

GEOGRAPHY

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Summary

Geography is defined as an environmental science that studies the interactions between the geosphere and its components with the biosphere and the anthroposphere. Geography stresses integration and interdependence between these spheres. In this sense it serves as a bridge between natural science and social science disciplines, with particular emphasis on studying the conditions required to support human life. Although geography's wide embrace may be seen as one of its weaknesses, it is also a strength and an attraction. There is a geographical basis to most unresolved political problems, and geographical reasons to explain them.

The history of geography is basically the history of interactions between nature and society, or society and nature. Human perception of the environment has always played a major part not only in human history generally, but also in the daily struggle between individuals and the environments within which they live. Concepts like *milieu* or *genre de vie* can be fruitful guiding principles for understanding those interrelationships. Geographers study the total environment. They seek to understand the processes that form physical and cultural environments, and the interplay among these environments. The results of individual studies may have wide applicability.

Because geography bridges the natural and the social sciences it plays an important role in our social world, since many problems call for an understanding of the interdependence both of human activities and of natural and cultural environments. In this sense, one of the future trends of geographical research will be the study of environmental change in the inhabited world at all time scales, from the distant past to the present, and into the future. Indeed studying environmental change is an integral part of the discipline, and includes the study of changing spatial patterns in physical environments such as landscape, climate, water, vegetation, and soil dynamics. It also

focuses on identifying the degree and underlying cause of change where human activity is involved: in other words social/environmental change, and the role of economic and political forces driving it.

Interest in geography can be traced throughout human history. The first geographical references come from travelers describing landscapes and people. Systematization of the discipline was begun by Bernhard Varenius in the seventeenth century. Its full development, however, which took place in parallel with the development of the natural sciences, is due to Alexander von Humboldt and Carl Ritter during the following century. Geography became fully consolidated as a university discipline in the twentieth century. The controversies generated by the tensions between different approaches (environmental determinism and possibilism, regional and general geography, quantitative approaches), along with the exponential growth of research, have led to the development of several different branches of geography, as in many other disciplines.

1. Introduction

In general terms it may be said that geography is “about” discovering the spatial relationships between the manifold and diverse physical and human features of the earth’s surface, but geographical attitudes, ideas, principles, and proceedings have evolved greatly through time. At present its practitioners follow many paths that might appear, at first sight, divergent.

We have tried to present this theme in the simplest manner possible, based on how the subject matter is taught presently in universities. We have introduced modern subject matters in the physical, human, and technical topics, with articles that go far beyond a simple description of places and travels. It is a choice that implies a scientific and positivist view of geography today.

The theme has been divided into four main topics: *Foundations of Geography*, *Physical Geography*, *Human Geography*, and *Technical Geography*. The scope of the foundation topic is to present an overview of the basis of the geographical field, its scope, history, methods, and its educational importance. The articles included are “Main stages of the development of geography,” “Theory and methods in geography,” and “Geographical education.”

The physical geography topic includes the historical background to the geographical study of the natural environment, and the main fields cultivated by geographers. It consists of eight articles on basic research fields, namely “Geomorphology,” “Climatology,” “Hydrology,” “Biogeography,” “Soil geography,” “Coastal systems,” “The ocean system,” and “Mountain geocology.” Three articles on environmental issues related to land-use and nature conservation—“Natural resources,” “Natural hazards,” “Land degradation and Desertification”—are also presented.

The human geography topic deals with the main fields of human activity. Seven articles discuss the current research fields: “Historical,” “Population,” “Cultural and social,” “Agricultural and rural,” “Industry and transport,” “Economic activities and world enterprise,” and “Urban.” Three further articles consider subjects developed more

recently, such as medical, political, and tourism geographies. Finally, the Regional approach is presented as the most traditional and integrative field.

The technical geography topic presents a range of subjects that provide essential tools to geographical research, teaching, and practice. On one hand it includes geomatics, one of geography's classical subject matters; on the other it introduces modeling of geographical systems, a field that has gained an important place in modern geography. It contains two articles related to the most traditional geographical techniques: geodesy, topography, mapping, and atlas production. The other three articles present modern techniques now very widely used by geographers: remote sensing, geographical information systems, and modeling.

Applied geography has not been included as a specific topic because it concerns all geographical fields. For that reason it has been discussed in each of the articles dealing with both physical and in human geography.

2. Scope of Geography

2.1. Definitions

Classical definitions of geography refer to it as a discipline that studies the earth as the home of humanity. Because the surface of the earth is the focus of geographical study, and is composed of natural and cultural features, geography is the science of the physical environment and of its interrelations with society. It also studies the spatial organizations that these relationships determine. Thus it embraces the natural and social fields: it is obvious that geography cannot be exclusively a natural or a social science. This duality is one of the essences of geography. From this dichotomy developed the two main branches of geography: physical geography and human geography.

Geography has also been regarded as a science of synthesis at the crossroads of various scientific disciplines. On one hand it is located amongst the earth or natural sciences, from geology to meteorology, hydrology, and biology. On the other it is placed amongst the social sciences, from history to economics and sociology. Geography is a science of multiple approaches. Its variable orientations make it very sensitive to social conjunctural issues, and it responds to the need for global knowledge. It involves in-depth investigations of the environment, population, and economics. For example, desertification is fundamentally caused by over-grazing and over-intensive farming, and the removal of trees and shrubs for firewood. The root cause of desertification may be poverty, however, and poverty itself may have its own root causes. A geographer would investigate the distribution patterns of desertification, but would also be concerned with the interaction of desertification with human factors, and other related issues.

Because a geographer cannot acquire encyclopedic knowledge, he or she becomes a specialist in the investigation of one or another of geography's domains. Some of these abide largely, or even entirely, in the physical or in the human domain; others are more richly informed by interactions between the two realms, for example studies of natural resources, environmental perceptions, human ecology, regions, and landscapes.

The dual character of geography is both problematic and advantageous. It has been reflected in the work of geographers since the subject's origins, and is the main reason why geographers are continually discussing the objectives, methods, and unity of geography. This unity cannot be a methodological one because of geography's use of the methods of both natural and social sciences; instead it can be defined as the study of the relationships between these two worlds. It can become a philosophy of nature and of the environment occupied by humans, considering both dogmatic (natural determinism) and dialectic (forces that give way to constant evolutionary interactions) processes. At an international level, the dual character of geography is clearly reflected in the International Geographical Union's membership of two scientific organizations: the International Council for Scientific Unions (ICSU), which embraces all associations of pure and natural sciences; and the International Social Sciences Council (ISSC), where all social sciences are represented.

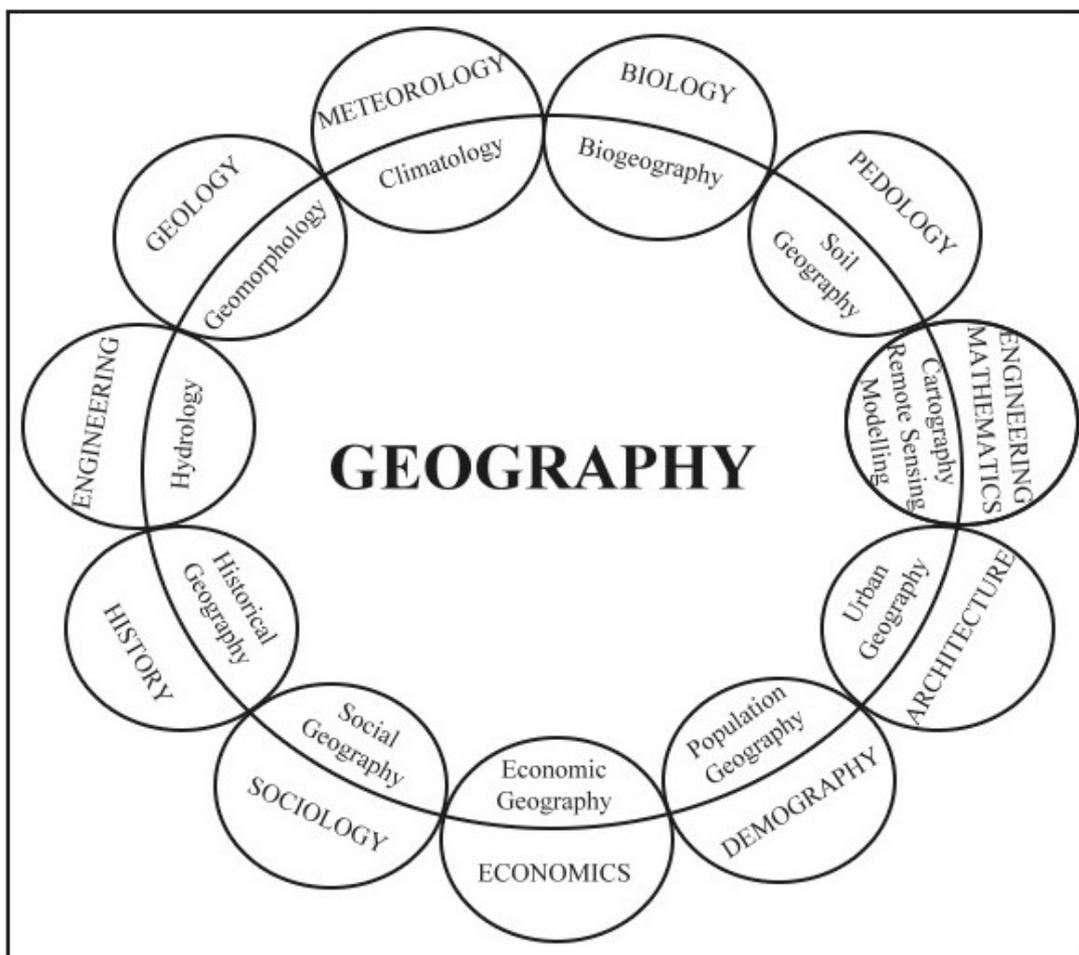


Figure 1. Relationships of main geography fields with other sciences

In conclusion geography, in aiming to bridge the natural and human sciences, acts as an intermediary between the environmental–ecological–conservationist approaches and cultural–social–development studies. Although the environment and its conservation is

a crucial issue, a geographer is also fundamentally concerned with the living standards of humankind.

2.2. Physical Geography

The study of the physical environment comprises investigation of its components: relief, climate, water, vegetation, and soils. These components may be studied, initially, in themselves, and thereafter with the assistance of different natural sciences, such as geology, meteorology, hydrology, botany, and pedology. A second fundamental approach for geographers is the study of the physical environment as the provider of natural resources, such as water and minerals. A third approach is the study of natural hazards.

Some authors, for example Holt-Jensen, point out that geography is founded in the study of the physical environment. In the United States William Morris Davis, the founder of modern physical geography, was of the same opinion. In Spain Huguet del Villar, the first modern geographer from the country, considered also that geography has to be based on physical geography due to the influence of the physical environment on human life, and on human knowledge of the earth and its potential resources. He advocated the study of human societies in relation to the best use of available resources.

Physical geography is grounded in the concepts of an objective, positive, empirical, science. It has its roots in eighteenth- and nineteenth-century exploration and discoveries. These led to the development of a natural science, based on the theory of uniformitarianism proposed by Hutton, Playfair, Lyell, and Geikie, and on the Darwinian appreciation of change through time. It intends to understand the earth's environment through positivist methods. At present it is mainly focused on the study of the processes that occur at the earth's surface. Physical geography includes understanding the environment in relation to society, studying human modification of environmental processes and patterns, and appreciating the physical base for environmental assessment and management in resources geography. In addition, physical geographers play leadership roles in the development of geographical methodologies, including systems theory, remote sensing, geographic information systems, and the application of quantitative models.

2.3. Human Geography

Human geography covers the study of human population, and its various activities on the surface of the earth. It deals with agriculture, urbanization, industry, economics, trade, and transport, and includes consideration of the political and social aspects of human life. Modern human geography includes introduced empirical and quantitative studies to develop and test hypotheses as a basis for theories and laws governing spatial processes.

For Doreen Massey, human geography has traditionally been distinguished by its concern with three relationships. First, there is the relationship between the social and the spatial: between society and social processes on one hand and the nature of the spatial organization of both on the other, Second, there is the relationship between the

social and the natural, between society and “the environment.” Third, there is the concern which geography shares with history in particular with the relationship between different socio-economic elements: economics, social structure, politics, and so on.

History, sociology, and economics are especially important to human geographers. The diversity of viewpoints amongst human geographers results from the profound complexity of the human world, and the fact that understanding each aspect of this “world” must be sought from a different, although perhaps complementary, direction. Each mode of thought suggests different approaches and questions at different scales: dominant positivism, existential humanism, Marxist or radical thought, gender perspectives, or some other paradigm. Each mode reveals different realities.

2.4. Landscapes and Regions

For geographers, regardless of their respective specialisms, the physical and human worlds constitute the elementary fabric of spatial understanding. A landscape can be seen from different perspectives. It may represent nature, a human habitat, an artifact of human activity, a system, a problem, a reflection of wealth, an expression of ideology, a history, a place, or an aesthetic reality.

The human–environment interaction, and the ways in which humankind has changed the earth, are key issues in this geographical field. Environmental determinism was a logical consequence of the ideas of evolution and positive science that prevailed in the late nineteenth century. In its contemporary sense, environment is seen as a landscape whose characteristics may be buffered or accentuated by human action and that can be addressed through a variety of approaches. A change in perspective from the dominance to the primacy of society is illustrated by studying different societies in similar environments that could host different human adaptations. A variant of possibilism—probabilism—posits that, for a given society, one possible outcome among many is more likely or probable. Technological materialism emphasizes technology as the dominant factor that determines both society’s use of the environment and its own socio-economic complexity. As we have seen, for many human geographers the world is created by human perception, intention, and behavior.

Geographers today conceive of human–environment interactions from the viewpoint of systems, components within which are mutually interactive and causal. The roots of this viewpoint can be found in Sauer’s concept of the cultural landscape, which recognized a mutual interaction between society and the environment. Anthro-geography focused on the cultural landscape as an artifact of human interaction with the environment, an environment that is both a “cause” affecting society and an “effect” of society’s activities.

2.5. Methods and Techniques

The system of geographical sciences also includes several specific techniques, such as geodesy and cartography, which allow understanding of the earth’s scale, and the principles and methods of mapping. The map is the primary tool of every geographer. Nevertheless, geography utilizes many methods and techniques for recording and

observation. Direct field observations are especially important, although contemporary advances in other areas such as aerial photography and remote sensing take the subject to a higher level of sophistication. Statistical methods support the spatial analysis of quantitative data, especially census and survey data.

Some geographers represent their worlds with words, others make maps, and still others prefer graphs or mathematical models. Words, maps, and models all express geographic phenomena and forces, as well as the understanding geographers bring to their classifications and explanations. In spite of the different viewpoints and representations they choose, geographers share a deep conviction that environmental and human processes create the reality in which humankind lives, and that these processes are keys to understanding the complexity of places.

2.6. Applied Geography

Geography has many uses. It combines knowledge of the basic physical characteristics of the world in which we live and the complex interrelations between humans with nature. Many application of geographical knowledge result in the formation of applied branches of geography within, and a strong geographical component to, such fields as medicine, defense studies, politics, and so on. Geography promotes ecological awareness and understanding, which in turn encourages commitment to protect our beautiful world.

Geographers' worlds also vary according to their professional responsibilities. Academic pursuits such as teaching and research, government services, private sector employment, citizen participation, and activities by voluntary organizations give rise to different but complementary worlds. Indeed, because every person must navigate within built structures and traverse outdoor locations in the course of daily life, everyone is inherently a geographer. Place and places are part of every human life.

2.7. Geographical Education

Rod Gerber (University of New England, Armidale, Australia) is the author of "*Geographical education*" in EOLSS on-line, from which this summary is taken. He considers geographical education to be a complex concept that can be understood by explaining its relationship to the discipline of geography, detailing its aims, explaining its place in both formal and non-formal education, and considering what its essential components are.

The way in which people learn about different approaches to geography, develop the skills required to conduct geographical investigations, embrace the values associated with these approaches, and practice them in their lives is known as geographical education. In the school curriculum, geography involves the education of young people *about*, *in* and *for* the environment and society in which they live. In that sense geography becomes the medium for education. It contributes to education through imparting knowledge and understanding *about* people and environments anywhere in the world, through fieldwork enabling learning *in* the community and *in* the local

environment, and through learning *for* the society and *for* environments that the people live in.

The *International Charter on Geographical Education* (IGU–CGE, 1992) identifies the aims of geographical education in terms of the knowledge, skills and attitudes, and values that people will develop through its study and practice. This knowledge and understanding includes: study of locations and places to establish a framework for geographical events, and to understand basic spatial relationships; study of major natural systems of our planet to understand how ecosystems interact; study of major socio-economic systems of our planet to develop a sense of place; appreciation of the diversity of peoples and societies to understand the cultural richness of humanity; studying the structure of regions and the processes which go on at regional level; and understanding global interdependence.

Attitudes and values developed through geographical education include:

- interest in, and curiosity about, the natural and human features on the earth's surface
- appreciation of the landscapes in which people live
- empathy for the different living conditions of people around the world
- readiness to use geographical knowledge and skills adequately and responsibly in private, professional, and public life
- respect for the equal rights of all people.

These attitudes and values influence the way in which people use geographical knowledge. They can influence how we find solutions to local, regional, national, and international problems that focus on society and the environment. Also, they influence how we understand the environmental impacts of humans' behavior—as individuals and collectively as societies—and may help them make sound decisions about environmental utilization.

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Biographical Sketch

Maria Sala is Titular Professor of Physical Geography at the Department of Geography and Regional Science, University of Barcelona, and has a B.A. (Honors) degree in Geography (Physical Landscapes) and a Ph.D. (Honors) degree in Geography (Fluvial Geomorphology) from the University of Barcelona.

Maria Sala leads 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. Research in these fields has mainly been undertaken in the Catalan Coastal Ranges, although through co-operative work she has done research in the UK, the German Alps, Tunisia, Portugal, Argentina, and Mexico. Her 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), and the EU. Current investigations include: *Hydrology and sediment dynamics in Mediterranean mountain catchments*; *Effects of prescribed burning in soil parameters and in increased runoff and erosion*; *Morphological changes and sediment transport in the bed of a Mediterranean river*, and *Fluvial transport of suspended material: sources, routing, storage, and yield*.

Professor Sala has been visiting scientist at the Centre 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 include: Physical Geography; Geomorphology; Erosional Processes in Slopes; Hydrology of Surface Waters; Theory and Method in Physical Geography; Fluvial Geomorphology; Hydrography and Soil Geography. Courses taught by invitation include: Geomorphological Processes (Departamento Geografía, Universidad Autónoma, Mexico, 1983), and Fluvial and Slope Processes (Departamento de Geología, Universidad de Salta, Argentina, 1991). At a European level she is the Spanish co-ordinator of ERASMUS Inter-University Co-operation between the Universities of Strasbourg, Amsterdam, Barcelona, Berlin, St. Andrews, Uppsala, and Cáceres.

Professor Sala has contributed to several research groups, including the European Society for Soil Conservation (ESSC), where she has served as Vice-President (1988–92) and Council Member (1988–6), and the International Geographical Union, where she has been the Chair of the *Study Group on Erosion and Desertification in Regions of Mediterranean Climate* (1992–6) and of the *Commission on Land Degradation and Desertification* (1996–2000). She is member of the editorial boards of several international journals, such as *Earth Surface Processes and Landforms*, *Zeitschrift für Geomorphologie*, and *Geomorphology of Brazil Journal*. She has been a member of the Technical Advisory Committee of the Centre for Environment and Development for the Arab Region and Europe (CEDARE) since 1990.

Professor Sala's scientific publications include more than eighty articles, thirty-three at an international level. She has contributed nineteen chapters to books, the most significant of the international ones dealing with regional geomorphology of the Iberian Peninsula and Mediterranean region fluvial and slope erosion. She has produced seventeen books, that considered most significant being Conacher, A. and Sala, M. (eds.), *Land Degradation in the World's Mediterranean Environments: Nature and Extent, Causes and Solutions*, John Wiley, London (1998).