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GEOGRAPHY: THE DISCIPLINE AND ITS ROLE IN PUBLIC POLICY

DR. REUBEN BENJAMIN OGENDO
PROFESSOR OF GEOGRAPHY

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109TH INAUGURAL LECTURE
UNIVERSITY OF NAIROBI
TAIFA HALL
27TH MAY, 1982

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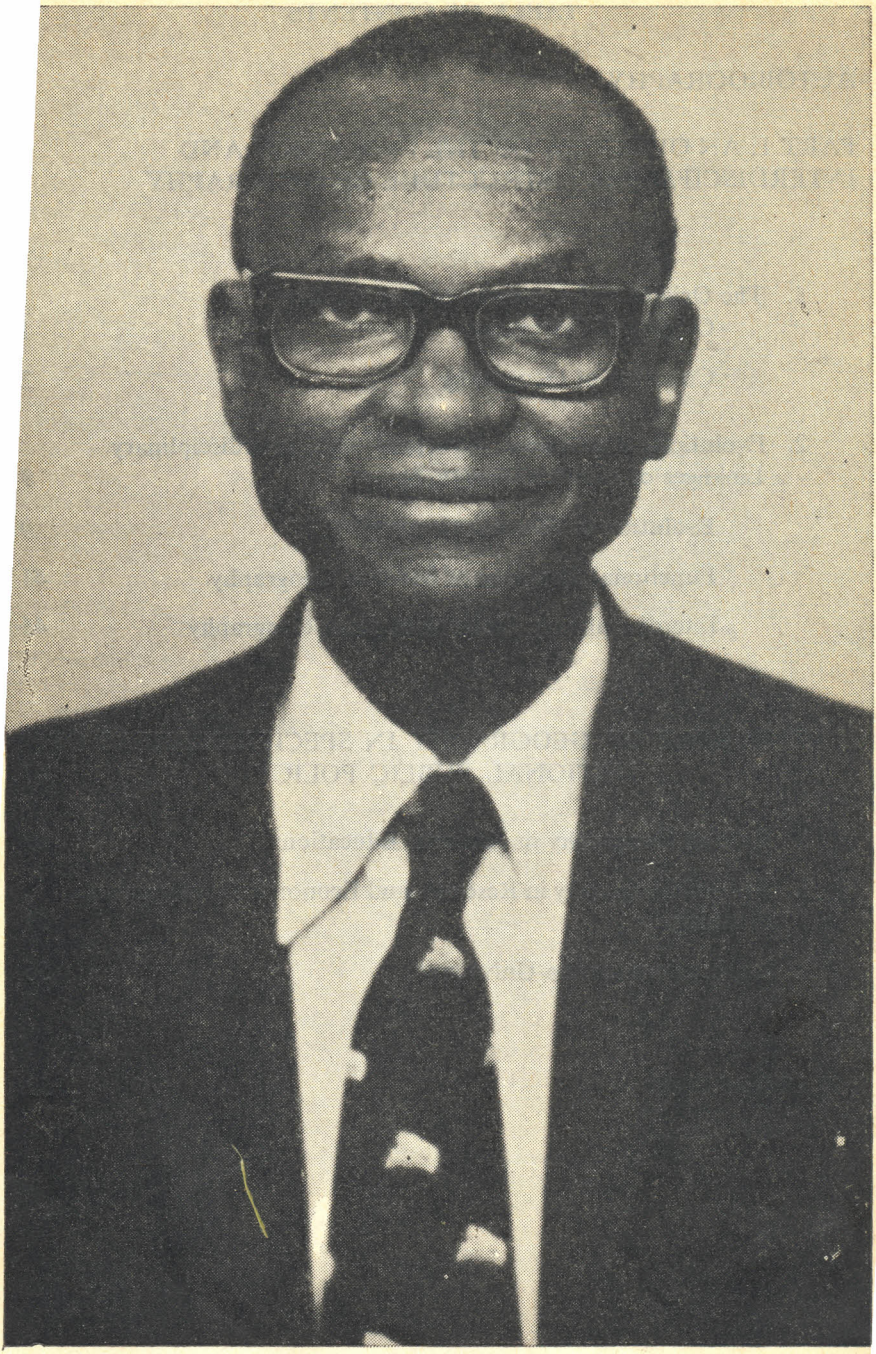

Professor R. B. Ogendo

AUTOBIOGRAPHY

Professor Reuben Benjamin Ogendo

Born in July 1928, Professor Ogendo had an outstanding academic record at Mangu High School, where he obtained a First Class Cambridge Overseas School Certificate in 1947.

From Mangu High School, he gained admission into Makerere College, having passed the Makerere Entrance Examination and qualified for both the Faculties of Arts and Science Makerere Higher Studies Certificates programmes. He opted for the Faculty of Science programme and studied Geography, Physics and Double Mathematics. At the end of the Higher Studies Certificate programme, he was awarded the coveted Higher Studies Certificate in 1949, and registered for the Makerere Diploma in Education, which he successfully completed in 1950.

He was posted to the CMS Maseno Secondary School in 1951, as the Head Geography teacher, although he also taught Mathematics, Physics, Chemistry and several other subjects. However, while at Maseno School, he greatly popularized Geography, as a result of which high standards in the subject and some of the best results on record were realized in Geography.

His devoted service at Maseno was rewarded by the award of a Government Overseas scholarship in 1957, thereby enabling him to undertake a four-year BSc (Honours) degree programme at the University of Aberdeen.

On the basis of the recognition of the Makerere Higher Studies Certificate by the University of Aberdeen Senate, as equivalent to first year undergraduate programme in Geography, Mathematics and Physics, he was exempted from studying these subjects in first year. He therefore proceeded to second year Geography, but also included first year proggrammes in Chemistry and Geology and first and second year programmes in Soil Science.

His academic dedication and seriousness of purpose enabled him to complete the four-year degree programme in three years. He, therefore, graduated from the University of Aberdeen in July 1960, with a (6:2:1:1—Honours) Bachelor of Science degree, at Upper Second Class, having specialized in Geography.

On his return to Kenya, and after more than a year's service at Maseno Secondary School, in 1962, he was appointed a Lecturer in Geography at the then Royal College, Nairobi — the predecessor of the University College Nairobi and the current University of Nairobi.

While lecturing at the Royal College, Nairobi, in November 1962, he registered for the University of London PhD degree programme, under the then Special Relation Scheme that the Royal College, Nairobi

had with the University of London. This culminated, in July 1967, in his being awarded a Doctor of Philosophy degree in Geography, in the Faculty of Science, for his thesis on *Location and structure of Kenya's Agricultural processing industries.*

In August 1968, Doctor Ogendo was promoted to Senior Lectureship and, in 1972, to Associate Professorship. In 1978, he became full Professor of Geography.

Apart from being fully involved in the training of undergraduate and postgraduate students, Professor Ogendo has cultivated and maintained high academic standards, both in the Faculties of Arts and Science. He has also played an active role in the University of Nairobi academic and social public affairs. Not only is he a full member of the Boards of the Faculties of Arts and Science, where he is on several important Faculty Standing Committees, but he has also been Chairman of the University Non-Academic Staff Provident Fund, and one of the earliest Chairmen of the University of Nairobi Academic Staff Association. More recently, Professor Ogendo was elected Dean of the Faculty of Arts (1978-80) thereby facilitating his membership and active role in the University Deans' Committee, the Senate and elsewhere on important University duties.

As a scholar, Professor Ogendo's wide research interests incorporate and are aimed at integrating bio-geography, urban geography and industrial geography, for purposes of focussing the important findings emerging from these geographic facets onto the solutions of problems relating to regional economic development and planning in East Africa, but with emphasis on Kenya. In pursuance of this, Professor Ogendo has published more than thirty papers in internationally recognized journals both in Africa and overseas.

Apart from his book on *Industrial Geography of Kenya*, he has also jointly published, along with a colleague, the very popular book *Kenya: a study in physical and human geography.* In addition to contributing one or more chapters to books such as: *Nairobi: City and Region*; *East African Studies*; *Studies in East African Geography and Development* and the *National Atlas of Kenya*, Professor Ogendo is responsible for the publication of the *New Kenya Atlas*, which is popular in Kenya Secondary Schools. He also helped to establish the present Faculty of Arts journal "*Hekima*", during his recent tenure of deanship.

Many of Professor Ogendo's recent and current research findings on the City of Nairobi and economic development planning in East Africa are scheduled to be published in two volumes expected in the near future, namely: *Nairobi: geography of a growing city*, and *East Africa: a study in regional economic development and planning.* Not only is the latter volume likely to be one of Professor Ogendo's major contributions to Geography, but it is also expected to be one that is likely to revolutionize

some of the earlier concepts and findings in the geography of East Africa, in particular, but should also contribute, in general, to the widening of the international geographical frontier(s).

"High towers, and metaphysically-great men resembling them, round both of which there is commonly much wind, are not for me .... my place is the fruitful bathos, the bottom-land of experience."

Immanuel Kant.

PART I: AN OVERVIEW OF THE EVOLUTION AND INTERDISCIPLINARY STRUCTURE OF GEOGRAPHY

1. THE ORIGINS AND CONCERNS OF GEOGRAPHY

Origins of geography:

Geography, as a discipline, had its origins at the beginnings of learning, hence it is an ancient field of study. The name was probably first proposed by Eratosthenes (a Greek scholar), about the 3rd Century BC, from the Greek words "*ge*" (=the earth) and "*grapho*" (=I write). Thus, writers of geography were amongst the earliest scholars of antiquity.

Before that, spoken (unwritten) geography must have been widely practised long before the invention of writing. The roots of geography lie in man's natural curiosity about places and other people's ways of life. Through centuries, man has repeatedly shown inquisitiveness and actual interest in the location patterns of both the natural physical and human phenomena on the earth's surface.

Speculation about the nature of the world, its shape, size and qualities may be traced back to the ancient Egyptians, who viewed the sky as a kind of ceiling supported above the earth by four pillars corresponding to the cardinal North, East, South and West points.

During the 3rd Century BC, Eratosthenes (a Greek Librarian and a Geographer) at Alexandria, accepted, with proof, the Greek view that the earth was a sphere, thus alleying the woes of Galileo and the fears of Columbus' sailors based on medieval belief that the earth was flat and had an edge over which one could fall off to eternity.

Retracing its development from antiquity (about 9th Century BC) to our time (nearly 3,000 years) is almost impossible, although the last few hundred years (since c 1500) of the recorded existence of the discipline may be retraced and reasonably narrated.

Strictly speaking, it is after 1950 that geography entered a most exciting phase of its modern development, thereby witnessing far-reaching metamorphosis, not only in its material content, but also in its philosophical and methodological dimensions.

Thus, from its ancient origins up till about mid-eighteenth century, geography largely seemed to be an art rather than a science, because geographic facts were usually established in the field merely by incidental observation rather than through accurate measurement.

Furthermore, theoretical bases of the discipline were strongly influenced by the prevalent research philosophy of the day, namely: environmental determinism. The latter unduly leaned heavily towards description and explanation of human behaviour largely in the context of the physical environmental component, thus being oblivious of the other equally important influential factors. At this stage of the development of the discipline, many writers of geography largely speculated about cause and effect processes often with astonishing insight.

From about 1770, one witnesses a vast growth of geographical knowledge gained through exploration, trade, conquest, missionary enterprise and, especially, through faster transport by steamships, railways, motor vehicles, aeroplanes and modern rockets. Against such background, a great mass of raw material has been accumulated for geographical study. However, raw material is always raw, and its discriminating use has depended on the growth of education in schools and universities, and on the availability of resourceful and industrious scholars to utilize the rich geographical information resources at their disposal.

Although the early talented amateurs, the critically minded explorers, the natural scholars of independent means and, even the Joneses to keep up with in geography, have existed and, in many cases, have become known as geographers, "the real modern growth of geography came with the recognition of the discipline by universities".

Much of the stimulus to geographical enquiry, in the 19th century, came from the Darwinian hypothesis, particularly from the idea of the adaptation of organisms to the environment with varying success. In addition to this, inspiration to the development of the discipline was also provided by the widening of scientific enterprise, especially in field study.

Although geography began as early as the 9th Century BC, and was declared officially born during the 6th Century BC, its development to-date owes a lot, not so much to the thousands of years of the discipline's existence, but rather to the work done during the past hundred or so years, especially since 1870. Apart from a vast increase in geographic material during the past one hundred years, there has been a good deal of thought on the relevance and methodology of the discipline directed towards the goal of yielding better and more dependable results.

Concerns of geography

Hecataeus of Miletus, at the first official birth-day of geography in the 6th Century BC, was possibly the first to have drawn the distinction between a "*choros*" and a "*chronos*". Implicit in this distinction was the idea that "Geography" is concerned with the spatial association amongst *phenomena* (or things), whereas "History" is concerned with development and change through time.

To-day, as in the past, geography is concerned with the patterns of *phenomena* on the earth's surface, and with the associations of *phenomena* which give character to particular places. It is generally agreed that geography comprises the study of the earth's surface, in its areal differentiation as the home of man.

The geographer seeks:

(a) to describe the diverse features of the earth's surface,

(b) to explain, if possible, how these features have come to be what they are, and

(c) to examine how they influence the distribution of man and his many activities.

The concept and scope of geography have undergone such considerable change that it is most unlikely that any one definition of the discipline would satisfy everyone. Complex as it is, geography is better defined step by step, progressively and hence, cumulatively for purposes of final synthesis, as follows: Geography is a field of knowledge concerned:

(i) with the provision of an accurate, orderly and rational description of the variable character of the earth's surface;

(ii) with the understanding of the vast, interacting system comprising all humanity and its natural environment on the earth's surface;

(iii) with the exact and organized knowledge of the distribution of phenomena on the earth's surface, resulting in the explanation of the interaction of man with his natural environment;

(vi) with explaining how the sub-systems of the physical environment are organized on the earth's surface, and how man distributes himself over the earth in relation to physical features and to other men;

(v) in giving man an orderly description of his world, although the contemporary stress is on the discipline as the study of spatial organization expressed as patterns and processes;

(vi) with the rational development and testing of theories which explain and predict the spatial distribution and location of various characteristics on the earth's surface.

Geographic material may be addressed to several kinds of audiences. It may be popular and descriptive or highly theoretical; it may be practical and directly applicable to current problems and public policies, such as those handled by engineers, planners, administrators, economists and businessmen. Whatever its tone, however, geography is always concerned with the characteristics of places and with the significance of likenesses and differences among places on the earth's surface.

While it is granted that geography is one of the oldest fields of knowledge, nevertheless, it is often "alleged" that the discipline, apparently, lacks a satisfactory definition of either the object or subject of study,

hence geography seems to suffer from a superabundance of definitions. While this allegation is denied our support, it may be stated here that the reasons for the "seeming" lack of a statisfactory definition of the subject of study, in particular, are, on the one hand, that the practical demands continuously being made on geography have often changed, so that the discipline's subject of study has tended to change in response. On the other hand, it should be realized that geography, standing as it does transitionally, yet centrally, amongst the physical and biological sciences, the social sciences, the humanities and the applied sciences, occupies a distinctive position within the system of knowledge, and is, in its concept and content, an integrated interdisciplinary whole. For individual disciplines, that significance may be examined on, at least, two levels, namely:

(a) the methodological, and

(b) the practical level.

On the methodological plane, it is important to know where any empirical knowledge belongs and how the building blocks of such knowledge fit into the complex structure of modern science. Thus, clearly defined object and subject of study are obviously essential for any scientific field of knowledge, including geography.

On the practical plane, the definition of the object and subject of each field of knowledge serves as a reference point in the search, especially for those who resolve scientific-technical and other applied problems. Consequently, a lack of clarity with respect to object and subject of study may generate parallelism and duplication in the investigations being undertaken by the different sciences.

As for the objects investigated by geography, there are a large number of them, so that it is often impossible, on that basis, to distinguish geography from the other scientific disciplines also investigating the same objects. However, *the broadest possible object of geography* is "*the geographical (or landscape) shell of the earth*", which is *equivalent* to "*the earth's surface*".

However, the earth's surface, as such, cannot be regarded as the subject of geography, since it is also the focus of study of so many other sciences as well. Therefore, the subject of geography must be sought in some of the geographical (or landscape) shell of the earth's distinctive aspects or properties that are investigated only by geography.

Moreover, we cannot treat geography as a system of sciences; nor does it make sense to refer to the discipline as a complex science, as there is no such thing as a complex science, except perhaps, knowledge in its entirety. Thus geographers have specifically to identify the subject of the discipline.

If we accept the proposition that any independent science must have its specific subject (and I am not aware of such so-called independent

sciences as opposed to the inter-dependent sciences), we must concede that geography does not constitute an independent science. We must therefore accept as axiomatic that there are fields of knowledge each occupying a separate and important place in the entire system of knowledge even without a clearly defined subject of study. Such branches of knowledge would include not only general geography, but also general geology, general chemistry, general biology and many other disciplines that make use of the findings of particular cognate disciplines. The development of those general disciplines is being stimulated by the need for a synthesis of knowledge as opposed to the process of differentiation.

Among these integrated fields of knowledge is *general geography*, which *is concerned with the totality, completeness and reliability of portraying the earth's geographical shell*, namely, *the huge segment of the world which is the home of man*. Virtually no other fields of knowledge, except geography, performs this important function. This underlines the extraordinarily vital role that geography plays in shaping a comprehensive view of the universe. This aspect of geography is not merely significant, because experience suggests that failure to master the totality of knowledge that general geography synthesizes out of the findings of the geographical and the other disciplines could result in great and, indeed, serious losses of a kind which is both material and ideological. This role of general geography in shaping a world view does not by any means exhaust all its functions, which also include some geographical engineering aspects.

The overall picture of the geographical (or landscape) shell which is provided by general geography is essential for "*achieving optimal forms of organization of the earth's surface*". *From the viewpoint of the subject of study*, we can therefore define "geography" as *a field of knowledge concerned with the organization of the earth's surface*.

With its distinctive point of view and place amongst the various other academic disciplines, geography remains the leading discipline which places space (namely, the earth's surface rather than abstract space) and location first. The other relatively young discipline which could make this claim, only to a limited extent, is Regional Science, although it differs from geography in that, while Regional Science is strongly characterized by abstract, largely aspatial, theoretical approach, geography is traditionally an empirical spatial discipline. It has such deep roots in genuine down to earth spatial experience, that one of the leading hallmarks of geography is its empirical spatial perspective.

Further, analogy with another field of human activity and knowledge that has much in common with geography, namely architecture, is hereby acknowledged, but not without its differentiating qualifications. Architecture is a field of human activity which combines art and science

(the latter including engineering). However, while architecture is concerned with the organization of functional space (that is, the space that man creates for himself and in which he spends his personal, social and productive life; the space of dwellings, various kinds of structures, factories and public buildings, the populated places and towns), the concerns of general geography (in the engineering sense) are much the same as those of architecture, except that, *general geography is concerned with the organization of functional space on a different scale, namely that of the earth's surface as a whole.* In this role, general geography functions not as a separate, even if a broad discipline, but as a vast interdisciplinary field of knowledge, because it operates with data derived not only, or not even principally, from the geographical sciences, but from the other branches of knowledge.

In fact, geography operates best through recourse to the totality of modern knowledge, in the same manner that engineering, agriculture and medical disciplines do. Thus, there is no macro-process occurring on the earth's surface which can be explained without drawing on the findings that are synthesized by geography or without considering the physical and economic regularities that are encompassed by physical and economic geography and of general geography as a whole. This makes geography useful and, indeed, necessary in the resolution of many problems concerning the use and organization of the earth's surface from place to place.

The soul of geography lies in establishing linkages between the various physical and socio-economic phenomena and the place(s) with which they are associated. However, the range of such phenomena is infinitely large, and to analyse them in depth to the extent that a particular science can, is certainly beyond the capacity of geography or any other general science for that matter.

Geography has sometimes been regarded as the mother of sciences, because many fields of knowledge, which started with both geographical observations and concern with the characteristics of the earth's surface, evolved into greater concern with the study of specific processes wherever they might be located. Thus, the various new disciplines which emerged from what were originally geographical observations, became specific systematic studies defined in terms of the various particular processes they investigated.

Workers in each separate discipline developed their own methods and devised special apparatus and precision instruments to analyse, measure and describe more precisely the particular sequences of change which interested them. In fact, some of the processes at work on the earth's surface, such as the physical and chemical processes, could and were reproduced under controlled laboratory conditions, where they

could be studied more closely in isolation from all irregularities or modifications caused by their original environments inevitably tied to specific places. From these studies there resulted deeper understanding of cause and effects relations, and many fundamental principles were formulated to describe the ideal or theoretical sequences of change.

In a similar manner, the biotic processes were investigated under controlled laboratory conditions, resulting in the development of such important concepts as those of evolution and natural selection, amongst many others.

Likewise, the social sciences have sought to understand the sequences of economic, social and political change, when the relevant processes are isolated from the, otherwise, disturbing circumstances of actual places.

However, because the so-called cultural processes, namely the processes related to human behaviour, could not be isolated for controlled laboratory investigation away from their particular environments in specific places, they were symbolically isolated, that is, isolated theoretically by such phrases as "other things being equal".

In the emerging disciplines (including physics, chemistry, the earth sciences (excluding geography) and, eventually, the social sciences), extra-ordinary gains were made in the understanding of processes, because the methods applied yielded results of profound importance.

Meanwhile geography, from which many of these new disciplines had emerged, continued to focus its attention on the characteristics which identified different regions and countries, and thereby became increasingly encyclopaedic.

Modern geography which, in a sense, is very new, functions somewhat differently from its ancient counterpart. It now begins with the understandings provided by the systematic sciences, which are devoted to the study of specific processes. While geography is still the field which is concerned with the associations of phenomena that give character to particular places, and with the likenesses and differences among places, it now plays this role with the background of systematic knowledge provided by other fields of knowledge. Geography now looks at particular places with a view to understanding how specific processes operate on the earth's surface "where other things are not equal."

In other words, the geographical methods are now such that they can be used to investigate, among other things, anything which is unevenly distributed on the earth's surface. Thus, while being a point of view, geography is a system of procedures.

Geography makes three kinds of contribution to our understanding, namely: →

(a) It extends the findings of the systematic sciences by observing the differences between the theoretical operation of a process and the actual operation as modified by the actual conditions of the total environment of a particular place, thereby contributing toward a better understanding of the earth as the habitat of man;
(b) it provides a method for testing the validity of concepts developed by the other sciences by applying them in particular places, and;
(c) it guarantees a realistic analysis of the conditions of particular places, thereby offering its own peculiar perspective aimed at aiding in the clarification of the issues involved in a wide variety of problems relating to public and/or private policy decisions.

Since, by virtue of both its object and subject, Geography does, in fact, investigate everything on the earth's surface, in the sense that any phenomenon (be it physical, biotic or cultural), which is unevenly distributed over the earth, can be studied by geographical method, the latter can be applied to the study of either material or non-material phenomena. Thus, those inclined towards geography, with future intention of undertaking further geographic research, need to specialize in order to develop competence in a specified portion of the discipline. Nevertheless, in whatever aspect(s) of geography they specialize (whether physical, biotic, cultural, etc.), the analysis of the meaning of likenesses and differences among places involves the use of certain staple concepts and methods. For instance, basic to the entire geographic discipline is the regional concept, whilst fundamental to the effective study of geographic phenomena is the method of precise cartographic analysis.

However, in whatever portion of the geographic discipline a scholar specializes, common ground is found with other geographers in two ways, that is:

(i) the scholar accepts the fundamental concept, namely, that differing patterns and associations of phenomena on the earth produce similarities and contrasts between places, and that such similarities and contrasts are significant in terms of continuing processes of change, hence, they are worth studying, and;
(ii) in order to understand the importance of areal differentiation more fully, the geographer has to define categories of patterns and associations and then study them in their areal relationships.

Scholars identified as professional geographers are, in no way, the only ones either making use of the geographic method, or studying and writing what, in a sense, is, in fact, geography. Indeed, a large amount of geographical work is done by geologists, chemists, physicists, mathematicians, meteorologists, botanists, zoologists and ecologists, educationists, economists, sociologists, anthropologists, political scientists, engineers, architects, lawyers, agricultural, veterinary and medical scientists, business-

men and a whole lot of others. This is particularly so, because it has increasingly become crucial for scholars in the various systematic and other sciences to concern themselves with the applied aspects of their ideal or theoretical laboratory findings involving the testing of such findings through the study of actual conditions in particular situations or places. Such applications usually involve geographic work. For example, when an economist and/or a businessman investigate(s) the advantages or otherwise of a specific location for a factory or a retail shop; or when he plans for the more efficient operation of a system of transportation or of marketing organization, the economist/businessman is actually working, in part, with geographic data.

Professional geographers can, in this way, offer certain concepts and methods derived from experience in the analysis of the significance of areal differences on the earth's surface. It would therefore be unrealistic for geographers to say that, in studying places, non-geographer-researchers undertake work which only professionally trained geographers should do. Indeed, while professional geographers should encourage, on the one hand, the non-geographers to apply *correctly* the geographic concepts and also to utilize *acceptable* geographic methodology, the geographers should, on the other hand, condemn the relevant non-geographers who, incompetently, apply geographical concepts and/or methods.

In fact, failure to make adequate use of geographical concepts and methods has been recognized as a common weakness in many of the systematic and social sciences, where such concepts and methods could greatly improve the expected outputs. This is, apparently, the outcome of costly neglect of geographic training in the relevant professional preparation for work in these geography-related fields. On the other hand, geographers are deeply aware that it is equally essential that they learn and adopt, in greater measure than has been the case in the past, the appropriate use of concepts and methods of the related, especially, those disciplines having greater links with geography.

2. EVOLUTION, FUNCTIONAL STRUCTURE AND INTERDISCIPLINARY LINKAGES OF MODERN GEOGRAPHY

Evolution of modern geography

In order to understand the nature of modern geography, as an academic discipline, we need to re-trace its development from antiquity, approximately from about the 9th Century BC. Before World War I, geography was already strongly established in Germany and France, and a useful beginning had been made in Britain, United States and Russia.

Much of the modern impetus in the development emanated from World War I and the subsequent treaties, which necessitated much re-

drawing of European boundaries to reflect the post-war changes on the map of Europe.

By about 1922, surveys of the day indicated that there were excellent foundations for the advanced teaching of geography in many universities, especially in Europe, but also in the United States and Russia. As a result, geography could, at that time, attract specialists, particularly, in Germany and France. This was also becoming increasingly feasible not only in Britain and the United States, but also in Russia.

In this critical phase of the development of geography, many British (and other European) scholars not only turned to the French geographers for guidance on methodology, but some of them (such as Herbertson and A.G. Ogilvie) had studied geography in other European Universities, especially in Germany. Moreover, apart from indigenous independent development of geography in the United States and Russia, at this time, considerable influence of German, French and British geographers accelerated further development of geography in these and several other eastern, western, Latin American, Australasian and African countries.

Besides further German influence, especially on British geography after World War I, it was the strong stimulus created by the throbbing activity of American geography that greatly influenced, not only the British and the other European geographers, but was also felt in Russia, the rest of Asia and Australasia and in both Latin America and Africa.

By about mid-twentieth century, despite their much dated beginnings from early 17th century (hindered, especially, by language difficulty and, hence, by few translations), the major pioneer works of Russian geographers were emerging with considerable impact on geographers in many other countries.

From the above preliminary précis of the development of geography, the entire span of the recognized existence of the discipline, since the 6th century BC (almost 2,600 years ago), may be conveniently divided into main periods and their sub-divisions as follows:-

1. *Ancient and/or old geography, or the period of the individual scholars* (consisting of isolated research by individual scholars), sub-divided into:
   (a) Ancient geography or encyclopaedic trend I;
   (b) Early modern geography or the classical geography;
      (i) Educational trend II.
2. *Middle and late modern geography or the period of groups and societies* (characterized by organized research by groups of geographers or geographical societies, each sponsoring researchers), sub-divided into:
   (a) Middle modern geography or early *regional* "*view*" geography;

(i) Colonial trend, III.
(ii) Generalization trend (especially, that of Vidal de la Blache and his adherents) IVA,

(b) Late modern geography or Late *regional* "*Landschaft*" geography;
(i) *Landschaft* generalization trend IVB,
(ii) Political trend V.

3. *Recent and Current geography or the period of National and International Organizations* (established through the incorporation of research into national and international organizations), sub-divided into:
(a) Recent or Specialization trend VI;
(b) Current (passing and emerging) trends VII;
(i) Passing or Quantitative Revolution trend VIIA,
(ii) Emerging post-Quantitative Revolution trend VIIB.

1. *Ancient and/or old geography or the period of the individual scholars:* (*a*) *Ancient geography or encyclopaedic trend* (I)—This is the first growth period of geography, which started right from the beginning of formal geographical study in ancient Greece, being promoted there by individual Greek national geographers [such as *Thales of Miletus* (c 640-546 BC; recognized as the first Greek geographer; introduced, from his travels in Egypt, geometric line-work methods into Greek geography); *Anaximander* (c 611-547 BC; Thales' disciple, who made the first map of the world based on information from Miletus sailors); *Herodotus* (c 484-425 BC; geographer-historian and originator of concepts of latitudes and longitudes; the first to name the continents of Europe, Asia and Africa); *Parmenides* (c 519-450 BC; first geographer to divide the earth's surface into latitudinal zones called "klimata"; also the first to conceive of two, apparently, uninhabitable torrid (too hot) and frigid (too cold) zones and the habitable intermediate temperate zones); *Aristotle* (c 384-322 BC; the first to demonstrate the earth's sphericity; also established "climatic zone" concept, thereby determining tropical, temperate and polar zones; he believed that the inhabitants of the torrid zone were burnt black by the sun), and, *Eratosthenes* (c 276-192 BC; scientific writer; the first to calculate the earth's circumference; probably the first to use the term "geography" to name the discipline; he was a scholar of astronomy, mathematics, geography and other scientific disciplines)].

The Greek geographers' work was continued by individual Roman national geographers, many of them of Greek origin [for example: *Strabo* (c 63 BC–AD 20; Strabo's 47 volumes (seventeen of them on non-original, descriptive encyclopaedic general and regional European,

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Asiatic and African geography) have survived from antiquity; without Strabo, we could hardly begin to follow the development of ancient geography), and; *Ptolemy* (2nd century AD; celebrated geographer, astronomer and mathematician; reputed as a geographer due to his "Guide to Geography" (or *Geographike Huphegesis*) based on scientific approach; his map projection studies led to his dividing the equator into 360 degrees of longitude and then proceeded to introduce the framework of parallels of latitude; he regarded "geography" as the study of the world, "chorography" as the study of parts of the earth, and "topography" as the study of small localities in detail)].

The completion of Roman conquests, the rise of Christianity (especially the Crusades) and the Fall of the Roman empire all culminated in the decline of the discipline, thereby ushering in for some time the dark age of geography, as the Greek science gave way to widespread ignorance and bigotry. However, since geography already had a respectable lineage stretching back to deeply rooted and fairly well recorded Greek and Latin works, the latter and other factors later contributed to the emergence of *individual Moslem geographical contributions*. In fact, many of the Greek and Roman geographical writings, especially Ptolemy's works, were translated into Arabic and tested by new observations over a wider area. Such travelling Moslem merchants as *Ibn Haukal* (in the 10th century) and *Ibn Batutah* (c 1304-1368 AD) ranged far beyond the limits reached by the Greeks and Romans. For example, *Ibn Batutah*, in sailing along East African Coast, nearly reached latitude 10°S., and observed that temperatures about the equator were more moderate than those imagined both by Herodotus and Aristotle. However, Batutah's observation of widespread distribution of black inhabitants, in the so-called torrid zone, proved, at least, one of Aristotle's guess works right.

Moslem geography scholars both criticised and preserved Greek and Roman geography, and also added new knowledge and novel concepts of their own. For instance, works in historical geography by *Al-Biruni*, *Al-Baladhuri* and, especially that of *Ibn Khaldun* (c 1332-1406) reached higher accuracy levels of observation and interpretation, particularly, as regards the relations of people to the land. Moreover, Moslem geographers had started formulating geological and geomorphological concepts concerning uplift of mountains by folding and the erosion of slopes by running water. Unfortunately, the Moslem geographers contributed little to cartography.

Although the European geographic horizons remained narrow while the Moslem geographers were making their contributions, from about the 13th century and later, Moslem geographers were either increasingly reinforced or later even replaced by either the revival of Western (or new Russian) geography, especially from the 16th to early 19th centuries.

In fact, European geographic horizons were only opened, partly, as a result of the "crusades" and, partly, due to the discoveries based on Portuguese, Spanish, British, Dutch, French and other, especially, western nations exploratory world expeditions.

Briefly, the progress in early geographic exploration could be listed sequentially as follows:

(1) *Exploration of the Mediterranean Region;*
Mainly by Egyptians, Phoenicians, Greeks, Romans and Norsemen, in that order.

(2) *Exploration of Asia and Africa:*
   (a) Pre-Marco Polo Venetian merchants visited China,
   (b) Marco Polo's travels to Central Asia, India, Malaya and China,
   (c) Arab merchants and travellers (especially Ibn Batutah) visited West and East Africa, Persia, Arabia, India, Malaya and China,
   (d) Ruy Gonzalez de Clavijo visited Samarkand,
   (e) Nicolo dé Conti visited Java, Sumatra and China, while
   (f) European Missionaries travelled to and explored Africa and Asia.

(3) *Exploration and opening of the Oceans:*
   (a) *Portuguese voyages under Prince Henry the Navigator*, especially by Vasco da Gama, explored African coasts and established a trade route to India.
   (b) *Spanish voyages sponsored by the King of Spain*, initially undertaken by the Venetian (Italian) Columbus, who unknowingly was, perhaps, the first European to sight the Americas, but mistook them for Asia, thus leaving the Americas to be confirmed by Balboa and named after the explorer Amerigo Vespucci, who *allegedly* claimed to have "discovered" them. The voyage of Magellan (the latter was murdered in the Philippines) round the world, through both Magellan strait and Cape of Good Hope, was completed by his colleagues.
   (c) *Other European voyages*, were mainly British, Dutch and French. Despite the Papal bull partitioning the world through Mid-Atlantic declaring the western sphere as Spanish and the eastern one as Portuguese, the British, the Dutch and the French inevitably ignored this naive decree, resulting in the circumnavigation of the world by; (i) the British explorers Francis Drake, Thomas Cavendish and, especially, Captain James Cook's three circumnavigations, and; (ii) the Dutch explorers A.J. Tasman. The Dutch were

particularly interested in establishing the ancient Greek geographers' speculation regarding the existence of a southern continent, which Tasman, unfortunately, did not sight, since he and other earlier explorers, Captain Cook included, were all sailing too far to the north to sight the elusive Antarctica.

(4) *Explorations of the Arctic and Antarctic Oceans* were cooperative yet competitive multi-national projects. The Antarctica was first sighted, in 1840, by an expedition under the command of the US Naval Officer C. Wilkes, while the North Pole was reached by R.E. Peary in 1909 and the South pole by R. Amundsen in 1911.

(5) Miscellaneous explorations were mainly concerned with Inner Asia, Africa, Australia and the Americas.

Many of the above voyages of exploration, especially those by Captain Cook, provided excellent starting point for the study of modern geography, because they are linked with some leading names in the development of geography.

The period of the individual scholars was characterised by geographic studies sporadically distributed in space and time. The number of scholars likely to be recognized by modern standards as geographers, at that time, was always small. Moreover, it was only occasionally that clusters of workers converged for some of the ancient geographical conferences, as those held in:

(a) Portugal in the 15th century AD, or;

(b) the (European) Low Countries in the 16th century AD, etc.

The patronage that encouraged these groups to attend such conferences usually came from an interest in practical problems, such as:

(a) methods of surveying the earth,

(b) instruments for marine navigation,

(c) map-making, and

(d) the printing of atlases, etc.

During this early period, the "learned" found the answers to many questions about the general shape of the earth and ways of putting spatial information on maps. The maps of the period include some of the most imposing products of Renaissance Europe. However, most of the schools of geography of this period were short-lived and experienced fluctuating fortunes.

Thus, the first and most fundamental concern of the *encyclopaedic trend* was the acquistion of raw materials by travellers, merchants, explorers and field-workers of (relatively) modern times.

In cartography, improvements in instruments and technique was also opening the way to the perfection of the geographers' characteristic

tools, namely, accurate maps of the earth's surface features. However, there was still a vast amount of hard facts to be accumulated by travellers and explorers before reasoned outlook on the geographical environment could be formed.

(*b*) *Early modern geography or the classical geography:*

(i) *Educational trend* (II)–By late 18th Century, facts of all kinds, bearing on the earth's surface and its life, had and continued to accumulate rapidly, thereby providing ample material for both the speculations of philosophers and precise analysis and interpretation by the scientists. Under the impact of advances in many spheres of thought, the study of geography made notable progress, for instance, in continental Europe, and more particularly in Germany, where the ideas of many scholars, for example, those of the French philosophers, such as the teaching of Jean Jacques Rousseau, met with ready response. The impact was further reinforced by scholarly publications, as when Conrad Malte-Braun initiated the publication of the famous *Geographie universelle* in 1810. In fact, this period marked a wave of new scientific writings, including the works by such masters as: J.B. de Lamarck, P.S. de Laplace, A.G. Werner, James Hutton, Charles Lyell, Georges Cuvier, William Smith, J.F. Blumenbach, etc.

Indeed, it is this period that provided the academic environment in which Immanuel Kant, Alexander von Humboldt and Karl Ritter thrived.

As formal treatment of geography was taking shape, Kant's conception of geography emerged. Immanuel Kant, the great German master of logical thought, gave geography its place in the over-all framework of organized and objective knowledge. The most significant practical approach that Kant made towards promoting the teaching of geography was the course of lectures in physical geography he gave over a number of years, after 1765, at the University of Königsberg, as part of a theory of human knowledge, in the context of a general outline of nature.

According to Kant, it was possible to classify knowledge gained from observation in either of the two ways, namely:

(i) a classification of phenomena perceived in accordance with some logical system or into categories of greater or lesser degree of generalization, hence a logical classification, or

(ii) a classification of phenomena in terms of the time and where they occur or that which describes the ideal operation of a process, or a chain of cause and effect relations and, hence, a physical classification.

From the former method, a systematic classification of nature emerges, as when plants and animals are placed in a system of species and genera regardless of where they occur. From the latter method, a geographical description of nature is gained, as when plants and animals that occur together in the same area are identified.

This is, essentially, the place of geography among the sciences that seems to have guided the main stream of geographic thought since Kant's time. He regarded physical geography as the summary of nature and the basis, among other things, of other possible geographies, such as:

(a) mathematical geography – treating of the measurement of the form, size and movements of the earth and its place in the solar systems;

(b) moral geography – an account of the different customs and characteristics of mankind;

(c) political geography – the study of areas according to their governmental organization;

(d) commercial geography – dealing with trade in surplus products of the world commodities, and;

(e) theological geography – the study of the distribution of religions.

Kant's concept of geography does not, however, provide an adequate foundation for contemporary geography. Apart from insufficient and/or uncertain discussion of some of the issues, Kant's concept of geography suffers from the following two major shortcomings:

(a) his concept of the scope and limits of geography is inevitably much broader than any contemporary concept can reasonably be, perhaps, because of the profuse growth of science since Kant's time; and

(b) as Kant draws it, the distinction between theoretical and empirical sciences is hardly acceptable today, hence it cannot guarantee the necessary logical autonomy or distinctness of geography from the other disciplines.

Kant's acquaintance with physical geography was, however, indirect, although he certainly made a valuable contribution by demonstrating that geography, as a discipline, could be studied systematically.

All in all, Kant's concept of geography remains extremely suggestive, because all contemporary concepts of the nature of geography are contained, at least initially, in his concept. Kant was probably one of the first in "modern" times to have assigned *environmental studies* to geography.

Until late 18th century, there were essentially two main purposes of geographical study, namely:

(1) the study of the shape and size of the earth, represented by Ptolemy and Apianus-Mercator, and;

(2) the compilation of informative descriptions of countries and regions, represented by Strabo and Münster.

Immanuel Kant provided a place in the broad framework of geography for both. Since Kant's time, the mathematical tradition has been continued, by the cartographers, on the borderline between geography and geodesy; meanwhile, the tradition of descriptive writings about places has been the main stream of geographical work.

However, the entry onto the geographical stage by both Alexander von Humboldt (1769-1859) and Karl Ritter (1779-1859) changed the nature of the main stream itself, so that modern geography actually begins with these two important and deservedly famous early 19th century German geographers.

The geographers before Humboldt and Ritter were, apparently, merely seeking to identify the phenomena and the associations of phenomena that gave distinctive character to particular places. "The understanding of process had not advanced far enough to permit a recognition of phenomena that were systematically related to one another in that they had been generated by the same process."

However, by the beginning of the 19th century, the systematic sciences (where each discipline is devoted to the investigation of a particular process), had so far advanced the understanding of the physical, chemical, biological and other allied processes that no longer could such knowledge be disregarded in the study of particular places.

Since the beginning of the 19th century, the selection of phenomena for inclusion in a study of the physical aspects of geography and the definition of categories of phenomena to be included in a system of classification have been guided by systematic knowledge of the processes involved. This advance in geographic theory was the result of the work of numerous late 18th century (already partly listed) geographers, who made the first applications of the new knowledge.

However, it remained the work of Humboldt and Ritter to synthesize the accumulated geographical facts into a reasoned system, in order to make the first effective use of the concepts therein and, in this way, von Humboldt and Ritter have since remained standing out as academic giants in the development of geographical thought.

Alexander von Humboldt, "the founder of modern geography", was born in 1769, the year Captain Cook sailed in the *Endeavour*, and died in 1859, the year Darwin's *Origins of Species* was published. The two dates are purposely mentioned here together because, in many respects, von Humboldt's work linked these two stages in the development of our geographical conception of the world.

By training, von Humboldt was a biologist, a geologist and a political economist, and his interest in science developed his passion and capacity

for careful, direct field observations of natural phenomena. As a resourceful extensive traveller in parts of Europe, South and Central America and later in Central Asia, he collected a vast amount of carefully measured and recorded data on all aspects of the countries he visited. Humboldt's merit as a traveller was to apply recent technical advances to the work of survey, through the use of the improved chronometer for observing longitudes on land and through the use of the barometer for observing heights.

From his own field observations and from the records of others, von Humboldt tried to build up a rational description of the universe. In his approach to this task, he was basically influenced by the philosophical, scientific and literary mood of the late 18th century.

Humboldt examined the great climatic zones of the world as determined by their position on the globe, their physical configuration and both the systems of winds and ocean currents. On account of these studies, he can be claimed to be the founder not only of modern climatology but also plant geography. Moreover, by his emphasis on the importance of maps, he gave a considerable impetus to the progress of cartography.

In 1827, von Humboldt began to deliver lectures at the University of Berlin on the physical world. It is these lectures that set the seal on his international reputation... "To geographic procedure von Humboldt's two great contributions were:

(a) the application of his knowledge of physical and biological processes to the systematic classification and comparative description of the phenomena he and others had observed, and;
(b) devising methods of measuring the phenomena observed, for example, he was the first to introduce the isothermal lines."

For much of the later years of his life, von Humboldt was engaged in writing, among many others of his volumes, his *Political Sketch of New Spain* and his famous *Kosmos*.

It was, perhaps, more by his work on the associated sciences, than by his general theory, that Humboldt advanced the development of geography. His contributions to the evolution of a geographical technique were notable. However, on the basis of Humboldt's two great contributions listed earlier, he bridged the gap from the then existing qualitative encyclopaedic description by introducing quantitative systematic description and, in this way, his contributions mark a major step in the history of geography.

Karl Ritter, ten years younger than von Humboldt, though considered the latter's friendly rival, regarded the senior colleague as his academic master. In many ways, Ritter based, especially, his early writings on von Humboldt's ideas.

Ritter received excellent early training in the natural sciences, as well as in history and theology. However, he tended to contribute some geographical works, which later generated criticisms because they leant more towards history. Having been trained by men who insisted on direct observation of nature as the best way of gaining the knowledge of the world, Ritter had, perhaps, the broadest background of preparation for geographical study in his days.

Thus Ritter, like von Humboldt, was a persistent and careful field observer although, unlike Humboldt, he did not undertake distant travels, mainly confining his field observations to Europe. Karl Ritter limited the scope of geography to the earth's surface and the related phenomena, and included man within its subject matter. Ritter's tendency to lay special emphasis on the physical aspects of geography became popular.

Ritter stressed the importance of comparative studies of different parts of the world, thereby pointing to the danger of drawing conclusions or formulating generalizations on the basis of knowledge from or of one area only. In his studies, Ritter invariably attempted to demonstrate how phenomena existed together in the same areas in mutual interrelationship. To him, geography presented that type of relationship existing between physiology and comparative anatomy, but with reference to the features of the earth's surface.

Ritter, like Humboldt, also made two contributions to geographical method, namely:

(a) the need to proceed from observation to observation, rather than from opinion to hypothesis and then lastly to observation. Thus, by gathering large quantities of accurate data from authenticated and verifiable sources and, after careful analysis of the data, the latter would be left to speak for themselves in revealing the coherent relations amongst the phenomena studied. Ritter was the first geographer to provide a system of subdivisions of the continents, based on surface features, as a framework for his detailed regional descriptions;

(b) his regional rather than systematic approach, whereby Ritter focused attention on particular places and on the phenomena, apparently, unsystematically associated there, rather than on systematically related phenomena wherever they might occur.

Ritter acknowledged, however, the point that without the systematic studies of von Humboldt, his own work could not have been carried out.

All told, Karl Ritter, with appropriate qualifications, may be regarded as a geographical "determinist". However, many of Ritter's observations and generalizations are still valid, apart from the context into which he fitted them. He showed how, by patient correlation of position, physical

features, climate and natural resources, an understanding of the individuality of a geographical area could be built up. Karl Ritter brought geographers to study the world both as a whole and as a group of interrelated units, and to reflect upon the significance of all this geographical diversity in the history of mankind.

Despite its relatively poor general readership at its publication, caused mainly by its author's failure to publicise it effectively, Karl Ritter's monumental two-volume major work, the *Erdkunde* (only covering Asia and part of Africa), though now little read, exerted greater influence on the development of geography than many of the previous works on the discipline.

Humboldt and Ritter tended to look down on their predecessors for having been purely descriptive, haphazard, disorganized and unsystematic in their geographical contribution. The two were the main contributors to the classical geographical period, and were responsible for clearer view of geographical methodology, the latter predominant for much of the 19th century and, in fact, formed Ratzel's guiding principle.

During the formative phase of modern geography, in the 19th century, normally referred to as the *classical period*, von Humboldt and Ritter's conception of the organization of geography held sway. The two considered the scientific organization of knowledge to be a two-stage process, namely:

(a) a first stage consisting of careful assembly of detailed and accurate factual material, and;

(b) a second stage in which the material is given coherence and made intelligible by being subsumed under a number of laws expressing the relationships of cause and effect observed in the phenomena as simply and concisely as possible.

In other words, on being first examined, all phenomena appear to be isolated, and it is only by the result of a multiplicity of observations, combined with reason, that we are able to trace the mutual relations existing between them.

The vital features of any science was this second stage, and it was the main characteristic of *classical geography*. Humboldt and Ritter believed that the status of a discipline depended on the successful formulation of laws facilitating the detailed material assembled to be organised and made intelligible. If geography, as a discipline, were to be worthy of ranking with the natural sciences, it must succeed in establishing such laws. "It must go on", Ritter added, "*rerum cognoscere causas*" (that is, to know the causes of things).

A second chief foundation of the classical view of geography was the conviction that, in the final analysis, there was no difference, methodologically, between what are now called the social sciences and the physical

sciences. In both cases, the ultimate aim was the formulation of laws expressing the universal operation of cause and effect.

A third common point on which most classical geographers seem, generally, to agree is that a prime object of geographical study is to investigate the ways in which the physical environment affects the functioning and development of human societies, hence, geographical determinism.

The story of the decline and fall of the "classical" conception of geography is a most interesting chapter in intellectual history. By the end of the 19th century, the classical conception of geography was widely attacked,

(i) for its rigidity;
(ii) because it was wedded to geographical determinism, and
(iii) since the new ideas about metholodogy in the social sciences made its whole approach to the understanding of social action and social change seem unrewarding.

Nonetheless, classical geography has left a rich legacy, including such immediately continuing arguments about *possibilism* and *probabilism*, both of which were deeply rooted in the classical attitude to geography. One other typical characteristic of classical geography, which is somewhat still in existence, may be observed in the format of some geography textbooks, which begin with such items as: solid geology, climate, vegetation, soils, etc., through to settlement, agriculture, industry, transport-etc,. ... a perfectly logical sequence of exposition in classical terms.

The reaction against classical geography took many forms: some merely as development from it (such as Hettner's writings); while others actually in opposition to it (for example, Brunhes' ideas), and still others developed along entirely new lines without close reference to it (such as the work and writings of Vidal de la Blache which, because of their great importance, inevitably served as introduction to the *post-classical period*, since they ultimately led to the *regional view* of the nature of geography).

The classical period is noted as marking the beginning of greater emphasis on geography as an important subject in schools and other educational institutions, such as teachers' training colleges. To facilitate this, many geography scholars in Germany, France, Britain, United States and elsewhere published textbooks for schools, colleges and universities. In certain cases, student geographical fieldwork was encouraged and formed part of the necessary practical training in geography, thus supplementing theoretical classroom or lecture theatre geography. The educational trend was, therefore, an important aspect in the development of geography. The beginning of emphasis on geography as an important academic subject marked the period when the need for efficient teaching of geography as part of general education was not only stressed, but was

also recognized by many of the academic societies, especially, the geographical societies.

2. Middle and late modern geography or the period of groups and societies: (*a*) *Middle modern geography or early regional "view" geography;*

(i) *Colonial trend (III)*–This phase in the development of geography was characterized by the desire of geographers to demonstrate the practical value of geography in assessing the potentialities of new lands and their problems. This led to a marked advance in commercial geography and, in time, to wider studies, including climatic, agricultural and health conditions, etc. In effect, it culminated in the colonization of new lands, so that the phase is normally termed the colonial trend.

Although the colonial trend is here, conservatively, confined to 50 years, it was prominent over 100 years, particularly, as from 1870 onwards. In recent years in Africa, especially before the independence of the various African countries, the colonial trend even became more prominent in the development of geography, because the various African University Colleges and Universities, then mainly staffed by expatriates, expanded their geography departments in order to tackle local problems with more sophisticated research methods. Meanwhile, a new generation of local African geographers emerged and have largely replaced the expatriates, thereby emphasizing the practical importance of local research in public policy and plans, in the process of drawing closer to their respective central governments in their development planning commitment aimed at realistic nation building. As large parts of the former colonial world became independent, it was inevitable that the colonial trend in geography would naturally end.

(ii) *Generalization trend* (IVA)—*Paul Vidal de la Blache* elevated French geography to a new level of accomplishment because, due to the great importance of his work, Vidal proposed a fresh and valuable idea.

We noted earlier that in the classical view, the study of the physical environment and that of the society were revetted to each other, because the main purpose of geographical study was to investigate the conditioning of society by the environment, hence, *geographical determinism.* However, Vidal was opposed to any strict determinism as relates to the interrelation of human activities to the physical environment. He maintained that man, as the active agent, operated in a setting that offered both possibilities and obstacles to man's wants. Thus, in Vidal's scheme, man and the physical environment were linked, so that any physical environment in which a society settles is greatly affected by the presence of man, the more so if the relevant society has an advanced material culture.

Vidal believed, according to his new idea, that the way forward in

geographical studies was to focus attention on relatively small areas in which to examine, in detail, the areal (that is, regional) differentiation resulting from physical and human processes.

What gives Vidal's work its special interest is not merely that he conceived a new attitude towards the organization of geographical material, apart from founding a very influential "school". It is, essentially, the resultant outcome, namely, that the rigour of his argument led him to realise that his method could not endure or outlive the aftermath of the Industrial Revolution. As a result, geographical methodology was obliged to abandon Vidal's regional concept, in a similar manner it had abandoned the classical scheme half a century earlier. This was because advanced communities were no longer local, no longer fundamentally rural, nor were they any longer characterized in their material culture by a host of features which were not to be seen elsewhere.

Despite the onset of a train of adverse events which was, in time, to make nonsense of his life's work, it is a measure of Vidal's stature as a scholar that he not only saw that the change was inevitable, but also suggested how sense could be made of the new order of things. Vidal noted, for example, that the organizing principle of economic life in the future would be the relationship of a region to its metropolitan centre to which it was subsidiary, hence, a relationship based on the case of access to an urban centre rather than the past rural relationship between man and the land.

(*b*) *Late modern geography:*

We observed earlier that von Humboldt and Ritter had co-ordinated past geographical concepts in such a manner that from their writings there emerged a new and unified concept of the nature of geography. Since their time, the main stream of geographic schoolarship had been devoted to the understanding of:

(i) the significance of likeness and differences from place to place on the earth and

(ii) the meaning of the associations and inter-relations among phenomena in specified places on the earth.

Armchair geography, based on the spinning of elaborate theories in advance of precise observation, was no longer acceptable. In contrast, geography had become essentially an out-of-door subject, based largely on the direct observation of phenomena in the field.

One technical problem had been the method of recording such direct observations. Former field notes were successively replaced by field data recorded on vertical aerial photographs thereby giving a new precision to geographical study never before realized, and the process continues to improve with information based on satellite photographs.

During the period since the middle of the 19th century, chorographic

study (that is, the study of areal differentiation and its meaning) steadily moved away from the encyclopaedic descriptive trend towards greater precision of field observation and organization of material relevant to a specified purpose and objective.

Modern geographic writings usually start with a problem and applies the geographic method to the search for answers or for classification of the issues involved in the formulation of policy.

The *regional period*, like the *classical period* of geographical methodology, left many legacies, some of which will, perhaps, prove permanent regarding the methods used in organizing and presenting geographical material.

(*i*) *Landschaft generalisation trend* (*IV B*)—Because of the relative unimportance of this deviation, for our purpose, it has not been found necessary to give it a separate treatment in this section.

(ii) *Political trend* (V)—Among the various deviations from the geographical scholarship was a relatively widely popular deviation which tended to identify geography with "geopolitics". Among the three German scholars coming after Alexander von Humboldt and Karl Ritter, (namely, Ferdinand von Richthofen, Friedrich Ratzel and Alfred Hettner), the above deviation is linked largely with the later work of Friedrich Ratzel. Others whose names are also associated with the political trend were the Briton Halford John Mackinder, the German General Haushofer and the American Isaiah Bowman.

The traveller and practical geographer *Friedrich Ratzel*, born in Karlsruhe in 1844 (and originally a trained chemist, geologist and zoologist), wrote his degree thesis in geography on "*Chinese migration to California, Mexico and Cuba*". In 1876, Ratzel was appointed to the chair of Geography (in Munich) and published extensive geographical work on the USA. However, Ratzel's academic reputation was not fully established until he was appointed to succeed Ferdinand von Richthofen at Leipzig in 1886.

Although Ratzel is normally associated with physical geography, political geography and anthropo-geography (the latter term coined by him), he also contributed to ethnography, geology and zoology. However, Ratzel's work may be regarded as an attempt to create a science of human societies to form a link between the natural sciences and man.

Ratzel's "*anthropo-geographie*" was first published in 1882. Part I of the volume deals with the "fundamentals of the application of geography to history", while Part II treats of the "distribution of man over the earth's surface in relation to geographical conditions".

Ratzel's "*Politischegeographie*" published in 1897, views the state as an organism in a specific position and environment on the earth's surface, where it gradually grows, matures and then declines. Thus,

the state requires a definite development space or area (that is, *raum*), thence the basis of the somewhat unpopular "*Lebensraum*" concept. In fact, Ratzel's "determinism", though now generally discredited, was quite influential in Germany, as witnessed by the story of the German geopoliticians.

The first attempt to form a British Geographical Society was in 1828 and, indeed, it was formally established between 1828 and 1830. Of the various aims of the society, four are of immediate interest to us, namely:

(i) to use such a society to facilitate the promotion of geography to attain the status of a science:
(ii) to collect and print interesting and useful facts and discoveries in a cheap form;
(iii) to establish a library of the best books in geography and a complete collection of maps and charts from the earliest period, and;
(iv) to maintain contact with foreign geographers.

Foremost amongst the listed foreign honorary members of the Society were the names of Alexander von Humboldt and Karl Ritter.

The first, apparently, abortive chair of geography was established at University College, London, to which Captain Maconochie (then Secretary to the renamed Royal Geographical Society) was appointed, but soon resigned, owing to lack of appreciation of geography as a university discipline, and because of the resultant very low attendance at the geography lectures.

Despite virtual dissolution of the Royal Geographical Society in the years that followed, the efforts and great influence of two of its Presidents, namely, Admiral Smyth and R.I. Murchison, especially, the latter, and also the establishment, in 1884, of the Royal Scottish Geographical Society in Edinburgh saved the day. Geography was revived as an important school and teachers' training college subject.

About this time, negotiations were undertaken with Oxford and Cambridge universities to establish a readership or chair of geography, on the condition that a suitable candidate was identified. A young Oxford graduate, called Halford John Mackinder (then a University Extension lecturer), who had shown a special aptitude for geography and had sound scientific training, was invited by the Royal Geographical Society to set down exactly what he meant by the "*New Geography*" about which he was delivering a series of lectures in his capacity as University Extension lecturer.

Mackinder delivered his well-argued, critical and warmly received lecture on "*The scope and methods of geography*", early in 1877. Apart from his other less successful definition, Mackinder defined geography as "the science whose main function is to trace the interaction of man in

society and as much of his environment as varies locally". Although Mackinder claimed that "no rational political geography" could exist which was not built upon and subsequent to physical geography, he stressed, with concrete examples, the point that "man alters his environment, and the action of that environment on his posterity is changed in consequence".

While Mackinder's arguments would have been commonplace to contemporary German geographers, such arguments had never been so clearly, forcefully and most directly stated before in Britain, especially to the Royal Geographical Society. Mackinder's lecture ultimately led to the establishment, by Oxford University, of a readership in geography, and Mackinder was appointed to the post at the age of twenty-six.

In time, Mackinder's lectures attracted large audiences and, being orientated towards German geographers, he borrowed Ratzel's term anthropogeography and claimed that anthropo-geographers were the most typical and complete geographers.

Mackinder's influence helped establish a diploma-awarding school of geography in Oxford in 1899 to provide for systematic training of geography teachers.

Apart from his historical geography publication of 1902, namely, *Britain and the British Seas*, Mackinder's further paper in historical geography, that is: *The geographical Pivot of History* which was read to the Royal Geographical Society in 1904, forecast the possibility of Russia and Germany forming allies in the Euro-Russian heartland having, at its periphery, an inner crescent of marginal continental states and, beyond that, an outer crescent of overseas powers (such as Britain, USA, Japan, etc.). The tilting of the balance of power in favour of the heartland or *pivot state*, resulting in its expansion over the marginal lands of Euro-Asia, would permit the use of vast continental resources for fleet-building, and the (new extensive) empire of the world (as a whole) would then be insight.

In order to neutralize this potential threat, Mackinder suggested that the overseas powers should maintain bridge-heads in France, Italy, Egypt, India and Korea, thereby obliging the pivot allies to develop their land forces, and in this way the pivot allies would be prevented from concentrating on the maintenance of powerful fleets. What Mackinder had then pointed out was that the political power was the product, not only of geographical conditions, but even more so of the number, virility, equipment and organization of the rival nations. He did not elaborate on this, however, especially in relation to the *heartland theme*, until he published his *Democratic ideals and reality* towards the end of World War I. Mackinder saw World War I as an attempt by Russia to use the *heartland* as an instrument of world domination.

The *Heartland theory* was later adopted by General Haushofer and

the German geopoliticians, the latter being those disciples interested in the development of the theories of Friedrich Ratzel. The basis of geopolitics was Ratzel's conceptions of space, position and movement. General Haushofer took over the general ideas and terminology and developed geopolitics as the application of geography to politics, thus replacing the *static* outlook of political geography by the *dynamic* art of geopolitics.

However, further improvement in technology deflated the importance of Mackinder's Heartland concept. Along with his colleagues (such as Markham, etc.), Mackinder, having made his main contribution to geography, set British geography on its 20th century course. He had brought to geography the power of eloquent exposition and a gift of brilliant generalization.

In the USA, the course of events developed on similar lines as in Britain. The American Geographical Society, founded in New York in 1852, had the same aims as those of the Royal Geographical Society. It soon became an important centre for collecting and disseminating geographical information and later geographical research.

For some time, the German geographers exerted considerable influence, especially the teaching of Karl Ritter, through A. Guyot, Professor of Geology and Geography at Princeton. However, it was the contemporary movement westwards across the North American continent which initially stimulated the study of geography, thereby affecting its American trend.

Professor Guyot stressed the intimate relationship between surface features and the underlying rock structure. Other notable contributors in this field were J.W. Powell (working on rivers and base-level of erosion) and G.K. Gilbert (on the structure of mountains and the processes of land sculpture), upon which foundation W.M. Davis enlarged and systematized the study of physical geography. W.M. Davis exerted a powerful personal influence on future generations of physical geographers, and founded the Association of American Geographers.

Apart from his association with other famous physical geographers, such as A. Penck and D.W. Johnson, Davis taught many famous geographers, including Huntington. However, recent trend in American geography had Isaiah Bowman's work as its major basis.

Beginning as a physical geographer under W.M. Davis influence, *Isaiah Bowman* owed much of his earlier training to Mark Jefferson, the great practical exponent of geographical method. Bowman soon developed to be one of the leading modern geographers. Apart from his extensive travels and numerous publications, Isaiah Bowman served as Director of the American Geographical Society (1915), and as adviser to the American delegation at the Versailles Peace Conference, among many other activities.

These opportunities Bowman seized to enrich the content and advance the status of geography in both the world of learning and public affairs. Bowman's practical experience of international relations combined with his geographical outlook and human sympathies made his book, the *New World: Problems in Political Geography* (1921) a valuable sourcebook of political and human geography as affected by the 1919 peace settlement.

All aspects of the discipline considered, it would seem that geography expanded remarkably in the post-World War I period, both in Europe and America. There was considerable interest in the world outside the above two continents. However, all through the (1919-1938) interwar period, very little was known about Russia, apparently, shut up in protective silence, since the 1917 revolution, with her successive five-year plans starting from the first one for the (1928-1932) period. Russian geographers, however, hold a differing view as to the development of geography in the USSR. Indeed, since the beginning of the 18th century, the development of Russian geography has been most substantial, especially, in general geography, physical geography and economic geography.

In the many countries with new boundaries after World War I, especially in Europe, the geographers immediately became concerned with their own countries' resources and problems, including agricultural and industrial planning, as noted, particularly, in German regional economic planning.

While academic advancement in geography during its evolution into a modern discipline, raised it to the status of an important university subject, it is worth realising that any discipline is both the product and victim of its own past successes and these (namely, the classical and the regional periods) were, *inter alia*, two of the most important successes of the modern geography period generated by geographical scholarship.

What then was to replace regional geography? Apparently, the early 19th century classical stage partially re-appeared, when regional study, though important, was less so than systematic study. After all, both systematic and regional studies are necessary, as was generally recognized by both the classical and regional geographers, so that the difference became a matter of emphasis.

The line of intellectual descent, which began with von Thünen and J.G. Kohl and led down through Alfred Weber, Christaller, Lösch and Isard, has, perhaps, provided the most fruitful of the ideas which have enabled geographers to tackle the question of "regional ordering and functioning of the economy and society in post-industrial communities". The thinking of the above train of geography scholars is not only systematic in its nature, but it is also very flexible for use in special studies.

In a sense, the Industrial Revolution has made possible a degree of regional differentiation of economic activity not possible earlier, thereby

bringing out regional distinctiveness with a sensitivity not previously realized. However, the changes at that time and the contemporary pattern of regional specialization could only be intelligible in terms, not of one region, but rather of a whole conglomerate of interlocked economies. Moreover, the great bulk of employment, as we know it in the modern industrialized countries, is to be found in secondary, tertiary and quarternary occupations, being far less on the land. Furthermore, in almost all industries, when the most important location factor is nowadays accessibility to the major markets, it is obvious that a systematic treatment is inevitable.

However, geography and geographers do not exist in scholastic isolation from the intellectual history of their day. As a result, many contemporary developments in geographical techniques and in ideas about the nature and methodology of geography are invariably linked to thought in the physical, biological, social and professional sciences in a much wider context.

Granted, then, that the *classical* and *regional* conceptions of geography had been proved inadequate, some new and outstanding conception of the *nature* and *methodology* of geography had to emerge. This is examined under "*Recent and current geography*" below.

Before introducing *Recent and current geography*, it may be stated [in closing this second period or Modern geography period of development of the discipline (which period started in early 19th century)], that the entire second period was characterised by organized interlinked research. Societies were founded to facilitate research linkage and co-ordination, so as to foster common interest in geographic research.

Broadly categorized, geographical societies were in four groups that is:

Group I—The national societies first emerged during the early half or middle years of the 19th century, and they had definite interest in global exploration.

Group II—National professional societies were established and largely dominated by university and research geographers. These societies have normally been younger in age, Smaller in membership and less catholic in scope than the national societies.

Group III—This group consists of societies established, especially, to promote geographical education in schools.

Group IV—Comprises sub-groups of the national professional societies. These sub-groups are the most rapidly expanding organizations. They were established mostly during the 1950s. Thus, geography seems to resemble the pattern of other sciences in the rapid growth of this fourth group.

The principal function of the various societies was to foster common research interest through the reading of papers at conferences, and the publication of journals, for purposes of circulating research findings. Other journals were published by interested individuals or by small groups. The growth in number of geographical journals provides a useful indicator of the increasing volume of geographical research.

3. Recent and current geography or the period of National and International Organization.

In order to provide a clearer understanding of how the *Quantitative Revolution* in geography emerged, it is important to examine some of the relevant developments in 20th century geography.

(*a*) *Recent or specialization trend* (VI)—According to Varenius, geography was best treated in two parts, namely, *topical* (or systematic) geography and *special* (or regional) geography. Systematic (or topical) geography is the study of a particular group of features generated by one kind of process wherever these features may occur in the world (hence, Varenius' *general geography*). Regional (or special) geography, on the other hand, is the study of all kinds of features as they occur in particular areas hence, Varenius' *special geography*).

Although Varenius's distinction between systematic and regional geography was not considered valid many years after his death, yet about mid-20th century, many geographers recognized the point that, in so far as all regions had to be defined in terms of specific criteria, the approach to regions had to be systematic. Moreover, since the study of any topic involves the definition of homogeneous areas (that is, geographic regions), all *topical* (that is, *systematic*) studies had to make use of the *regional method*, hence the latter still remained important even after mid-20th century.

However, the mid-20th century *new concept of the region* was that of *specialization*, originating as it did from experience in detailed field studies. It was realized, however, that, although it is obvious that no two points on the earth's surface are identical, if, on the other hand, the complexity of the earth's surface is to be brought within manageable limits for the purpose of examining the causes and consequences of areal differentiation, to examine each and every spot separately would defeat both the aim and purpose of the effort.

Consequently: (i) geographers must always generalize; (ii) they must define categories of phenomena that are meaningful in that they are associated in area with other phenomena, and; (iii) they must seek associations of phenomena, defined as regions, that are significant in that they are related to a particular process or group of processes.

As formulated by Immanuel Kant, in all sciences there are two kinds of generalizations: (i) that which deals with the classification of phenomena into categories of greater or lesser degree of generalization, and; (ii) another that describes the *ideal operation of a process*, or a chain of cause and effect relations. Traditionally, geography deals with the former; although modern geography classifies phenomena on the basis of systematic knowledge of processes, including the use of mathematical and/or statistical procedures.

Conceived in the above manner, the region is a device for illuminating the factors of a problem which would otherwise be less clearly understood. The region is not an objective fact; rather it is an intellectual concept. Thus, the device called region is only justified if it illuminates the elements of a problem, and not otherwise. While there is no such thing as a *true region*; there are, in fact, as many regional systems as there are problems which deserve being studied by the "*geographic region*" method.

The regions which geographers define and observe on the earth's surface are plotted at reduced scale on maps so that, with the aid of modern methods of field observation, including ordinary aerial and satellite photography, the modern geographers, who are much more specialized than their earlier counterparts, can now achieve a degree of precision never before possible. Indeed, as a result of these modern aids, maps can be even more exact than statistical solutions, except that the form the cartographic precision takes is geometric and, hence, visual rather than mathematical, the latter being abstract and often aspatial.

When a homogeneous area is defined and plotted on a map, its outline is matched against the outlines of other kinds of phenomena. Naturally, we expect that every phenomena has some kind of areal relationship to every other phenomena on the earth, although some relationships are *accordant* while others are *discordant*. As a result, accordant areal relations are determined by matching a variety of geographical phenomena maps and observing where regional outlines correspond.

This procedure, which specifically refers to *areal relationships* rather than *causal relationships*, constitutes the *geographic region* (or *regional*) method. However, it seems that an attempt to define regions based on phenomena originating from too many different types of processes may be unwise, as it could lead to serious errors of interpretation. "There are geographers who prefer to define several parallel systems of regions in the same area, each based on phenomena generated by one process or a group of closely related processes, and then to analyse the areal relations of the systems of regions." Regions based on anything approaching the total content of an area must be regarded with specially critical eye, unless and until they have been validated by a comparison of the areal relations of the *component* regional systems. In fact, this calls for careful and,

perhaps, complex statistical procedures to arrive at the correct relationships of the relevant systems of regions,

By the application of geographical procedures, two types of concepts are developed, namely:

(a) the concept of regional make-up, and;

(b) the concept of causal relationships.

Because the multiple of phenomena acting and interacting on the earth's surface are the result of such a wide variety of processes, if significant regional systems are to be determined, *either:* the broader, more highly generalized multiple-feature regions must be carefully analyzed in order to reveal their various components; *or:* the broader regions must be built up by matching of maps of numerous small single-feature regions.

Concept of regional make-up—starting from the largest and most complex systems of regions to the simpler types, it may be stated that the adjective *geographic* is normally used to refer to extensive patterns of areal differences on the earth's surface (namely, the whole Ptolemaic system in which geography is defined as that scale (no longer in common use) which deals with the whole world), and to the multiple-feature regions and the associated regional systems that are used to reveal them. Down the hierarchical ladder are the less complex regions, normally drawn on maps with scales which are too small to permit the plotting of specific features. Consequently, such features must be generalized in categories of greater areal spread. Such a geographical regional study is defined as *chorographic.* The lower order of regional investigation in the hierarchy is defined as *topographic* study, and is concerned with a study carried out using maps of adequately large scale to allow the plotting of the specific features of the human occupance, large enough as to show specific fields on a farm.

Concept of causal relationships—The second concept developed by modern geographical study relates to *causal relationships*, which are clearly distinguished from *areal relationships*, the latter revealed by the regional method.

The concept of *causal relationships* sounds the warning that, even when two (or more) phenomena occupy exactly the same space (that is to say, the outlines of their mapped boundaries coincide, as demonstrated by the regional method), this correspondence/coincidence of the outlines of the boundaries may not necessarily show any conclusive causal connection between two or amongst the several geographic phenomena found exactly in the same place.

Causal relationship can only be demonstrated on tracing the operation of a process through time. Although coincident areal relations may suggest a probability of some kind of causal connection, in order to prove that such a connection actually exists, it is necessary that the nature of the

process or processes which has or have caused the observed phenomena be described.

Since the above concept reveals the fact that geography cannot be strictly contemporary, it is important that, practically, all geographic studies should be approached historically, if they are to be considered complete. *Historical geography* is concerned with the reconstruction of past geographies and with geographical changes through time. Thus, a full understanding of contemporary geographic phenomena requires the full perspective of past geographies, for the operation of any one process at a particular place and time is, to a certain extent, modified by the total environment with which the process is involved.

The regional concept, then, embraces not only the idea that patterns and associations of phenomena in particular places give character to those places, but also that the meaning of likenesses and differences among places is to be understood only in the light of complex continuous change growing out of the past, and going on into the future.

However, there are some dangers in the conclusion that geography cannot be strictly contemporary. The conclusion involves proceeding from observations of fact to the application of hypotheses concerning origins and developments. The sequences of change called processes are intellectual concepts, tested, to be sure, by the direct observation of what are "thought to be" the resulting phenomena of areal differentiation (but which may not be true at times). However, once a sequence of change has been clearly described, it is dangerously easy to think that evidence has been found to support it. Hence, there is need for considerable imagination and independence of mind to help in exposing possible conflicting evidence. For example, sometime back many, apparently, false peneplains were identified and described. These turned out to be good instances of intellectually stiffling effect of clearly-stated but over-simplified theory. Despite the ever-present and essentially human temptation to find what one is looking for, one cannot well go to the extreme of refusing to look for anything.

The deeper understanding of the patterns and associations of phenomena which create areal differentiation involves a search for meanings in terms of causes and consequences, and this search inevitably moves away from the strictly contemporary.

The systematic sciences work to unfold (or disentangle) all these disturbing connections with the environment and to describe the ideal operation of any given process in isolation. Geography, on the other hand, seeks to put the given process back in its earthly setting and to examine its connection both in space and time.

The general concept commonly accepted by professional geographers is based on the notions that, (a) the physical character of the earth has

different meaning for different people, and; (b) the significance to man of the physical environment is a function of the attitudes, objectives and technical abilities of man himself. With each change in any of the elements of the human culture, the resource base provided by the earth must be re-valued.

Geographical generalizations, like those of all sciences, must be constantly subjected to critical study and review. The regional divisions carefully established by an earlier generation of geographers for specific purposes of that generation may need to be revised through the application of new criteria in order to define regions more relevant to current problems. Concepts concerning causal relations, even if widely accepted at one time, must be scrutinized anew by each succeeding generation of professional geographers.

We mentioned earlier that one of the characteristic development of the 20th century geography has been the specialization trend. As a result, when the new political geography omnibus, namely, *The Changing World* (edited by W.G. East and A.E. Moodie) appeared in 1956, it was the contribution of twenty scholars specialized in their specific areas of politics rather than the one omni-present Bowman.

The range of material available on any aspect of geography has, of course, vastly increased and, consequently, geography scholars are generally researching on more restricted geographical fields than was the case during the earlier times. The specialization trend could be observed in Taylor's *Geography in the 20th century*, James and Jones' *American Geography: Inventory and Prospect*, and Chorley and Haggett's *Models in Geography*, to mention but these three publications among many others.

In view of such a heavily-branched tree of geography, there is greater opportunity to specialize in one of the thirty or so branches of the discipline. This is, certainly, a distinct change from those early years when a university Geography Department might include in its main courses, such aspects of geography as physical, human, regional with, perhaps, also economic and political components.

With such extensive branching of the discipline, a university geography specializing honours may now have a wide range of 30 or more courses, each of them merely covering a small part of a given entire theme, as opposed to the practice in the past, when a course, say in historical geography, could ramble over an extensive academic territory from palaeolithic times to the 20th century.

Apart from specialization in smaller aspects of the discipline (the findings from which are then pooled together with those of other scholars also working in other specialized areas of the discipline, for the benefit of man), it is now also found more appropriate to focus such elements of

regional study, in a pooled manner, around some theme such as resource assessment as related to regional economic development planning (instead of the old lengthy regional approach of systematically treating, one after the other, all the components of physical and human geography).

(*b*) *Current* (*passing and emerging*) *trends* (VII)—In pursuance of better methods of ascertaining causal relationships and of solving other technical geographical problems, an aspect which seems to have been of considerable importance in the recent development of modern geography has been the application of statistical concepts and devices to many areas of geography. Through such concepts, theories, models and a series of other devices, there emerged *Quantitative Revolution* and the so-called *New Geography*, of the 1960s and, especially, the 1970s. *Quantitative Revolution* is often also referred to as the "*Nomothetic*" period.

(i) *Quantitative Revolution trend or Nomothetic period* (VIIA)—During the 1960s, there was a conflict between geographers anxious to innovate with mathematical methods and those skeptical of the usefulness of quantitative methods in solving orthodox problems. As Quantitative Revolution became more familiar, (especially after the first few years when the dust of over-enthusiastic pressing of quantitative methods on a reluctant profession settled down), there emerged a general compromise whereby more mathematical training of the new generation of students was accepted, followed by greater application of the computer to facilitate the use of the quantitative techniques. The Quantitative Revolution fever soon gave way to the present phase, in which mathematical methods became merely one of the many available tools for tackling geographical problems.

Quantitative methods are today commonly used in helping to solve problems such as: the testing of regional boundaries; the spacing and determination of both the size and sphere of influence of settlements; testing: location theory, migratory movements, characteristic crop combination and plant associations; and, in a series of geomorphological and hydrological questions, etc.

However, there are two aspects worth stressing at this point. Firstly, while quantitative methods are, indeed, very powerful aids and facilitate the examination of many complex problems formerly difficult to solve in geography, nonetheless, these statistical methods are merely an aid to good judgment and are not meant to be a substitute to such judgment. Secondly, pit-falls exist in the process of loose/careless use of quantitative methods. In fact, there is need to learn the psychology of electronic computers, in order to avoid regarding them as a medium of worship instead of tools to be mastered, controlled, checked for sense, and regularly reviewed.

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While there are several areas where conceptual and technical developments can contribute to the effectiveness with which applied geographical research is undertaken [especially with regard to developments in spatial (rather than aspatial) statistics, thereby facilitating the devising of appropriate statistical procedures for handling spatially-distributed data], care should be taken to avoid seizing any statistical tools availale, because such tools may be inappropriate for the geographers' spatial purpose. Moreover, geographers should critically appraise all sources of information, instead of easily accepting any data at face value, with no knowledge about its background.

Indeed, dangers actually exist in the process of mindless use of inferential statistics; consequently, few things have been more harmful to quantitative methods, (especially statistics), than the availability of computer package programmes of multi-variate analysis. Because of the above possible loop-holes, theoretically-minded geographers should develop, along with "suitable" statisticians, spatially-orientated statistical procedures and to explore more fully the implications of analysing the aggregated statistics on which geographers depend.

One of the striking differences between geographical research papers published in the various geographical journals during the 1950s and the 1970s is the fact that, during the 1970s most papers demonstrate the greatly increased proportion of research applying mathematical techniques than those of the 1950s. Quantitative Revolution was inseparably associated with mathematical explanation in geography, and this involved theory and modelling. Today, the range of mathematical models has expanded significantly, almost affecting most of the branches of geography. Modelling has, thus, greatly facilitated the development of spatial theory.

The general acceptance of mathematical techniques, especially by a significant section of the younger members of the profession, and the great encouragement of students to undergo better training in mathematics (at "O" or "A" level and at university), further facilitated by the availability of computers in most university campuses, have all reinforced the *nomothetic period.*

A post-*nomothetic period* trend, which has emerged, concerns human geography much more than the discipline as a whole. Considerable research in human geography seems to be of a "positivist" nature. *Positivism* is a philosophical approach (that is, an attitude developed in the natural (especially the physical) sciences, but borrowed by geographers working in social science areas), which maintains that our sensory experiences are the exclusive source of valid geographic information about the world. The establishment of logical positivism during the Quantitative Revolution provided a firm foundation suitable not only for the proliferation of theory and quantitative techniques, but also for extensive modelling.

The positivistic approach led to the discussion of human behaviour in terms of analogies drawn from the natural sciences, for instance, the discussion of human migration in terms of Newton's gravity laws. Thus, much geographic efforts of the 1960s were used to explain patterns of human behaviour with neat, lawlike statements, so that ultimate causes and essential nature of phenomena such as human migration were put aside and regarded virtually as incomprehensible if not, in fact, mysterious. Whatever its virtues, especially in the more physical aspects of the discipline, its effects on human geography led to a stylized, sometimes over-academic kind of research.

While the principal trait of the logical positivism, betrayed by its practitioners, was directed towards a quest for order on the earth's surface and in pinpointing repetitive patterns thereon, the philosophy more than satisfied the great omission, especially of the *classical period*, namely: first, it established theories for explaining and for predicting relationships amongst variables, and; secondly, it enacted a reproduceable procedure easily cultivated by other researchers, so that the results based either on observations or on experiments might be ratified. The spatial analysis traditionalists of the time, being devoted practitioners of the then staple logical positivism, firmly believed that, by reinforcing the already laid foundation in the form of earlier researches, their additional studies would augment and diffuse information on fundamental processes, culminating in a regular pool of knowledge.

Originating largely from the western world, especially from the US, Quantitative Revolution concentrated on inferential statistical techniques, emphasizing the role of "spatial variable" as a controlling element on human behaviour, (despite its fragmentation responsible for causing lack of wholeness in the discipline, except for the quantitative methods tool). Yet, badly needed for the cohesion of the discipline, but wholly lacking, was an over-all vision on which to found the subject. It is, therefore, not surprising that critics of the Quantitative Revolution were quick at questioning the autonomy of an embarrassingly disjointed spatial perspective.

While quantitative techniques have helped solve many of the geographer's long-standing and, indeed, some of the formerly most intractable methodological problems, thereby helping to accommodate in a single discipline both the physio-biological and social components, it is debatable whether the *nomothetic period* could be equated either to the *classical* or the *regional* conception period. Since quantitative methods merely provide tools within the general geographical methodology, they can neither give the necessary vision nor provide geography with the kind of unity that both the *classical* and the *regional* conceptions afforded the discipline, whatever the defects of the two conceptions.

Consequently, most of the geographical writings and research work of the quantitative revolutionists of recent years lacked any generally accepted over-all view of geography, even though techniques have overwhelmingly proliferated.

Owing to lack of "paradigmatic statement", that is, absence of a general view, direction or vision of the geographical discipline, which has typified Quantitative Revolution, the latter has been condemned as a bad thing. Apparently, the quantitative revolutionists' main interest has merely been the description of the various types of spatial patterns evaluated against *ideal* (not real) patterns (in the form of "models", many of them aspatial rather than spatial), built-up from a variety of assumptions regarding rational economic behaviour.

However, while a unifying vision (or paradigm) is a most comforting conception to build on, it is vital that it should not be exposed to the danger from both rigidity and the creation of an orthodoxy. At all events it is arguable as to whether the best sign of health is production of good and successfully applicable research output rather than the manufacture of general techniques; though, perhaps, the necessary clear vision of the discipline, together with good and applicable research work, reinforced by a good set of quantitative methods within a well organized geographical methodology are to be preferred, so long as they are in reasonable harmony.

Due to the many weaknesses of the Quantitative Revolution, some of which are cited above, the many criticisms levelled against it prompted new efforts to provide alternative positivist change in the form of "*Behavioural revolution*". The latter derived its strength from the study of decision-making behaviour regarding spatial processes and their patterns. The behaviouralism of Alan Pred was short-lived, however, being replaced by yet another alternative which stressed (something akin to the pre-scientific classical period) man-environmental relationships. Since it concentrated on various aspects of human experience, hence phenomenological in nature, it tended to de-emphasize development of theory and virtually, discarded hypothesis testing. Consequently, instead of the positivistic approach, there has been renewed interest in the phenomenological approach. Phenomenology is an existential philosophical approach which concedes that introspective or intuitive attempts to gain geographical knowledge are valid. It therefore accepts subjective categories as appear to be in the experience of the person behaving. Phenomenologists are unhappy about attempts at lawlike statements of positivism. Thus, the difference between the positivists group and the phenomenologists group is that, while the former group believes that "there exists, regardless of mankind, an objective world", the latter (phenomenologists) group relies on experience, their (subjective) conviction being that all knowledge is

drawn from the world of experience and is inseparable from it. In the phenomenologists' view, man is merely a source of acts and intentions, the study of the latter two of which gives meaning to behaviour. Thus, according to the phenomenologists, there is no single objective world, but a variety of worlds whose array is limited by the type and number of man's intentions and attitudes.

Of course, no geographer's work is ever "purely" positivistic or "purely" phenomenological, because most geographers adopt a middle course between the two extremes, with systematic approaches to the field, which tend normally to stress the positivistic side. However, they also work with a regional emphasis, thereby adopting a more phenomenological view point.

In the late 1960s, a new group, variously called the "*Radical revolution*", the *Social*" *relevance*" or the "*Structural/radical revolution*", emerged. From the 1970s todate, published geography research papers (especially those in the radical journal *Antipode*), on social and the so-called "welfare and policy", issues have tended to proliferate.

The radical/relevance group has betrayed varied outlook amongst its ranks, reflected in the two groups represented by: (a) the liberals (supporting increasing change within the group) and, (b) the radicals (advocating revolutionary socialism facilitating the creation of social justice in essentially, modern Capitalist Corporate State).

Generally speaking, quite a large number of the old and many of the younger generations of professional geographers never welcomed the Quantitative Revolution and its practitioners. Indeed, the above two protesting groups were reinforced towards the end of the 1960s and during the 1970s by the younger generation, who were intolerant of the so-called "*New Geography*".

Aggravating the already adverse general feeling that geography was failing to measure up to the challenges of important issues of the day, the "New Geography", which is characterized by its impersonal, virtually automated advances, rocked the geographical boat, already inebriated with criticism, almost to its capsizing point. The principal and most popular teaching areas of the New Geography included, among others, such topics as: social discrimination, poverty, social injustice, pollution, hunger, social inequality, etc. However important these aspects were, apparently, they were over-pressed to the extreme and, for some time, they had far-reaching repercussions elsewhere.

(ii) *Emerging post-nomothetic period trend* (VIIB)—Each new generation of geographers builds on the earlier work but reinterprets its goals to match the prevailing social and scientific requirements. It would seem that, in future, geography is likely to become more strongly orientated towards applied fields which are more closely associated with practical

problems. Thus, instead of increasing specialization, there is likely to be greater emphasis on extending the ecosystem approach, still largely confined to the physical and biological fields, to include man's own environment-modifying activities.

Moreover, agreement will have to be reached between those geographers interested in quantitative modelling and those concerned with the realities of individual regional complexes, including serious economic studies of the oceans and their floors. Geographers will certainly need to apply to their spatial studies the added rigour akin to that of the econometrician.

As a single discipline, geography,

(a) has both a distinctive point of view and a characteristic methodology,

(b) enjoys a tradition through which geographic thought has grown and geographic concepts have been formulated and revised;

(c) plays a part in the contemporary world not played by any other field, or by all the other fields together, and;

(d) is new in the significance of the role it plays, yet it is old in terms of its traditional point of view.

Confronted with changing economic, social and political values, as a result of the radical changes in the technology of living, the person, say a geographer, charged with responsibility for policy decisions, as well as thinking citizens who, in a democracy, share that responsibility, must be seen to be practical in seeking clarification of the issues involved in the said decisions in order to make specific geographic contribution which would add depth of perspective in those decisions, if the best results are to be realized.

The third and last period of the evolution of modern geography (referred to as the *Period of National and International Organizations*) continues to concentrate, through the various geographical societies or otherwise, on the dissemination of information (relating to the importance of the findings about problems studied) to the rest of the communities they serve.

Their partial success, marked the beginning of a third phase of geographical study, which overlapped the second phase. During the third phase most of the departments of geography were formally established in major universities. In some of these universities, or within their relevant departments were established special Research Institutes sponsored by the national governments concerned.

While Germany took the lead in university research, having established several approriate departments, developments in France were close behind the Germans. In the United States, Britain and the Commonwealth

the development of university research comparatively lagged behind for various reasons, apparently, caused mainly by irregular spatial diffusion pattern.

In other countries of the world, the need for national geographical research centres had led to the establishment of research institutes or their equivalents, such as those of the Soviet Union, Brazil, United Kingdom, Australasia, etc. These national research institutes have since been charged with the investigation and publication of regional data within their respective territories.

Since 1923, the initiation and co-ordination of geographic research requiring international cooperation has been handled through the International Geographical Union. This organization holds meetings at intervals of four years. In between, it appoints Commissions to study special subjects, such as new trends in urban geography, economic regionalization, desertification or trends in quantitative methods.

Different International Geographical Union (IGU) member countries have different interests in the various areas of geographical research, for example, problems relating to applied geography and regional planning are foremost in much Eastern Europe and Russian geographical research.

Functional Structure of modern geography:

A study of the various definitions of geography reveals several common elements in these definitions, thereby unravelling the sequential relationships and, hence, unity of the seemingly differing definitions of the discipline. In the first instance, geographers share with other scholars of the earth sciences a concern with a common object or arena, namely, the earth's surface, rather than aspatial or abstract space.

However, the non-geography scholars of the earth sciences look at the earth's surface from a wide variety of view points, in contrast to the geographers, who look at it, especially, from the view point of the social sciences, among other less emphasized view points. Geographers are, thus, concerned with the earth as the environment of man, an environment that man himself has helped to modify and build.

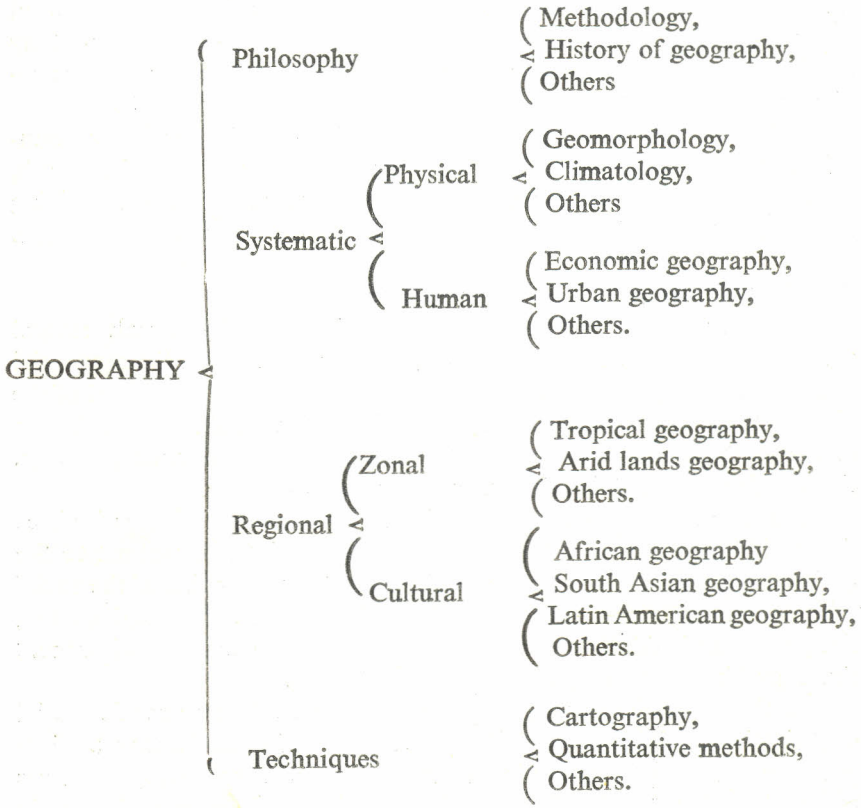
In the second instance, geographers focus attention on man's spatial organization and his ecological relationship to his environment. Geographers seek ways of improving the manner in which space and resources are used, and emphasize the role of appropriate regional organization in reaching this end. Their work provides a perspective of man's tenure on the earth and various forecast, both optimistic and pessimistic, of his future on the planet.

Finally, geographers are sensitive to the richness and variety of the earth. They do not believe in blanket solutions to development problems. Instead, they feel that policy should be carefully tuned to the spatial

variety concealed by terms such as equatorial highlands, polar ice, slum, etc. Thus, on each geographic scale, geographers are always keen to disaggregate and dissect the homogeneous space of the legislator within the complex space of the real world.

It is within this broadly defined area of agreement that different branches of geography have proliferated, giving rise to major divisions and sub-divisions of the discipline, each concerned with (greater or lesser though, generally) limited research topic.

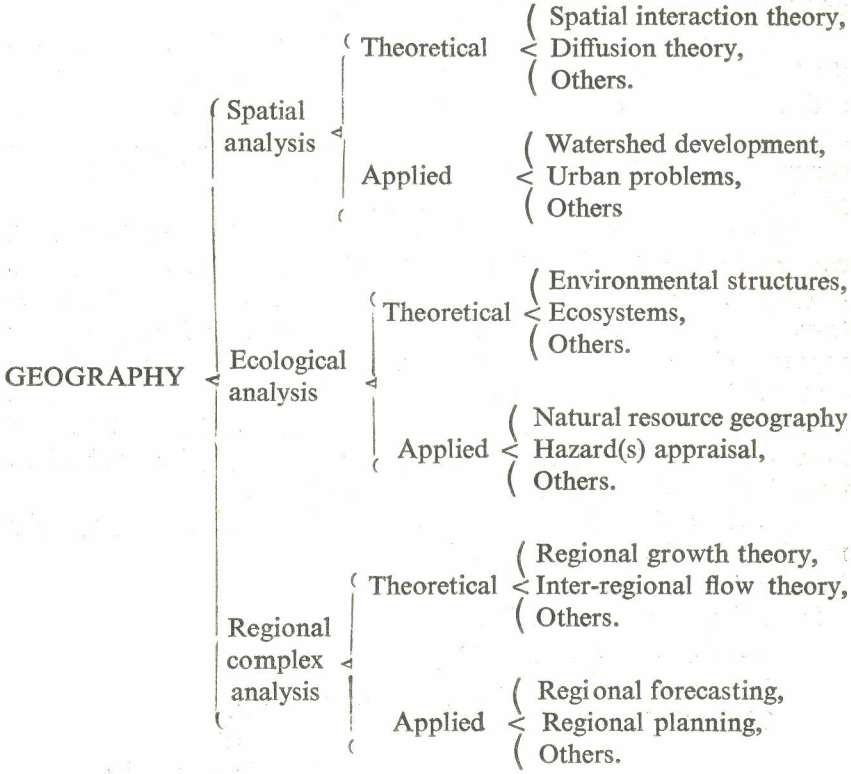
The orthodox division of geography into the study of regions (that is, regional geography) and an analysis of the relevant regions' systematic characteristics (that is, systematic geography) is structured as follows:—



The orthodox division of geography has been used for so long that many geography textbooks are structured in a similar manner. However, current integrated approach to geography suggests the structuring of the discipline according to how geography tackles its problems, essentially in three different approaches, namely:

(a) spatial analysis,

(b) ecological analysis, and
(c) regional complex analysis.



The first approach, namely, *Spatial analysis*, examines the locational variation of a significant property or series of properties such, as the interpretation of the distribution of population density or of rural poverty. What factors control the patterns of distribution being studied and how can these patterns be modified to make distributions more efficient or more equitable?

The second approach termed *Ecological analysis* is concerned with interrelating human and environmental variables and then interpreting their links, such as those linkages encountered in such processes as the hydrological cycle and land-use cycles. In this type of analysis, emphasis is placed on the relationships within a single, bounded, geographical area (rather than on spatial variation between areas).

The third and final approach, namely, *Regional complex analysis* is that in which the results of spatial and ecological analyses are combined. In this approach, appropriate regional units or components are identified through areal differentiation, and then the flows and links between pairs

of regions, in turns, are determined. Despite some of the difficulties associated with regional complex analysis, there are several of its features which could be applied in regional planning.

The above three approaches have greater advantage over the orthodox divisions of geography in that they stress the unity of physical and non-physical elements rather than their diversity. Geographers concerned with, say, water resources or human settlement may find a common ground in the ways in which systems are studied or in their parallel search for efficient regional units.

The work of most geographers fall within the triangle at each corner of which is situated one of the three analytical approaches to geography. Some geographers may specialize, or better still, move towards one of the three corners of the triangle. In fact, geography appears to have periodically leant heavily, in turns, towards each of these corners. For example, in the 1930s, the discipline was inclined towards the regional analysis corner, while during the 1950s and 1960s it lurched towards the spatial analysis corner. At present, geography is more inclined towards the ecological analysis apex of the triangle.

Existing and possible extended future detailed structure of geography may be approximated as listed below:

1. *General geography*:
   (a) Philosophical geography:
   Development of geography

   Theoretical geography $\lesssim$ Geographical thought,
   Conceptual geography:
   Explanation in geography
   Models in geography.

   (b) Methodological geography:
   Surveying and photogrammetry,
   Aerial photography and remote sensing,
   Geographical cartography,
   Quantitative methods,
   Research methods (and/or Field techniques).
2. *Physical geography*:
   (a) Geomorphology;
   (b) Climatology;
   (c) Hydrology (terrestrial and marine);
   (d) Soil geography;
   (e) Biogeography:
   Phytogeography and zoogeography,
   Physiological climatology and Medical geography
   Environmental geography.

3. *Human geography*:
   (a) Population geography;
   (b) Economic geography:
      Resource geography
      Agricultural geography
      Transportation geography,
      Settlement geography (urban and rural),
      Industrial geography (extractive and manufacturing),
      Marketing geography (including tertiary and quarternary economic activities),
      Recreational geography.
   (c) Political geography;
   (d) Planning geography;
   (d) Social and cultural geography;
   (f) Military geography;
   (g) Historical geography.
4. *Future Outer-space geography:*
   (a) General Outer-space geography;
   (b) Geography of individual planets;
   (c) Outer-space infrastructural geography:
      space transportation geography,
      space communication geography.
   (d) Economic geography of Outer-space.
   (e) Political and Military geography of Outer-space.

Inter-disciplinary links of modern geography:

In order to appreciate fully the relevance and links among the various divisions and sub-divisions of geography, as listed above, it is important to examine briefly those other disciplines which support geography. Like many other fields of scientific knowledge, geography is particularly dependent on the diffusion of concepts and techniques from more specialized systematic sciences, especially mathematics. Thus, in regional climatology, for example, geographers adapt models originally developed by meteorologists who, in turn draw their concepts from basic physics.

In a similar manner, the geographer's models of regional growth are modified from those of the econometrician. However, since the physicist and the econometrician both use systems of equations developed by mathematical research, both the above systems can be traced back to a common mathematical origin.

Consequently, out of the various disciplines which support geography, special importance is attached to mathematics, because it provides a common language by which geographers may express spatial, ecological and regional concepts in a concise manner on an international basis.

Apart from physics, economics, mathematics, statistics and computer science, the other disciplines supporting geography include, among many others, botany, zoology, meteorology, geology, engineering, pedology and edaphology, demography, sociology, anthropology, political science, history, philosophy, linguistics and planning.

Academic subjects, such as geography, may come together and/or be integrated at quite different levels of abstraction. A geographer may integrate by focusing the results of a number of systematic sciences on a specific regional problem. For example, how could we overcome the environmental problem of low and unreliable rainfall in the regional development of northern Kenya? By using the findings of two disciplines, such as meteorology and econometrics, in the regional analysis, the geographer facilitates the integration of the two disciplines. The latter normally start their operations from a mathematical base, and then come together again at a very abstract level, through their common dependence on mathematics, in solving the geographer's drought problem in the regional development of northern Kenya.

As in the above case, if mathematics and geography represent the two different levels at which the same concepts come together then, in mathematics the links come from the common logical structure used to derive equations; whereas in geography, the links come from the common regional context to which equations are applied. Each region introduces a set of disturbance terms into the general equations, so that the relevant region stands out as an anomaly (or a residual). If the geographers are able to define what these anomalies are and give them a rational structure, then they are well on their way to defining the elusive quality of individual regions.

Since the supporting fields are of such importance to geography, familiarity with them is essential, hence the need to include them along with the main geography programme, as parallel subsidiary courses serviced by the relevant departments. For example, if a geographer wishes to specialize in environmental problems, the main programme could be supported by subsidiary parallel courses in earth sciences, such as hydrology or oceanography, further strengthened by a subsidiary course in resource economics.

Whichever courses are elected by the geographer concerned, will depend on a combination of factors, such as: the candidate's long-term expectation; the candidate's interest, ability and the previous training background. Given below is a general listing of broad major supporting groups, indicating their constituent divisions and sub-divisions of geography involved and, thereby, demonstrating the complex inter-disciplinary nature of geography:

Earth Science group–quaternary studies, climatology and geomorphology;

Ecological group–biogeography, environmental studies, natural resources, conservation and resource planning;

Regional Science group—population geography, regional economics, regional growth and regional planning;

Urban studies group—Urban sociology, urban economics, location theory and urban geography;

Area studies group—African anthropology, African and other languages, African history and African geography.

Apart from the above groups, geographers borrow from photogrammetry and remote sensing (both parts of engineering), statistics, especially probability (from Mathematics and Computer Science) and Operational research and Spatial optimization (associated with econometrics).

PART II: ROLE OF GEOGRAPHY IN SPECIFIED AREAS OF NATIONAL PUBLIC POLICY

From the above discussion relating to geography, we have become aware of both the discipline's academic possibilities and, perhaps, some of its regional economic development planning potentials. Thus, under national policies and economic development, there are a number of facets where geography could play a major role.

Stated in a composite manner, the major roles of geography, in a variety of aspects of public policy, are in the following areas, which are vital for our development, namely;

(a) in education (in general and in manpower training),
(b) in research (both applied and pure),
(c) in planning (especially, urban and regional, both physical and comprehensive),
(d) in industry (both consultancy and direct participation in certain aspects of productive activity).

Before examining in greater detail the listed major roles of geography, it is, perhaps, in order to familiarise ourselves with the term "*public policy*". The word "policy", though in itself rather ambiguous, broadly means "*the courses of action (or inaction) adopted by any group which has the power to make its action stick*".

At senior government level, "policy" means *those public actions or attitudes sustained by the government of the day.* At slightly lower down in government, "policy" covers the tactics of the senior public and private bureaucracies, such as those of the central and provincial governments and those of the larger private organizations. Some policies are codified

by legislation or by constitution or by urban by-laws, etc. However, many of the policies are unwritten but quite effective, so long as they are regularly applied.

However, certain themes emerge and reflection on these suggests a number of ways in which geographers can more effectively influence public policy in future.

Perhaps, the leading role of geography, with the greatest influence on public policy, is that based on geographical education. In this area, the initial role lies in the designing of progressive primary, secondary and university geography programmes, specifically with a view to nation building. In other words, over and above their staple academic purposes, the over-riding goal of such progressive and, hence, comprehensive geographical education programmes is to provide an all-round geographical preparation. This is especially so in the training of the resultant manpower, which is largely orientated towards solving practical national problems, in so far as they relate to the geographer's central theme of the earth's surface. That is to say, man's environment, which provides him with both the living habitat, hence, a home, and the resources for his livelihood, hence, obviously a most crucial public concern calling for specific public policy and plans.

A glance at the spatial patterns of economic development in East Africa leaves us puzzled by the stark underdevelopment of both our natural and human resources. A closer study of the nature of this underdevelopment reveals, among other things, the pathetic national, especially, regional inequalities in many of the initial and essential elements necessary for the establishment of the very foundation of over-all economic development.

Since each of the three East African states undertakes overall economic development planning (normally, in terms of a series of five-year national development plans), it is natural that the principal aim of each of the three countries is to replace current underdevelopment with well-planned, equitably distributed, concrete and inward-orientated sustained development, fully reinforced by appropriate conservation in the process of making full use of feasible natural and human resources. The final goal, in each country, is to improve the standard of living of the *wananchi* concerned, where standard of living incorporates such crucial issues as: good health, proper education, sufficient food, employment, acceptable working conditions, adequate consumption, reasonable savings, competent transportation, enough housing, ample clothing, recreation, social security and normal human freedoms. It is in the area of improving the standard of living of *wananchi* that the many roles of geography could be harnessed to facilitate the realization of goals, policies and plans of the government.

I. Role of Geography in National Education

An illiterate society provides poor human resources for development, hence geographical education (whether formal or informal) has a special role, in this instance, in creating full awareness as to human relationships and, therefore, the need for responsible attitude towards the environment. As a delicately balanced and easily polluted medium, the environment should be regarded as, partly, renewable and, partly, non-renewable actual and/or potential resource.

Our over-all immediate environment is far more than our own, since it is meant for many other generations to come. Thus, geographical knowledge about the environment as actual and/or potential resource, should be disseminated both formally (to the youth through school and university geography) and informally (through adult mass education, especially in matters of environmental management, including protection and conservation).

The environment should be perceived as an organic whole which therefore, has its own life cycle almost continuously exposed to possible destruction through lack of appropriate management policies.

Formal education in geography, whether it be at school and/or university level(s), should aim, in all these cases, at providing self-contained training in geography, as befits the stage of geographical education. However, geographic instructions should be given in such a manner, at each of the educational levels, as to be sufficiently complete and orientated towards the national development needs and, indeed, geography for life.

Geographers should present the discipline in both its theoretical and applied contexts, so that its teaching objectives, through the various school stages to the university stages, are formulated and executed in accordance with practical national needs, thus facilitating easy realization of government policies and goals as expressed in the relevant development plans.

In order to satisfy the national needs, the school and university geographical education programmes should incorporate, among others, the following more committed objectives:

(i) To learn the nature of geography, so as to assess its potentials and limitations for purposes of national policies, development goals and plans;

(ii) To cultivate early appreciation of the need for geographers to co-operate with those in related disciplines, especially those closely linked to geography, thus facilitating a wider range of the usefulness of geography, particularly in inter-disciplinary joint investigations;

(iii) To acquire skills in geographical methodology as regards, (a) field observations, (b) methods of measuring and recording such observations; (c) techniques of analysing data collected; and (d) the interpretation of the geographical patterns of the observed phenomena, with a view to practical application of the recommendations based on both the findings and conclusions dawn from such findings;

(iv) To promote geographical consciousness of the environment as a renewable or non-renewable actual and/or potential resource, and thereby develop an attitude of involvement in proper assessment, management and protection of the national (natural and human) resources, including their conservation-orientated utilization and full development, for the equitable improved standard of living for all the indigenous people concerned;

(v) To ascertain and provide solutions for the political, economic, social and cultural barriers (both internal and external) likely to emerge (especially internally) in the form of development restraints;

(vi) To acquire a wider view of geography that facilitates our appreciation of East Africa and especially, our own national state, not merely as our own at present, but as a heritage to be preserved and passed on, in a fitter status, to the future generations and to posterity; and

(vii) To foster awareness of good neighbourliness not only with the contiguous African countries with whom we inevitably interact in trade and other beneficial contacts, but also with all the other non-African (foreign) countries of the world, ascertaining that whatever relations we have with these foreign countries (be they African or non-African), these relations do not involve us in any external exploitation and, hence, lead to no adverse external or (externally generated) internal exposure of our people to any kind of human indignity.

Apart from these common principal geographical education objectives, the university geography programme should be seen to be original, and with strong local bias and influence on a stage which allows for international orientation in terms of academic outputs and inputs, in that order. Thus, the international facet of geography should involve us in both the dissemination of the original research contributions based on local geographical topic of public concern, and the reception (with the necessary constructive criticisms) of research contributions from external (and other internal) academic and/or research communities. This practice should encourage the essential cross-fertilization throughout the structure of the

discipline and its extensive interdisciplinary links, all of which are ever-changing. In this manner, it is possible to make adjustments and/or add to the discipline's general vision and methodology. This is why it is vital that all university academic departments should have, either, reasearch wing attachments, or , at least, official access to a faculty-based Research Institute, where teaching staff could, at times, be accommodated mainly for the purposes of pure and applied research, including government and other external contract research projects to serve as sources of pooled research funds.

Geographical education may, in summary, influence public policy through:

(i) training of ordinary man-power for the many staple posts in virtually all the ministries of the government;

(ii) training university postgraduate and other research personnel both for university and the government research posts;

(iii) training the higher cadres of the civil servants and parastatal personnel responsible for translating government policies and development goals into development plans for final implementation.

(iv) training of the government environmental secretariat personnel responsible for making decisions enforcing conservation and protection of the national environment against man-created or natural hazards, and who, in co-operation with the internal environmental authorities, assist in external controls of possible adverse international environmental deterioration.

2. Role of Geography in Research and Economic Development Planning

One of the most crucial public concerns is man's environment, which incorporates his home. However, man's environment, including his actual habitat, is an important variation on the geographer's central theme of the earth's surface. Here, the geographer has developed both sophisticated research concepts and skills which facilitate substantial and effective contribution towards the solution of some of the major economic development and environmental problems already facing or are likely to face our society. For example, geographers involved in economic development planning are in an excellent position to advise the government regarding the manner in which the national earth's resources may be preserved from possible short-sighted utilization and wastage.

In the area of research, geographers are best placed in research involving water resources, outdoor recreation, urban studies, regional economic development planning, remote sensing of a wide variety of natural resources, transportation, industrial studies, environmental impact perception research, geographical information and data banking

studies, semi-arid and arid lands studies, resource management, ecosystem/ecological orientated biogeographical research, agro-climatic studies, population management, agricultural geography, etc.

Many university Geography Departments are today undertaking courses designed to train undergraduate and graduate students in planning and decision-making for purpose of handling public policy, both in physical and comprehensive economic development planning. Moreover, geographers are increasingly being included in many of the government advisory committees along with representatives from the physical, biological and social sciences in many countries of the world. Geographers now undertake important contract research projects, with excellent results, based on actual spatial treatment, thus adding an important dimension often lacking in the submissions of the other disciplines.

However, economic development planning invariably involves a complex process of policy formulation, normally viewed as comprising four stages, namely:

(a) the identification of some important problem for which there is either no policy or to solve which the existing policies are ineffective;
(b) the formulation of a policy which is intended to seek the solution of the specified problem;
(c) the implementation of the formulated policy, and
(d) the monitoring of the policy's effects, possibly leading to a new or modified policy.

However, each of the four stages is much more complex, for instance, policy formulation is most likely to require the identification of a number of possible courses of action and the subsequent selection of one of them, possibly after a long period of consultation. Normally, professional geographers are of use mainly at the first and third stages. The second stage is, essentially, a political one, in which the contributions of an individual discipline are minimal, since practical political system of thinking is rather different from that familiar to those in the academic circles.

There are several levels at which a geographical input to policy can be made. Moreover, the effectiveness of that input is likely to be conditioned, not only by the abilities of the individuals concerned and by the availability of appropriate concepts and skills, but also by the level of the administrative hierarchy at which the input to policy is made. The latter is most likely to influence both the availability of the necessary information and the extent to which the contribution is known by the policy-makers.

At one end of the various stages and levels of policy involvement is the policy-maker himself (say, a Minister), while at the other end is the relevant professional geographer (or other contract professional researchers) concerned with understanding of the problem which the policy-

maker will finally seek to solve. In between we find a variety of roles here arranged in order of decreasing influence;

(a) Senior official internal advisers, mainly civil servants,
(b) External advisers (either individuals or Advisory Board members)
(c) Research consultants (who undertake appraisals, investigate problems and suggest possible solutions), and,
(d) Unofficial critics (normally committed research and other knowledgeable scholars or pressure groups seeking to influence policy-making from outside).

However, at the highest level, the professional geographer's contribution can be made only through a general awareness of the spatial and integrated nature of the problem. How effective any contribution will be, will depend on the stage and the administrative level at which the contribution is made.

On the other hand, while the necessary conditions for making such contribution depends on the existence of a problem of great public concern which the skills and concepts of the given discipline are competent to help solve, there must also be an awareness on the part of the policy-maker, or his advisers, of the part that both the relevant discipline and the individual could play. This often depends, in part, on the channels of communication within the bureaucracy and, in part also, on the accident of personal contact and both geographical proximity and good neighbourliness. It is also likely to depend on the openness of the government and on its general receptiveness to outside influences.

The merits of the expert group encouraged by the Swedish Government (whose purpose is to facilitate close contact between the important government officials and their university academic counterparts in order to ascertain that research findings, conclusions and recommendations are used effectively, and that gaps in research which are relevant to regional policy are identified and filled), certainly deserves serious consideration by our own Government.

I can see, from the above observations, the emergence of several generalizations, namely:

(a) the choice of research topics seems to confirm the view that it is the coincidence of public concerns and disciplinary concepts and skills which largely determine the influence which a profession can have on policy (because, for geographers, most of their research topics relate to the regional theme and use (or mis-use) of resources);
(b) the conflict between policies devised in a national context and their application in certain specific localities, where they are obviously inappropriate (a good example of failure arising from

lack of spatial dimension in public policy, such as those based purely on aspatial or theoretical concepts) are issues which the professional geographer is well qualified to remedy;

(c) the seemingly increasing number of examples of policies failing to achieve their objectives, because the structure of the government is such that the relevant policies are erroneously considered sectorally (Ministry-wise), thereby conflicting with other sectorally derived policies when they are implemented. It is in this connection (where sectoral views are to be reconciled), that the geographer's concern with the greatly varied phenomena (which occupy segments of the earth's surface/space) is particularly valuable.

Apparently, the lesson of most general application to geographers, who wish to see their discipline making a more effective contribution to public policy, is the importance of understanding the structure of government and the processes of decision-making, not only because official policy-making and academic investigation present different systems of thought, but also because effective solutions may require new administrative and political structures, especially at regional and local levels.

Attention needs to be drawn, at this point, to two special needs, so far, overlooked in this presentation, namely:

(a) the desirability of anticipating the requirements of policy-orientated research, and

(b) the development of a more adequate means of forecasting the likely outcomes of particular policies.

It is obvious that, because policies are concerned with shaping the future, forecasting (both, in the wider sense, of creating scenarios of likely futures, that is, simulation modelling of a complex situation as is done in economics and, in the narrower sense, of predicting the likely outcome of present policies) is of fundamental significance.

Moreover, since decisions are constantly being made and policies (which are likely to have major effects on the geography of a country) are formulated, there is undoubtedly a justified pressing need that a major research effort should be made to improve methods of regional forecasting. However, unlike past approaches to forecasting using static or partial models, more attention should now be directed towards constructing dynamic models of systems and sub-systems, but with particular reference to their spatial (and not aspatial) attributes.

We are, no doubt, in need of a much more adequate understanding of how things change, so that we may better understand the consequences of altering some part of a given system. Thus, we require a much more adequate understanding of human systems than we at present have, if

more reliable and safer forecasting is to be achieved. Furthermore, we need a deeper knowledge of:

(a) the mainsprings of human behaviour,
(b) the motivations of the individuals, and
(c) differences between what people say and what they actually do, if satisfactory policies are to emerge to deal with, say, regional migration, environmental quality and the like.

Over and above forecasting, both the assessment of technology and environmental impact are two further aspects worth more geographical research, seeing that geographers are somewhat better represented in these areas. Indeed, professional geographers have made it in ever increasing numbers (in other parts of the world) and in respect of a widening range of issues. Geographers are, in fact, capable of making better and more numerous contributions than they are currently called upon to make, especially, in East Africa.

However, in seeking to participate in matters of public policy, the geographers should observe that, although they can handle policy matters and have most of the correct answers, they can make their best contributions in collaboration with others in the many sister disciplines in research topics where both the man in the street and, I believe, the politician recognize no disciplinary or sectoral boundaries in those policies which affect the earth's surface as the home of man.

Although it would have been appropriate under this sub-section to examine briefly progress in our own Department of Geography, I have deliberately omitted the review of both the physical and academic developmental history of the Department, including current and future research and other development trends. The reason is that these are, actually in the realm of the Departmental Chairman, who is responsible to the university authorities for all departmental policies, goals and plans, and not the responsibility of the non-chairman Professor who, apparently, has no clear departmental professional role other than those of directing research and teaching.

Personal research interests are in three major areas comprising, biogeography, urban geography and industrial geography. Considerable progress has been made in each of these areas, both in terms of published papers and books. During the last seven years, efforts have successfully been made to focus pooled findings from the above three areas of research interest onto a new and most rewarding composite area of interest, namely, regional economic development planning in East Africa.

Research in this area is much advanced, and its ample early fruits are already being richly harvested in the form of new teaching materials. Many discoveries have been made regarding, not only the natural-resource based and human-innovation based (potential and actual) develop-

ment facilities, but also detailed spatial inter-relationships of these facilities, especially, as they are likely to influence future regional economic development planning, can now be assessed. The most astonishing revelation of the continuing comprehensive research project is that our previous knowledge about the potentials of East Africa for economic development had been pathetic. Fortunately, this shortcoming is bound to be short-lived as the future research output in this area is bright.

3. Implications for the University

In order to facilitate the undertaking of contract-research for both the government and private organizations, under the umbrella of the university, with a view to establishing a pool of university research funds, it is here suggested that each faculty should have attached to it a Research Institute intended to facilitate departmental or, preferably, joint faculty interdisciplinary participation in such contract-research projects. This suggestion is, partly prompted by the fact that, as presently structured (especially in terms of much greater average teaching and administrative load each member of the academic staff is expected to shoulder), the individual university academic departments are at a disadvantage in attempting to handle such contract-research.

In fact, research-contract arrangements under the umbrella of a faculty Research Institute would be more feasible, since such projects require that the necessary findings and recommendations, etc., should be submitted to the organizations concerned on specified dates. Thus, in order to fulfill the contract demands, the relevant/suitable members of staff should be released from the pertinent department(s) to handle such contract-research projects. Obviously, they should be accommodated and provided with the necessary research facilities within the faculty Research Institute (away from possible departmental distractions) for the duration of their specified contract-research period. Consequently, after the project is completed they can then move back to the department(s) to resume their normal departmental duties.

This necessarily implies that there should be an adequate number of research posts in each department to facilitate undertaking of contract-research on a rotational basis, depending on the staff required for contract-research. While secondment of academic staff to the government ministries sounds attractive, one very much doubts the wisdom of university academic staff being so seconded. It would appear that such academic staff handling contract-research are far better off in a Research Institute's academic atmosphere, which should naturally discourage the rusting tendencies likely elsewhere. Of course, a certain flexibility should be allowed, affording short period exchanges, involving the accommodation of special government ministries' research personnel in the university Research

Institute(s), and vise versa for university academic staff to be accommodated in the said government ministries. Such exchanges have certain advantages, such as:

(a) bringing fresh experience and critical thinking to bear on the problems of government ministries departments, the university and industry, by facilitating closer liaison amongst them;

(b) the emergence of research centres of excellence, brought about through cooperation involving inter-government-industry and university research personnel pooling their very best talents.

It should be emphasized that, while contract-research should have an important place in the professional scholar's research commitment, the rest of the non-contract research should concentrate on theoretical aspects, especially in those that are crucial in the development of the relevant discipline's frontiers of knowledge, and which are likely to find future practical application. In other words, it would be a serious mistake to confine our research efforts on contract-research, for we must keep in the theoretical research forefront for purpose of new discoveries. To encourage this, we could take advantage of the masses of data from contract-research, which should offer excellent theoretical experimental media than the lean data obtained from the more limited university research funds. Indeed, contract-research, by virture of its generous data provisions and its other advantages, may more conveniently allow insight into the real world, which may be far more helpful in the development of more reliable concepts in our theoretical work. Moreover, contract-research should be utilized to strengthen our theoretical research, especially where it provides an opportunity to devise and test new techniques of measurement, etc..

Apart from many other advantages accruing from contract research in favour of the advancement of our theoretical research, attention is here drawn to one serious disadvantage of contract researches, namely, that the relevant researchers are often not allowed to publish their findings. While this negative aspect of contract-research may be regarded as a necessary evil, there is no doubt that such contract-researches expose the scholars concerned to problem-orientated and/or policy-based aspects of real life in the field of, say, applied geography. They are, thus, invaluable for providing concrete actual experience and, indeed, most essential for us in matters of nation building.

Reference was made earlier about university research funds being pooled together from proceeds based on government and private organizations contract-researches, under the umbrella of university faculty Research Institutes. It is here, further suggested, that such faculty Research Institutes, preferably working jointly, are in a better position to establish a university contract company wing to undertake, effectively,

the various government and private contract-research projects, assigning the projects according to tested talents and taking full advantage of the inter-disciplinary capability of the varied university academic structure, emphasis being placed on the very best combination of talents on an inter-faculty basis.

Sooner or later, one sees the possibility of the university research-contract company establishing an industrial wing, probably around a nucleus formed by the long-awaited university printing press, but extending into actual manufacturing based on the professional and feasible non-professional faculties.

The positive early good relationships with the National Council for Science and Technology augers extremely well, both in the case of liaison with the various government ministries and, even, with private organizations, in promoting the suggested contract-research concept and the muted possibility of university industrial enterprises.

"The climaxing of the science of geography . . . should create that unity of knowledge without which all learning remains only piece-work".

Immanuel Kant.

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