MAIN STAGES OF DEVELOPMENT OF GEOGRAPHY

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Summary

Geographical perceptions can be traced from very ancient cultures, although geography as all sciences developed during the Enlightenment, but it was in the early nineteen century when it was firmly established based in many aspects in the Darwinian revolution. Chinese geographical writings are considered the first predecessors, followed and developed during the Greek and Roman times. Pilgrimages, travels for trade and the discovery of new lands contributed significantly to the geographical knowledge, as it did the astronomical discoveries. The Germans, Humboldt and Ritter, are considered the fathers of modern geography, the first on the line of physical geography and the second on the human aspects. After them and up to the present, new

directions have developed within geography, mainly due to the introduction of quantitative and technical tools and to the recent globalization.

1. Introduction

The history of geography is closely connected with the history of human society and its development. It is part of human interests, and precedents can be found in all ancient cultures. But as a science, geography is relatively young and many of its fundamentals appear during the nineteenth century.

For Kish Geography is as old as man's search for soil to dig for plantings, for a path that leads to water, for a trail to a place where hard rock for arrowheads may be found. But Geography is also as new as man's current search for ways to relieve urban congestion, to establish well-marked international boundaries, to describe and analyze vegetation patterns in remote parts of the earth.
While the first geographical references are from travelers describing the landscapes and the people living in them, the first scientific studies are from mathematicians and physicists interested in the environment. It can thus be said that the foundations of geography are in the natural sciences, from the need to explain the physical environment and also on the idea of the influence of this environment on humans and society.

Livingstone asserts that for generations, geography has been intimately involved in exploration, at least since the time of Muslim scholar-travelers, the voyages of the Scandinavians, Chinese, and medieval Christian adventurers. But it was with the European voyages of reconnaissance, during the fifteenth and sixteenth centuries, that this first-hand knowledge of the world contributed most decisively to coherent body of geographical knowledge of the terrestrial globe. The significance of scientific travel was mainly due to Alexander von Humboldt through his explorations in South America.

The knowledge explosion occasioned by the European voyages of exploration brought new cartographic challenges and accomplishments. Although around the Mediterranean, Portolano Sea charts had been circulating for a long time and there already existed various *Mappaemundi*, the new lands discovered had to be reduced to paper. Gerard Mercator solved some of the mathematical problems associated with transferring a sphere to a flat surface with his famous map projection. In the following centuries, geography's close links with cartography continued to be maintained. The map, as both graphic language and visual representation, continues to be used as a geographical tool, at present with the invaluable assistance of remote sensing and Geographical Information Systems.

The first work entitled G*eography* was written in Alexandria, in the third century B.C., by Eratosthenes. From those beginnings the study of the earth as the home of humans, of earth processes, and of the distribution of terrestrial phenomena has continued to our day. Writings range from biblical texts and early Greek explanations to the first formal statements on geography as a science, written between 1650 and 1850.

2. The Predecessors

2.1. Chinese

Kish presents several Chinese geographical writings taken from the work by Needham and Wang Ling, *Science and Civilization in China.* The section dedicated to earth sciences includes examples of early Chinese geographical writing.

The oldest Chinese geographical document is *The Tribute of Yü,* written during the 5th century B.C. and considered the first naturalist document in Chinese history. It is a survey of several provinces of China, including their soils, agricultural products and great rivers. Needham and Wang Ling believe it may be contemporary with the work of the Ionian geographer-philosophers.

Other Chinese geographical documents are descriptions of southern regions and foreign countries, written during the first millennium of the Christian era. A much later book (fourteenth century) deals with Chinese trade with lands around the Indian Ocean and beyond.

A Chinese pilgrim, Hsüan-Chang, wrote on Indian cosmography and on the lands and peoples of southern Asia during the 7th century A.D. Fa'Hsien, 5th century A.D., describes his pilgrimage travels. It has to be borne in mind that to Buddhist a travel to India is similar to the Muslims pilgrimage to Mecca. Chau Ju-Kua dealt with Chinese overseas trade and maritime expeditions of the 13th century, a book of the typo of a geographical encyclopedia

Slaymaker, in *Physical Geography*, asserts that from the five types of Chinese geography recognized by Needham and Wang Ling there are three that bear on physical geography: hydrographical books and coastal descriptions (5th century B.C.), local topographies or gazettes (4th century A.D.), geographic encyclopedias (4th century A.D.). In addition, the Chinese cartographic tradition, culminating in Chu Ssu-Pen's map of China (1311-1320) was significantly ahead of European work at the time.

2.2. Greek and Latin

The principles of geographical writing were formulated in the days of Greek and Hellenistic science. Homer's *Iliad* and *Odyssey* (9th century B. C.) are often considered to be the first geographical works, in the sense that they provide detailed descriptions of the people and places visited.

For Kish, Hesiod's poems represent the earliest written traditions of our Greek heritage. Hesiod (8th century B.C.) wrote about the yearly cycle in the life of Greek country folk. *Works and Days* has been called a shepherd's calendar, and describes the march of the seasons and the associated environmental changes. In the poem *Theogony,* he describes the power of the winds over the lives of men.

Holt-Jensen explains how scholarly Greek writers produced topographical descriptions of places in the known world, discussing both natural conditions and the way of life of the people living there. Herodotus (485-425 BC), although considered the father of history, described geographical events in a geographical setting, and some of his

writings are truly geographical in character. He not only described geographical phenomena as, for example, the annual flow of the Nile, but also attempted to explain them. In addition, he incorporated older sources of geographical information, including the existing maps. In this way Herodotus used earlier theories and descriptions which would otherwise have been forgotten.

It was Aristotle, about a century after Herodotus, who produced observational evidence for a spherical form for the Earth. The scholars at the Museum in Alexandria were then able to establish the foundations for the calculation of latitude, longitude and the size of the Earth. In the 3rd century B.C., Eratosthenes (276-494, BC) made the first accurate estimation of the length of the Earth circumference with an error of only 90 km in respect to the present knowledge and has been considered as the father of scientific geography. Of equal importance was his development of systems of coordinates for the world, latitude and longitude, which he used to locate places and to measure distances. This made it possible for him to draw the first rather accurate map.

Hippocrates of Cos (460- 360 B.C.), although best known for his contributions to medicine, was one of the first writers to take into account the relationship between the environment and the health and general character of men. Aristarchus of Samos (c. 3 10-230 B.C.) is remembered both for his practical and his theoretical contributions to geography. He occupies a place in the history of geographical ideas for his elaboration of a heliocentric theory of the universe.

The travels of Greek merchants and seamen produced two of the earliest genres of Greek geographical writing. The *periplus,* which provided detailed information about distances at sea and anchorages near land, and the *periegesis,,*a more general view of the major bodies of water. Sea charts, the first relatively accurate maps known in the Western world, may well have been first developed during Greco-Roman times in the Mediterranean. Navigation, trade and travel were an essential part of the life of the Greek city-states. From an early date Greek merchants and seamen traveled not only throughout the Mediterranean but beyond jt, westward to the Atlantic coasts of Europe, eastward to Arabia, Egypt, and India. The reports of these travels-describing business ventures, military undertakings, and diplomatic missions-were preserved in both written and graphic form

The writings of the Latin encyclopedists were based on the work of their Greek predecessors. During the late Empire and through much of the Middle Ages, the Latin-speaking West, unable to read the original sources, relied entirely upon these Roman authors of handbooks. Vano, Pliny, Pomponius Mela, Solinus, and Macrobius were read, copied, and later still, printed-while Aristotle, Hipparchus, and Strabo were only names in a long list of authorities quoted in geographical writings.

Holt-Jensen explains how the topographical tradition of Greek geography was carried forward into Roman times. Strabo and Ptolemy can be considered to have had the most direct influence on the future shape of European geography. Strabo (64 BC—AD 20) wrote a work of 17 volumes called *Geographica*. This was largely an encyclopedic description of the known world whose chief value was that it preserved for posterity many writings that he annotated and cited. *Geographica* also included attempts to

explain cultural distinctiveness, types of governments and customs in particular places. The significance of natural conditions for cultural development was discussed in relation to a number of places, especially in the description of Italy.

The contributions of Ptolemy (2nd century A. D.), who was an astronomer, were descriptions of the known world that he called chorography, emphasizing that geography was concerned with the whole Earth and that therefore the mathematical sciences are central to geography. Ptolemy (AD 90-168) wrote a major work in eight volumes, which is now known as Ptolemy's Geography. The first volume explained the principles for calculating the dimensions of the Earth, its division into degrees, calculations of latitude and longitude, and a discussion of map projections. The eighth volume contained maps of different parts of the world. Other volumes included tables of latitude and longitude for 4000 places.
Although it was widely known how to calculate geographical latitude from the altitude of the Sun in Ptolemy's time, calculations had only been made for a handful of places. The calculation of longitude was then only possible by estimating the length of journeys from one place to another and so many of Ptolemy's locations for places were erroneous. His biggest mistake was to underestimate the size of the Earth, rejecting the almost correct estimate of Eratosthenes in favor of a reckoning made by Posidonius in about 100 BC.

3. Middle Ages

3.1. Muslim Geography

While accomplishing the pilgrimage to Mecca, Moslems traveled across much of the Old World relying on written geographical information and often adding greatly to it. The Moslem contribution to geography took many forms. Possibly the most important was the translation and absorption of knowledge from various sources, mainly from Greeks. The preservation of these writings was essential later on for the revival of geography in the Christian world. A second contribution was the compilation of geographical descriptions of the world of Islam, which extended from the Atlantic to the Pacific. Muslims also made original contributions in mathematical geography and surveying.

With the rise and spread of Islam (7^{th} to 14^{th} century A.D.), Muslim geographic knowledge increased considerably as a result of travel for religious and economic reasons. Geography has always been a special interest to Muslims as many religious rituals such as fasting and prayer required the appropriate knowledge of time and direction. This sense of time and direction encouraged an early stage the development of relevant instruments for measurements. One of the earliest observatory stations was established by the Arabs in Damascus, Baghdad and Cairo.

During the Middle Ages the Muslims had more advanced culture than did most of medieval Europe, specially in Al-Andalus. They had made great discoveries in various fields and, above all, preserved many of the writings of ancient Greek, Roman and other oriental civilizations. Learned men with knowledge of Arabic and Hebrew translated into Latin many manuscripts. The centers of learning in Muslim Spain were thriving,

with scholars from many places and particularly so from Europe. Spain became the land of contact between Islam and Christianity. As Arabic was the language of culture and learning, many books were translated from Arabic into Latin and other European languages including German, French and English. It is worth mentioning that during the X century there was an important school of translators in Ripoll Monastery, in the Catalan Pyrenees near the French border. Gerbert d'Orlhac, who became Pope Sylvester II (999-1003), obtained in Ripoll his scientific background that he later introduced in Europe

Pilgrimage to Mecca gave way to the production of detailed travel guides. Al-Idrisi (1099-1180) completed a descriptive geography in 1154 that described the towns and territories of many places, the nature of agriculture and settlements, and the extent of its seas, mountains and plains. Ibn Khaldun (1332-1406) is a more substantial scholar, whose contribution to historical geography was major.

One of the more outstanding and original contribution of Muslims to geography were in the field of regional and mathematical geography, as well as in surveying. Although most of the studies were concerned with regions or individual countries, some contributions were highly specialized dealing with only one topic, such as climate or plants. The regional approach is represented by the many books written with the title *Al-Masalik wa Al-Mamalik* ("Roads and Provinces") and those with the title *Al-Bilad* (Countries). The treatment in these regional studies covers all aspects, both physical and human.

The influence of Ptolemy's geography on the first generation of Arab geographers was considerable, and most Arab writers looked at the work of this Greek scholar with admiration and respect. Most Muslim geographers such as Al-Maqadisi (945-1000) followed the scientific method in compiling their works. The zeal of the Muslims to travel to collect accurate firsthand information may be revealed by the examples of Ibn Battuta (1304-1368) whose journeys covered over 75000 miles and took 28 years to complete, and Al-Maqadisi (945-1000) who was willing to pay up to 10000 dirhams to finance his travels.

On the whole it may be said that Muslim geographers paid less attention to the physical aspects of geography as compared to the human ones. Nevertheless there was reference to landforms, oceanography, climatology and biogeography. Human geography covered almost all the modern branches, such as cultural, urban, medical and economic. The contribution of Muslim geographers to cartography during the Middle Ages amounted to hundreds of maps and diagrams.

3.2. Christian Geography

The earliest contribution of Christian geography was, like that of Muslim contributions, the production of guidebooks for pilgrims, in this case traveling to the Holy Land. This can be exemplified by the *Bordeaux Itinerary* and by Bishop Eucherius' *Epitome . . .about certain holy places.* A second type of Christian geography is based entirely on scripture, as in the case *Christian Topography* by Cosmas. The third genre was the

encyclopedia, a form already well established in Roman times, being the best example the *Etymologiae by* Isidore of Seville.

It is to the Byzantines that we owe the survival of Ptolemy's work, but few examples of actual Byzantine geographical writing exist. One is that of Procopius, a historian of the age of Justinian and the second that of Constantine VII, an emperor-statesman who ruled the Byzantine Empire during the tenth century.

David Livingstone suggests that the translation of Ptolemy's *Geography* into Latin in 1410 was a milestone, not least because he had devised a system of geographical coordinates by which any point on the surface of Earth could be identified. The new availability of this work, together with the use of the compass since the 11th century, and the idea that the ocean was not so much a barrier to movement but rather a waterway, stimulated taking seriously the possibility of westward exploration.

The age of discoveries, which mostly took part during the late fifteenth and early sixteenth centuries, navigators managed to circumnavigate Africa opening a direct sea route to the spice lands of Southern Asia. And a New World was found to the west, later called America, and by sailing around its southernmost extremity it was possible to sail around the whole world. The result was a complete change on the view of the world and of geography.

While the *Cosmography* of Martin Waldseemüller, a humanist-scholar of the turn of the sixteenth century, has still a traditional concept of geography and is only slightly affected by the discoveries, the real geographical change of view comes from the descriptions of the Portuguese voyages along the African coast and into the Indian Ocean and of Columbus' reports of his travels. It is interesting to note that Columbus never accepted to have found new lands, thinking that he had arrived to India, due to the fact that his calculations were based on Ptolemy's, which underestimated the real length of the earth circumference instead of those of Eratostenes that were more correct.

The writings of these navigators produced a great deal of geographical information. Columbus describes the first glimpse of the West Indies in his *Journa*l (1451-1506) preserved by the Spanish historian Las Casas, and on his formal report to Ferdinand and Isabelle. The letter is the oldest authentic document of the European presence in the New World. He writes of high mountains, broad sketches of country, forests and extremely fruitful fields excellently adapted for sowing and grazing, building dwelling houses, excellent harbors, and a wealth of rivers. He also mentions differences between islands. He also describes the inhabitants, their appearance and way of living.

The best maps showing the results of discoveries were drawn, engraved, and published in Italy. But the credit for reforming geography, for giving up-at least in part- the exclusive reliance on classical and biblical authorities, and for introducing personal observation belongs to the German humanists.

4. Early Modern Times

4.1. Astronomy and Universal Geography

As Kish points out, Cassini, a seventeenth century astronomer, determined the exact time of the appearance and disappearance of the satellites of Jupiter and published these data in an astronomical almanac, the *Ephemerides*. French scientists working under Cassini's direction were able to develop an accurate method of determining longitude. The result of their work was a world map, published in 1696, bearing Cassini's name; which was the first map giving the longitude of a number of places around the world.

The introduction of optical instruments into the field of geodesy enabled scientists to accurately measure an arc of the meridian. These measurements were carried out by several expeditions led by French scientist on the equator, in Lapland and in France. The final computation led, in 1791, to the establishment of the metric system. The French surveys had also confirmed Newton's definition of the earth as a rotational spheroid.

Geographical writings at first followed closely the established custom of presenting a general view of the earth, its shape, and dimensions, as did Philip Cluver in his *Introduction to Universal Geography*, a text that was popular during the first half of the seventeenth century. The first work to introduce a more disciplined approach to the subject of geography was the *Geographia Generalis* of Varenius, published in 1650. It was reprinted in 1672 and again in 1681 in Cambridge, where Isaac Newton used it as a text for his students. The works of Cluverius and Varenius were standard until the middle of the eighteenth century and bring us to the threshold of the development of modern geography as a discipline. About Varenius contribution to geography see Section 4 in *Geography*

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Bibliography

Abler, R.F., Marcus, M.G. & Olson, J.M. (eds.) (1992). *Geography's Inner Worlds: Pervasive Themes in Contemporary American geography*. Rutgers University Press, New Jersey [This book presents comprehensive account of contemporary American geography focusing on what geographers of all specialities have in common intellectually]

Buttimer,A. & Wallin,L (eds) (1999). Nature and Identity in Cross-Cultural Perspectives. Kluwer Academic Publishers, Dorchecht [This book explores some of the fundamental ideas which have shaped Western attitudes toward the natural world..."]

Chorley, R.J. & Haggett, P. (Eds.) (1967). *Models in Geography*. London Methuen [A collection of papers presenting the model approach in different branches of geography]

Davies, W.K.D. (1972). *The conceptual Revolution in Geography*. University of London Press Ltd. London. [A collection of emphasizing the change in geographical approach that gives primacy to methodology, the role of ideas and the systems approach]

Dickinson, R.E. (1969). *The Makers of Modern Geography*. New York: Friederich A. Praeger publishers. [A classical book on the history of geography and the scientists that were protagonists]

Haggett, P. (1979). *Geography. A modern Synthesis*. Harper International, New York [The most widely priced textbook presenting the range of geographic topics presented as a stimulated introduction to the discipline]

Hartshorne, R. (1939). *The Nature of Geography: A Critical Survey of Current Thought in Light of the Past*. Lancaster, Penn.: Association of American Geographers. [A classical treatise on the nature of geography emphasizing the regional aspects]

Holt-Jensen, A. (1981). *Geography its history and concepts. A student's guide*. Harper & Row Publishers. London. [A clear and complete guide to the ideas ans focuses in geography]

Huntington, E. (1924). *The Character of Races as Influenced by Physical Environment, Natural Selection and Historical Development*. New York: Charles Scribner's Sons [The book that presented for the first time a deterministic interpretation of geography]

Hull,O. (1964). *Frontiers of Geography*. Macmillan, London [The book introduces some of the topics that relate geography to the problems of everyday life]

Johnston, R. J. (ed) (1985). *The future of Geography*. Methuen & Co. Ltd. London. [A collection of essays on the content, philosophy, methodology and social implications of geography]

Johnston, R. J. (1997). *Geography and Geographers: Anglo-American Human Geography Since 1945* (5th Edition). London: Arnold. [The book is basically a reconstruction from published material of philosophical and methodological debates within human geography]

Johnston,R.J. & Claval,P. (eds.) (1984). *Geography Since the Second World War*. Croom Helm, London [A collection of papers presenting several modern trends in geography]

Kish, G. (ed.) (1978). *A Source Book in Geography*, Harvard University Press, London. [This volume is composed of examples of writings that may be called geographical, chronologically ranging from Xinese, biblical, early Greek anad muslim texts, to the first formal statements on geography as a science.]

Livingstone, D.N. (1992). *The Geographical Tradition: Episodes in the History of a Contested Enterprise*. Oxford: Blackwell Publishers. [A look at what people have taken geography to be over the years and to acknowledge the transformations that the geographical tradition has undergone, specially under the impact of Darwin]

Needham,J. & Wang Ling (1970). *Science and Civilisation in China*, Cambridge University Press, Cambridge.

Peet, R. (1998). *Modern Geographical Thought*. Blackwell, Oxford. [A detailed critical account of the development of thought in twentieth century geography.]

Stoddart, D. R. (1966). "Darwin's impact on geography." *Annals of the Association of American Geographers*, 56.3: 683-698. [Documents the decisive importance of Darwin's ideas in the development of geographical thought.] ...]

Stoddart, D. R. (1975). 'That Victorian science': Huxley's Physiography and its impact on geography. *Trans. Ins. B. Geogr*., 66. [A historical review of the evolution of geography and of the influence of the physiography approach

Stoddart, D. R. (1986). *On Geography and its History*. Oxford: Blackwell. [A source book on the modern history of geography]

Biographical Sketch

Maria Sala is Emeritus Professor of Physical Geography at the Department of Geography and Regional Science, University of Barcelona, and has a BA (Hons) degree in Geography (Physical Landscapes) and a PhD (Hons) degree in Geography (Fluvial Geomorphology) from the University of Barcelona.
Maria Sala founded and leadered the GRAM, Mediterranean Environment Research Group, which is recognized and funded by the University of Barcelona and the Catalan Autonomous Government. Her current research interests lie in the fields of fluvial geomorphology, soil and slope erosion, catchment hydrology and water quality. Work in these fields has mainly been undertaken in the Catalan Coastal

Ranges although through cooperative work she has done research in UK, German Alps, Tunisia, Portugal, Argentina, Mexico. Fundamental research is applied to environmental problems, mainly increased runoff and flooding as a result of expanding urban land use and forest fires. Recent and current research has attracted substantial funding from a number of sources including CICYT (Spanish Ministry of Education), CIRIT (Catalan Council for Research), EU.

Recent investigations include: Hydrology and sediment dynamics in Mediterranean mountain catchments, Effects of prescribed burning in soil parameters and in the increased runoff and erosion, Morphological changes and sediment transport in the bed of a Mediterranean river, fluvial transport of suspended material: sources, routing, storage and yield.

She has been visiting scientist at the Center de Géographie Appliquée, Université. Louis Pasteur, Strasbourg, under the guidance of Professor Jean Tricart (Climatic geomorphology, 1975) and at the Department of Geological Sciences, Seattle, under the guidance of Professor Thomas Dunne (Fluvial and slope processes, 1984)

Regular courses taught included: Physical Geography, Geomorphology, Erosional Processes in the Slopes, Hydrology of Surface Waters, Theory and Methods in Physical Geography, Fluvial Geomorphology, Hydrography and Soil Geography. Invited courses include: Geomorphological Processes, at the Departamento Geografía, Universidad Autónoma, México, (1983), and Fluvial and Slope Processes, at the Departamento de Geología, Universidad de Salta, Argentina (1991). At the European level she is the Spanish coordinator of an ERASMUS Inter-University Cooperation with the Universities of Strasbourg, Amsterdam, Barcelona, Berlín, St. Andrews, Uppsala and Cáceres

Maria Sala has contributed to several research groups, like the European Society for Soil Conservation (ESSC), where she has served as Vice-President (1988 -1992) and Council Member (1988-1996), and the International Geographical Union, where she has been the Chair of the Study Group on Erosion and Desertification in Regions of Mediterranean Climate (1992-1996) and of the Commission on Land Degradation and Desertification (1996-2000). She is member of several International Journals Editorial Boards, such as Earth Surface Processes and Landforms, Zeitschrift für Geomorphologie, and Geomorphology of Brazil Journal.

Scientific publications include more 80 articles, 33 at an international level. Chapters in books amount to 19, the most significant of the international ones on Regional Geomorphology of the Iberian Peninsula and on Mediterranean fluvial and slope erosion. Books published are 17, the one considered most significant being Conacher, A. and Sala, M. (Eds.)(1998): *Land Degradation in the World's Mediterranean Environments-Nature and Extent, Causes, and Solutions*, John Wiley, London. In Spanish it is worth to mention she has published, together sith Ramon Batalla, *Teoría y métodos en geografía física*, Editorial Síntesis, Madrid.