reducing space to mere geometrical concepts of surface as viewed by the positivists. From a humanistic point of view, space is inseparable from consciousness of humans who inhabit it. Humanism is a rejection of the geometric determinism which views human beings as always dictated by universal spatial structures and abstract spatial logics. Within this humanistic perspective concepts of traditional significance in geography are given new meanings. The focus of humanistic geography is on people and their condition. Humanism does not treat humans as machines. The followers of this approach consider geography as 'the study of the earth as home of man.' Humanistic geography achieves an understanding of the human world by studying people's relation with nature, as well as their feelings and ideas in regard to space and place. Post- Modern geography is a spatial science increasingly focusing on the study of spatial aspects of social and economic phenomena, and thus being pre-eminently anthropocentric.

Geography, in the 21st century, is experiencing another revolutionary phase (Crisis Phase 8). With the widespread introduction of computer technology, geography has entered a new methodological revolution, the Digital Revolution. Although this change had already come in the West in late 1950s, the revolution has become universal in the present times. The Revolution refers to a shift from analogue to digital electronics. Central to this revolution is the mass production and widespread use of digital logic circuits, and its derived technologies, including the computer, cellular phone, and the Internet. Since geographers are directly concerned with analyzing the variable data related to earth's surface, this has opened up vast areas for analysis and research. These technological innovations have transformed traditional practice of data collection, presentation and analysis. The information may be more easily collected, stored, processed, accessed and communicated after the conversion of technology from analogue to digital format. Digital information is compact, transportable, and, therefore, more efficient to use. Computers, remote sensing, GIS and related fields are opening up new avenues

for geographers. Computers have enriched the discipline of geography with the development of automated geography, GIS, and the virtual geography department. No other technological innovation in human history has affected the practice of geography in such a profound way earlier. The traditional geography has been radically transformed. Computers have fundamentally changed not only how geographers study the world, but also what we study, as spaces and places, the natural and human landscapes, are constantly being refigured by computers. The increasing use of computers has allowed geographers faster processing of larger sets of data that were simply unmanageable and tedious few years ago. The Computers have also stimulated the growth of new branches of geography, as quantitative geography, computer-assisted cartography, analytical cartography, remote sensing, and GIS; the process culminating in building of the Virtual Geography Departments the world over. With all these developments still going on, our earth is not simply the terrestrial unit any longer; it has transformed into a Digital Earth, envisioned as a multi-resolution, three-dimensional representation of the planet, into which we can embed vast quantities of georeferenced data. Digital Earth is inherently an intriguing concept for modern geographers. Digital Earth challenges our state of knowledge about the planet, not only in terms of raw data, but also in terms of data access and the ability to communicate data through visualization. Digital Earth is interesting because of its implications for the organization of information. As a consequence, the content of geography has changed, for example, via the very concept of globalization space-time compression, and space-time distantiation. The rapid, cheap worldwide transfer of messages, documents, data, and images has brought about yet another shrinking of distance and abetting of globalization in all its economic and cultural forms. A geospatially literate population is the goal of geographers in the 21st century. Just as new technologies have profoundly expanded both research possibilities and the knowledge base of other disciplines, so too are the revolutionary new geographic technologies developed during the past few decades extending frontiers in geographic research, education and applications. They are also creating new and resurgent roles for geography in both society and in the university. This accelerating trend would, undoubtedly lead to a new paradigm shift in Geography.

II. CONCLUSION

Thus, various paradigmatic shifts and crises have lead Geography to evolve as a scientific discipline and obtain a more or less clear-cut methodology. Precisely eight paradigmatic and crisis phases have propelled this development. The knowledge of geographical nature has infiltrated from disparate Schools of Thought in Pre-Modern, Modern and Post-Modern periods, refining its methodology from time to time. The Pre-Modern period represented the Ancient and medieval traditions. Besides the Pre-Paradigm and Professionalization phases, two initial Paradigmatic shifts in this period are linked to the emergence of Greco-Roman and Arab School. Throughout its Pre-Modern period Phase, geography was considered as a descriptive field of study, with religion being the primary source of knowledge. The Dark Age and Age of Discovery brought crises in the discipline during ancient and medieval periods respectively. Emergence of Chorological perspective, Videlian Tradition and Man-Environment based studies were the major developments during Modern period. The German, French, American and British Schools have largely been responsible for these developments. The major methodological concerns of the period have been the issues related to systematic and regional approach. The politics and universities took over as the primary sources of authority in Modern period, with two new approaches, empiricism and logic, becoming dominant. The chorological viewpoint presented geography with a problem of great methodological controversy throughout. The prevalence of numerous dualistic tendencies threw the discipline into crises during this period. The view was ultimately challenged by F.K. Schaefer in mid Twentieth century through his powerful paper, bringing in the turning point in the history of geographical thought. The Radicalism, Humanistic trends and Social Relevance of Geography have been instrumental in bringing about the paradigmatic shifts in Post-Modern period. Postmodernism brought with it an epistemological pluralism, reflecting more methodological concerns than conceptual.

The scholarly observations of the Western and Eastern civilizations during ancient period mark the Pre-Paradigm Phase. The main subjects of ancient philosophy were related to understanding the fundamental causes and principles of the universe; all having a common underlying theme of religion. The Professionalization in the discipline had started becoming evident in the attempts of the European, Indian and Chinese scholars during ancient period itself. Displacing others in a short time, however, the Greco-Roman School attained dominance representing Paradigm Phase-1, leading to concentrated research, an activity described as Normal Science. The phase witnessed the emergence of various fields of learning that covered almost the entire gamut of geographical knowledge. Resultantly, Geography got enriched by a number of concepts, terminologies and techniques. The first phase of Crisis with Revolution in geography, popularly known as Dark Age in Europe, was observed in Early Medieval Period. This Phase saw geographic horizons closing in due to theocratic slant inducted by Christianity, adversely affecting human thinking, writings and the art of map-making. The involvement of Christians and Muslims in crusade wars further aggravated the problem. When Europe was plunged into darkness, the rise of Arab school marked the end of this recession. This saw

geography entering in a new paradigm phase of development. Although, the outstanding contributions of Arabs go to various fields of learning the modern geographers are particularly impressed with this phase for laying roots for the philosophy of climatic determinism, generating a voluminous literature on the ecumene and non-ecumene areas of the known world and presenting a new outlook of the world that later led to the onset of the Age of Discovery (Crisis phase II). The discovery of new lands, improvements in cartography and various scientific and technological inventions characterized this age. Major gain of this period was the accumulation of huge amount of knowledge of geographical nature, followed by Emergence of various modern schools of thought and beginning of speculative investigations and generalizations in geography. The foundations of Modern period of geographical thought were already laid in the works of German scholars before the Medieval period came to a close after the Age of Discovery.

Modern period witnessed great intellectual development with three major and rapid paradigmatic shifts. It was as a result of the dominance of German School inducting the studies with Systematic and Regional approach; origin of Determinism focusing the role of environment in human affairs; and emergence of Videlian tradition with a thrust on man in man-environment study. Major paradigms of this phase included Determinism, Possibilism and Chorological view. The intervening Crisis phases developed various dualistic tendencies addressed to these doctrines. The Paradigm Phase III represents the developments after Age of Discovery when the German School of thought was at its peak, taking the credit for establishing the principles behind spatial arrangement of phenomena, their causal connections and inter-relationships that could give geography a true scientific status. Darwinism, dualistic tendencies and a physical bias in studies brought a turning point (Crisis Phase III) in the history of geography in the late 19th century. Under the impact of Darwin, the more expanding frontiers were those of physical and biological sciences than human. The cosmographic way of thinking was replaced by the causal explanations characteristic of natural sciences, giving rise to positivism. The early 20th century saw a preponderance of physically-biased studies in geography, particularly brought in by the German and American Schools. It was the Darwinian tradition that led geography into next phase of professionalism, Paradigm Phase IV, with the rise of Determinism being the major philosophical outcome. The scientific milieu in the later half of the 19th and the early 20th centuries was dominated by Darwin's idea and the deductive approaches. The pre-Darwinian views on Determinism were found relatively more modest in comparison to that in post-Darwinian period, when they attained more extreme form. In spite of its vigorous criticism the school of Determinism did not die away completely, its central theme continued to survive in the form of Neo-Determinism or 'Stop-Go-Determinism'. Geography encountered another crisis phase in early 20th century when there was widespread criticism to Determinism. In spite of the emergence of Neo-determinism, the move towards human studies continued, and grew stronger under the leadership of French School. Opposing the environmental determinism as a Darwinian heritage, the French scholars contributed to human studies with regional approach. Their attempts have been successful in bringing a shift in geographical studies from physical to human, to the extent that a new paradigm was established. Paradigm Phase-V was devoted to research in human and regional studies in the Second quarter of 20th Century. With the fusion of these two approaches, Blache was able to put forward three interrelated doctrines, viz. 'Possibilism', 'Genre de Vie' and 'Paysage', the viewpoints together constituting the 'Videlian Tradition'. The idea of region was promoted through 'Paysage' in France, and was further strengthened by its usage in two other parallel forms, viz. 'Landschaft' in Germany and 'Landscape' in America. The climax of this tradition was witnessed in the views of Richard Hartshorne and Alfred Hettner, when the concept of geography as a chorological science was advocated by full force. In spite of the fact that man has numerous possibilities in a given physical setting, he cannot go against the directions laid by the physical environment. Even the possibilism did not hold for many years. But, as part of Videlian tradition, the major concern of geographers to study region, continued, and for a long time, they kept on stressing the central position of Region in geography.

Postmodernism in geography commenced with the criticism to chorological view, and brought with it the questioning of previous approaches of knowing, introducing new methods of study. Geography witnessed faster paradigmatic shifts in comparison to earlier phases of development. The nomothetic, spatial (locational) and anthropocentric twists have been instrumental in bringing about this change. The crises in the discipline, on the other hand, developed due to Schaefer-Hartshorne Debate, Quantitative Revolution, Critical Revolution and Digital Revolution. The methodology of geography were debated most earnestly in the writings of two American scholars, namely Richard Hartshorne and Fred K. Schaefer during mid 20th century, the former promoting chorological (regional) approach, and the latter advocating the use of spatial laws as a basis for geographic explanation, Hartshorne,. However, Hartshorne's chorological paradigm was criticized for becoming sterile and not yielding laws and theories; and the new generation of geographers was increasingly drawn to Schaefer's positivist approach. Consequently, various objections were raised against the idiographic view 1950s onwards and, in lieu, Nomothetic method was advocated. The Quantitative Revolution began under the banner of the scientific method during 1950s and 1960s. It sought to develop a more rigorous and systematic methodology for the discipline that later lead to a switch over to a new Paradigm. Adopting the philosophy of

'positivism' from natural sciences, the geographers turned to mathematics, especially statistics, to find solutions to their problems. All these efforts were devoted to the fundamental conception of geography as a spatial science. Although, this movement is over now, it did lead to mathematization of much of our discipline, leading to a shift from a descriptive geography to an empirical law making geography. Besides, the changes introduced during this phase initiated the ever increasing use of computer-based practices. By mid-1960s the quantitative revolution had successfully displaced regional geography from its dominant position. However, soon the geographers began to expose the inadequacy of quantitative methods and this again proved another phase of transformation in the form of Critical Revolution (Crisis Phase-7). The development Critical geography (Paradigm Phase 8) led to three main schools of thought, viz. Behaviorism, Radicalism and Humanism. Behaviouralism tried to challenge quantitative side of geography by providing a greater understanding of how people perceive space and place; Radicalism questioned the social relevance of the discipline; and the last and most accepted ideology of Humanism, addressed human awareness, agency, consciousness and activity. Within this humanistic perspective concepts of traditional significance in geography are given new meanings. Post-Modern geography is a spatial science increasingly focusing on the study of spatial aspects of social and economic phenomena, and thus being pre-eminently anthropocentric.

Geography, in the 21st century, is experiencing another revolutionary phase (Crisis Phase 8). With the widespread introduction of computer technology, geography has entered a new methodological revolution, the Digital Revolution. The Revolution refers to a shift from analogue to digital electronics, and these technological innovations have transformed traditional practice of data collection, presentation and analysis. Computers, remote sensing, GIS and related fields are opening up new avenues for geographers. With all these developments still going on, our earth is not simply the terrestrial unit any longer; it has transformed into a Digital Earth. Digital Earth challenges our current state of knowledge about the planet. It is creating new and resurgent roles for geography to experience a new paradigm shift.

REFERENCES

- [1]. Agamben, Giorgio (2002), "What is a Paradigm", <http://www.youtube.com>, August 2002.
- [2]. Holt-Jenson, A. (2009), "Paradigms and Revolutions", *Geography: History and Concepts: A Systematic Guide*, Fourth Edition, SAGE, London, pp:100-124
- [3]. Kuhn, Thomas. S. (1962), *The Structure of Scientific Revolutions*, Vol. II, No.2, Foundations of the Unity of Science, International Encyclopedia of Unified Science.
- [4]. Kuhn, Thomas. S. (1970), *The Structure of Scientific Revolutions*, Second Edition, The University of Chicago Press.
- [5]. Malik, Anand (2014), "Thomas Kuhn and Changing Paradigm in Geography: Critical Review", *Asian Journal of Multidisciplinary Studies*, Volume 2, Issue 4, April 2014
- [6]. Rana, L. (2008), *Geographical Thought: A systematic Record of Evolution*, Concept Publishing Company, New Delhi.
- [7]. Rana, L. (2014), *Ancient Tradition in Geography: The Western & Oriental Perspective Geographical Thought*, Classical Publishing Company, Karampura, New Delhi.
- [8]. Rana, L. (2014).: *Classical to Contemporary*, Concept Publishing Company, New Delhi.
- [9] Rana, L. (2019), *Paradigmatic Shifts in Geographical Thought: A methodological Examination*, Concept Publishing Company, New Delhi.
- [10] Schaefer, Fred K. (1953), "Exceptionalism in Geography: A Methodological Examination", *Annals of the Association of American Geographers*, Vol. 43, No. 3, pp. 226-249.