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## Geographical DNA

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Geograficzne DNA

### ABSTRACT

The article shows the results of a study undertaken to search for a model illustrating the development of geographical thought. The created model, formulated with a triad that defines geography: human being-space-time, displays levels merging geographical sciences. These joining elements created by geographers, more or less consciously cooperating with the representatives of other sciences, seem to be the essence of the unity of the continuously spreading study range of geography.

**Key words:** geography, history of geographical thought, division of geographical sciences, geography unity

### INTRODUCTION

All considerations concerning the evolution of geographical thought are necessarily full of mysteries and puzzles for a researcher. He/she feels much better in the worldly environment in which the contemporary history of geography takes place. Yet an overwhelming need tells us to go back to the roots and search for the interpretations of the past.

In the history of geographical thought there has been no epoch more favourable to know the geography mystery of 'unity in multitude' than the one which we live in. Moreover, it is noticeable that the contemporary geographical thought is characterized by an intensified analysis of cultural geography, a field of geography which is predisposed towards a holistic vision of the surrounding reality. Not only do the studies and discussions concerning it touch upon the issues connected with the natural and socio-economic geographical space, but they also go deeper. The

world available for the senses has been enriched with a landscape of experiences and emotions, beauty and delight, identity and value.

This article is an attempt at providing an insight into the history of geographical thought from the perspective of ‘elements’ joining geographical sciences created in time. These elements constitute an essential place in the structure of geographical thought, called a model of geographical DNA by the author.

### GEOGRAPHICAL DNA – AN OUTLINE

If one wanted to graphically illustrate the development of geographical sciences, one would need to draw two mutually interweaving spiralling strands (Fig. 1). While the black spiral symbolizing the natural environment represents physical geography, the grey one, on the other hand, depicting the anthropogenic environment – socio-economic geography. What needs to be emphasized is the fact that the rising thickness of the spirals corresponds to the quantitative growth of different geographical sciences, disciplines and branches and, at the same time, to the evolutionary spreading of their study areas. It needs to be added that a continuous extension of these areas (especially at the initial and contemporary time of science development) was, to a great extent, conditioned by a continuous wish of geographers to give geographical knowledge a practical character. It is important to note that the development of individual disciplines usually took place according to three stages, one following the other one: 1) satisfying the basic existential needs, 2) satisfying curiosity of the world, 3) a wish to explain the genesis of phenomena and processes that accompany a human being. For instance, in a geographical discipline undertaking studies concerning hydrosphere, the original subject matter of scientific considerations seems to be a river. The basins of the Tigris and the Euphrates for Mesopotamia, or the one of the Nile for Egypt, are examples that prove the thesis of a priority of future potamology. A wish to get to know the rules of the existence and character of water courses (a river regime, needless to say) contributed to a formation of foundations for hydrometeorology and hydrogeology. Their further development (especially of the latter), with the participation of knowledge concerning the field of paludology, allowed to satisfy the basic need of a human being, which is safety. The thought to practically use water led to the birth of another branch of hydrology – applied hydrology (contemporarily called engineering hydrology or technical hydrology). Among the engineering water-balance tasks one can include making use of a murmuring stream. Thus, water-wheels were very popular, especially in those parts of the world where you could find mountain rivers. When rivers flowing through human settlements became unfit for human consumption, drinkable water had to be extracted from the ground or imported with aqueducts from mountain springs. A search for spring regions and a further observation of their dynamism enriched human knowledge

which should be associated today with crenology. What happened next? Curiosity of the world and geographical discoveries (for example, within the limits of the Mediterranean Sea in the ancient world, on the North Atlantic Ocean among the Vikings, or on Lake Titicaca in Incan times) caused a further growth of hydrologic disciplines or subdisciplines. With a simultaneous contribution of descriptive hydrology, called hydrography (here, the author takes into account especially river, ocean, and lake mapping), proto-oceanography, proto-limnology, and next proto-glaciology. In more recent times, hydro-experts, with a contribution of scientists of other natural sciences such as physics, chemistry or biology, created hydrophysics, hydrochemistry and hydrobiology... And so, based on the example of hydrology, we will unintentionally watch the inevitable specialization process which, according to J. Wojtanowicz (2006), caused individuality of scientific fields and branches of geography being a reason for separation and even individualization of some of them.

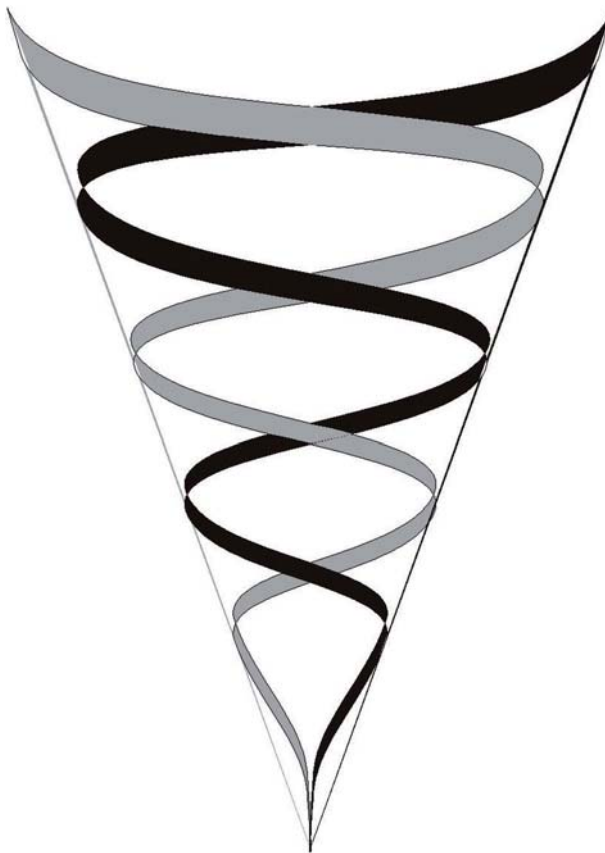


Fig. 1. A geographical model of DNA

However, let us come back to our considerations concerning the issue of a geographical model of DNA. Next to the two spirals illustrating natural space and a human being, the last element of the geographical triad, i.e. time, also plays an important role in the schema. In the suggested schema (Fig. 2), by going up we deal with linear time (in geography it is geological and historical time), whereas the serpentine shape of the strands is supposed to symbolize cyclicality (astronomical time, geomorphological time, water circulation time, circulation cycle of rock materials). This cyclicality, but in another – unique and linear – time dimension, makes geography unpredictable in its predictability.

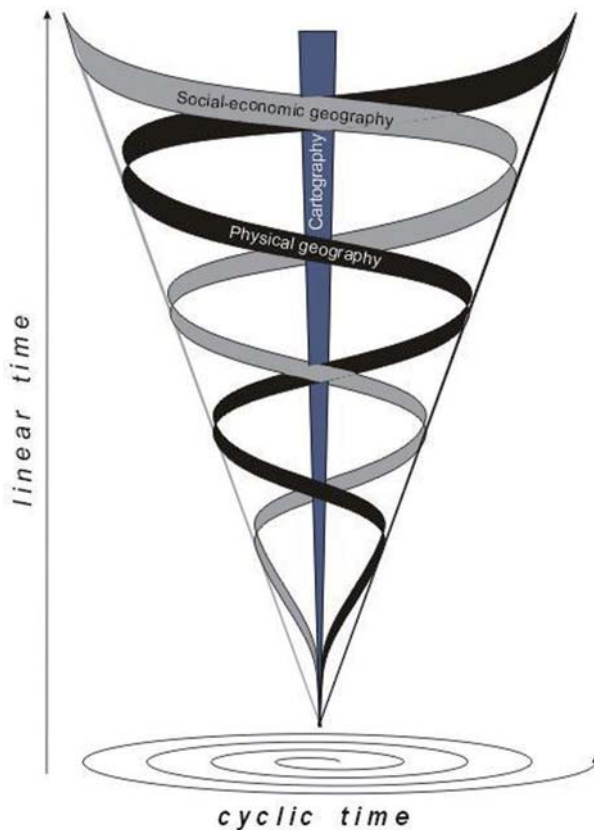


Fig. 2. The place of time in the geographical model of DNA

In order to make our two strands characteristic of vertical stability, we ought to supply the geographical model of DNA with the vertical. Let us call it “the backbone of geographical sciences”. It is cartography (Fig. 2). It occupies the central position among geographical sciences not because it is more abstract than the other ones, but due to the fact that it attracts and gathers a great deal of represen-

tatives of probably all geographical sciences. Moreover, owing to the original role of geography which boils down to a description of distribution of objects on the surface of the Earth, cartography seems to be the oldest discipline in the system of geographical sciences. Thus, it is privileged to occupy a specific place in the geographical DNA. A map, being a product of cartography, with its specific language characteristic of symbolism and generalization, has been popular among geographers from time immemorial. It seems that a map itself has become the proto-source of stimuli that integrate geographers who attempted to close objects of the spherical three-dimensional world in a two-dimensional one. To do so, with a help of mathematics, they transformed a geographical coordinate system into a map projection. Since that event, the Earth appears to be more imaginable (of course, as far as its availability conditioned by the history of geographical discoveries is concerned), and even closer to a human being. It should be noticed that as it is with the case of both spirals, the perpendicular of geographical DNA was also gradually extending. Looking for new solutions (of the issue of methods of presentation of the material, among others) and using newer and newer technological advancements, cartography experienced and still experiences its evolution, not only quantitative, but also a qualitative one.

It needs to be emphasized that thinking about geography is not possible without consideration of its links to other sciences. This openness of geographical sciences is characterized by mutuality. Deriving methodological solutions as well as achievements of other sciences, whether natural, social or technical ones, geography offers them its own solutions. As it is pointed out by Wojtanowicz (2006), by deeply analyzing the structure of geographical sciences, new branches of science are coming to existence; for instance, paleogeography or geoecology.

Let us notice that geography was called a mathematical science from the very beginning. It can be said after Ptolemy that geography was created to measure the globe in relation to the sky (celestial bodies), and to measure *terra firma*, its parts and quantitative features. With time passing by, it appeared that geography not only dealt with measurements, but it also interpreted the results. What is more, these activities took place within various spaces and analytical structures, not only physical but also socio-economic ones, cultural – to be specific (present both in the sphere of material culture and spiritual culture).

This variation of phenomena analyzed by geography leads to a situation in which it needs to use, to a greater or lesser extent, the accomplishments of other academic disciplines. The branches which geography has been linked to are: mathematics and statistics; among natural sciences: astronomy, biology, chemistry, physics, geology, and among social sciences: history, political science, sociology and economy. Commercialization of science in recent times, on the other hand, which is pointed out by, among others, A. Lisowski (2011), “forced an increase in importance of the technical function associated with a generally under-

stood shaping of local and regional space, which made geography close to applied sciences: special economy and town-planning”. Designing a geographical chain of DNA, we cannot omit other sciences which are presented in the schema (Fig. 3) with a help of small symbolic spirals coming from the outside.

It follows from the presented studies that geography is closely linked to other sciences. However, it needs to be mentioned that its individual disciplines and branches form also (or even first of all) their own structures, more or less correlated with each other. The evolution of some of them led to such a stage of development of the structure of geographical DNA in which original interdisciplinary forms were created. And it is these relational spaces, one could say trans-disciplines which strengthen the thesis of science unity, that we are going to deal in the next part of the article.

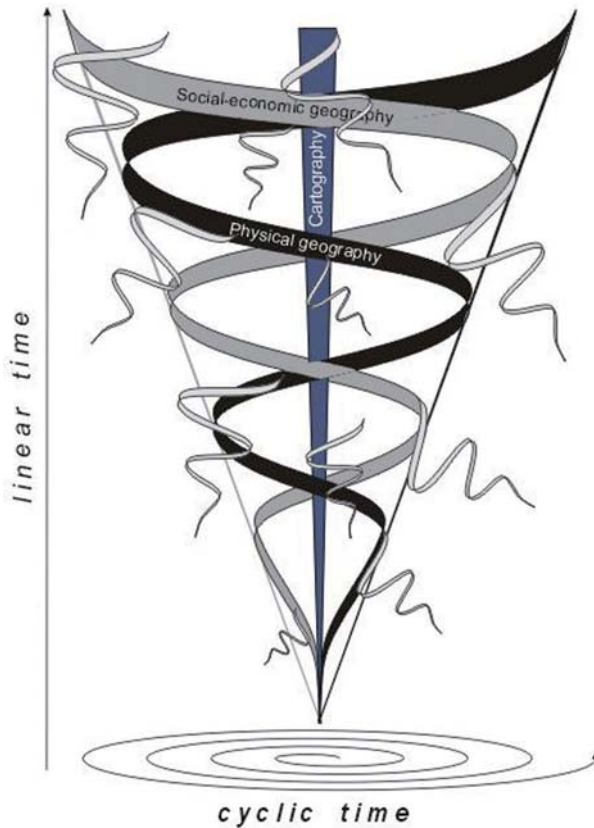


Fig. 3. Relations of geography with other sciences in the geographical model of DNA

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## GEOGRAPHICAL HOLISM – INTEGRATION LEVELS

Holism (Gr. *holos* ‘whole’) – a view according to which all phenomena create overall structures which are subjects to specific regularities impossible to conclude on the basis of regularities that rule their elements. Translating the above-mentioned definition into the language of geography, we can conclude that the world forms a kind of a whole. The world is a place of mutual relations between natural phenomena and processes, and human life and activity. Therefore, we need to remember that particular phenomena in the reality of the world are inextricably linked. What is more, from a holistic point of view, it is the cause-effects relations which are of great importance in the surrounding world. In turn, when we look at the system of geographical sciences from the perspective of holism, we should put forward a thesis of their common origin, and the same creative force of their representatives, which is expressed in the willingness to learn the interdependence between the Earth and human beings, or human beings and the Earth. For some, this anthropo-geographical view of interdependence was the same with dependence of human life on natural conditions, whereas for others, it was synonymous to humans making the most of natural environments.

The above-mentioned theses became an inspiration for further search of elements of geographical DNA. This time, these were integration levels, which are schematically presented (Fig. 4) in the form of parallel circles, limited by the strands of both spirals. It should be highlighted though that this graphic illustration is aimed not at symbolizing the limitations of the levels but at showing the need for close interdependence of both spirals. Additionally, we need to take into account the fact that the created “levels of integration” are subject to a universal factor of time. It seems then that a better graphic example to illustrate such a state of affairs is replacing the circles by solid figures, with the shape similar to cones facing downwards (Fig. 5). The proposed layout would suggest successive development of isolated structures. It is worth mentioning that the following (located in higher positions) levels are in a way a continuation of the previous integration forms. Nevertheless, each of them is found in a different spatiotemporal reality of the system of natural sciences. That is why they were accompanied by a new methodological approach.

Five main levels of integration were distinguished in the geographical DNA model. The starting point of the first integrating stadium seems to be the meeting of a sun’s ray with a grain of sand and a drop of water. According to A. Pol (1850) we could talk about three geographical life powers: lands, waters and air circles. As a result of observation of such a beautiful creative meeting, *geomorphology* was formed. Another breakthrough in – let us call it – the evolution of integrating geography was made when it became clear that natural space was not a distinguishing feature of geography. The need to contact a creature able to make

irreversible changes in the natural environment, both positive and negative to the environment, and the creature itself. A human being, located in a specific natural space, became a factor integrating the scope of geographical sciences. A human being is the most effective cause of changes made to this natural space. On the basis of natural and anthropogenic elements, *regional geography* is born, and then *ecology*. Another strategic moment in the creation of an interdependence network was based on the discovery of boundless whole. The previous understanding of space just in physical terms was too shallow. A higher reality was needed, and it was spirituality. *Humanistic geography* and *cultural geography* became the scientific ways of linking the material world with the non-material one.

A lot could be written about each of the five levels of integration. In this article, I do not want to present a detailed history of each of them. It is essential to get to their guiding principles of their creators and practitioners. There was also a search for other, non-geographical sciences which were aimed at integrating the science. It is in this way that the analysis of particular levels of integration is made.

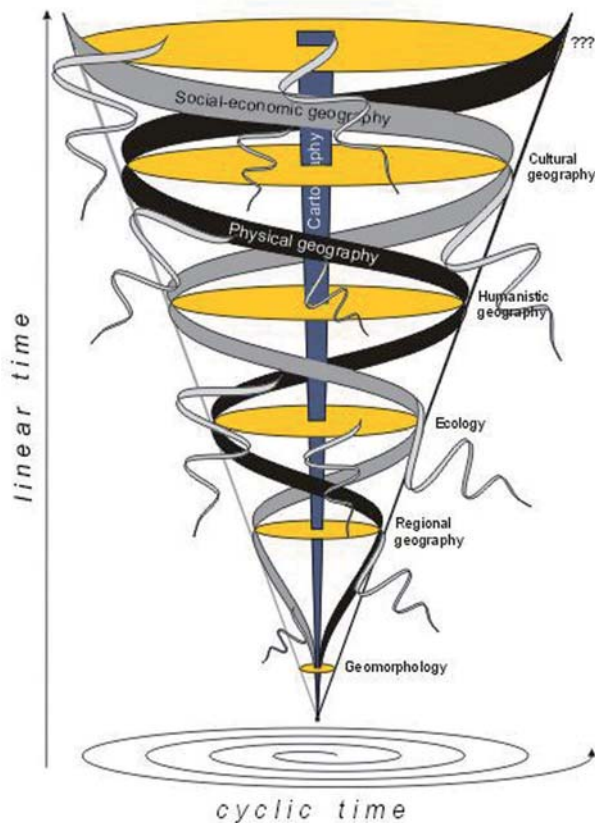


Fig. 4. Levels of integration in the geographical DNA model



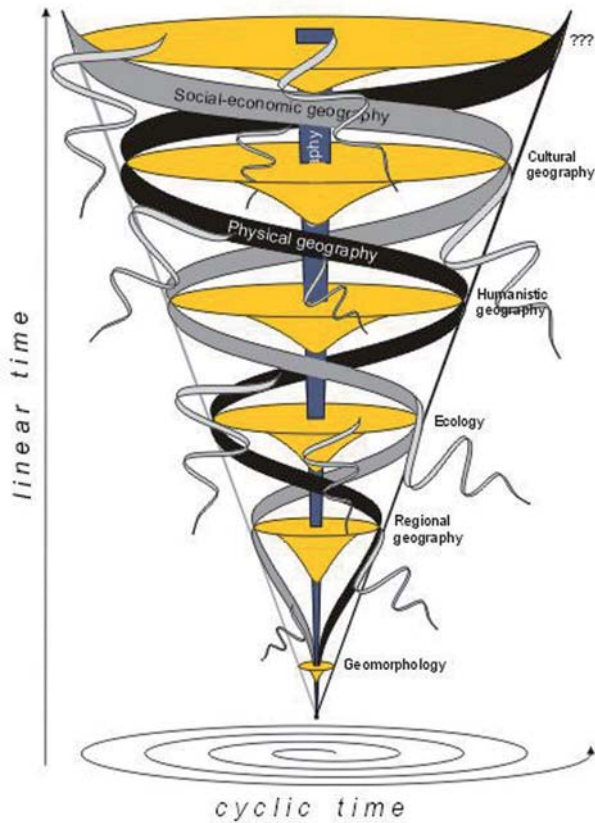


Fig. 5. Geographical DNA model

Trying to answer the question “How did the idea of integration of geography evolve?”, we need to get back to the beginning. The Earth was born out of fire. That is how the lithosphere was made. Volcanoes set free some gases which formed: clouds (atmosphere) and oceans (hydrosphere). The battle between the three elements constantly shaped the planet. It is this shape that became the subject of study for geomorphology, which tried to reconcile the clashing powers of three geospheres: earth, water, and air. It should be added that the resulting area of study became the basis for the whole geography, both in the general sense, as well as from the perspective of its particular disciplines. After a careful analysis of such a clash, based on the observation of the past in the light of the present, geography – according to W. Nałkowski (1904) – “had to become one with geology”. The seal put to the processes which integrated sciences at the lowest level of the geographical DNA model, was the combination of history and the geomorphological-geological union. As a result, archeology was born. The influence of geography on history was stressed

by a 19th-century writer, J. Michelet who is attributed with the sentence: “there is no history without geography” (after: Duszyńska 1957). It should be noticed that human beings, as the key subject of history studies, developed because of their relations with environment they lived in. They quenched their thirst, walked on the fertile land, appreciated the warmth of the sun and a gust of wind, made use of stone.

## REGIONAL GEOGRAPHY

Regional geography was born out of a scientific attempt to justify the regional cult. Development of research methods aimed at showing the distinctiveness, and sometimes uniqueness of phenomena and processes on the studied area led to the integration of geography as a science. The essence of studies on regions, which is the product of historical activity of numerous factors, was the search for human identification with the place in a particular geographical space. Centers needed to create this “connective tissue” were: continuity of natural reality, and the accompanying human existence. The work of regional geographers was based on building bridges between nature (animate and inanimate) and human beings. The building material was cultural heritage found in a particular region. That is how geography became a natural-economic union caught in the historical-political context of material and non-material culture. It is this centuries-old cultural continuity that grew on the natural ground, and which constitutes the basic feature of the region and which “through a system of rites was deeply integrated with the landscape” and “yearly rhythm of phenomena taking place in nature”, which was highlighted by M. Z. Pulinowa (1999).

## ECOLOGY

When the two threads of “geographical DNA” (physical geography and socio-economic geography) started to diverge once again, ecology filled the gap. It was an answer to the increasingly more intensive destruction of the natural environment. Scientific thought was accompanied by a more and more popular idea that the further human development and the development of human environment should be channeled and directed. Necessary plans had to be drawn up after a careful analysis of, on the one hand, the societies’ needs, and the possibilities offered by the natural environment, on the other. In the light of the fact that a biological part of landscape is very sensitive to negative anthropogenic influences, ecology was seen as a potential to enrich geography with biotic elements. At the same time, there was a chance to get back to correlations between geographical phenomena and processes from a holistic perspective. Finding the interdependence in the studied reality turned out to be vital (Grzybowski 1984). Biology, chemistry, and physics played an important role in integrating sciences.

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## HUMANISTIC GEOGRAPHY

Humanistic geography put human beings and humanistic values in the center of its attention. It rejected an objective and emotionless stance and introduced a subject emotionally bound with the surrounding natural environment. The basic aim of humanistic geography seems to be the understanding of human beings, not only in terms of their physical appearance, intelligence, emotions, but also in terms of their spirituality (Kaczmarek, 2003). J. Flis (1983) seemed to be particularly right when he wrote “geography cannot be limited only to description of physical features, which are accessible to the sense of sight, and which could be evaluated in terms of aesthetics. Nor does it deal with literary descriptions of countries (...) Geography should become a nomothetic science. By analogy, writers describing people in their literary works do not only rely on descriptions of appearance together with some aesthetic evaluations, but also try to get an insight into their spirituality, intelligence and character”. Hence, geographers discovered new possibilities of studying human beings coexisting with other human beings in certain space. The significance of sense organs and their role in perceiving space, understanding of body behavior with assessment of feelings of change; knowledge of individual’s fate and interacting groups were deemed useful. Useful to a lesser extent were: individual religious experience, and related ontological features of individuals, groups, and places. Researchers found the whole human activity interesting. The consequences of such an approach was making geography dependent on reality created in human minds. The efforts of holistic geographers were not isolated. They were supported by sociologists, psychologists, psychoanalysts, anthropologists, and philosophers.

## CULTURAL GEOGRAPHY

Cultural geography became an extension of humanistic geography. Whereas the subject study of geomorphology, ecology, and regional geography was quite precise, material earthly space, then humanistic geography and its successor, cultural geography go beyond the real world into the abstract sphere. Cultural landscape is something more than a form where natural and economic processes take place. It is a sphere of spiritual processes connected with cultural development. Paraphrasing T. Mann (1982) it should be noticed that cultural space “hour after hour leads to internal changes, similar to those caused by the flow of time, but in a way superior to them”. To the fundamental geographical questions: where? why? to what extent?, some other fundamental question concerning humanity was added: what is the sense of it? That was the beginning of the search for the answer to questions such as: what is reality? What is time? What is the meaning of life? What is the effect of the surrounding space on my system of values? The pro-

blems that cultural geography deals with made geographers think about ontological problems.

Cultural geography, synthesizing various forms, kinds and effects of human activity, created specific scientific borderland, in which the real space is mixed with mental world, places experienced by senses are mixed with places experienced spiritually, objectivity is mixed with subjectivity, landscape morphology is mixed with metaphors of iconosphere. This phenomenon of borderland, according to K. Rembowska (2002), enables geographers to study relations between “people (their minds and emotions) and landscape, tries to perform the function of anthropology and philosophy of places, and semiotics of cultural landscape. It raises the status of the category of human ideas, of the character of their relations with places, of the meanings and values of human creation”.

## CONCLUSIONS

Things exist as long as there is someone who observes them.  
Jean Paul Sartre

Geographical thought has been developing for years along a certain route. Beginning with studies of external forms of nature, it focused its attention on the role of rock, water, and air in the relation of the Sun and the Earth. Then, to this inanimate world, it added the animate world with human beings in its central point. The created two scientific worlds, physical geography and socio-economic geography, developing dynamically within their scopes, formed strong mutual relations. Thanks to their differences and diversity, they could enrich each other and develop together. However, they were also a source of many problems. “The specialization and differentiation processes – according to A. Lisowski (2011) – were accompanied by integration and unification processes. On the one hand, a growing number of disciplines and scientific specializations is a reflection of efforts made at more effective research by concentrating on selected spheres of reality. On the other hand, it can be undesirable because of the growing distance between the researchers, and isolation and particularism of some disciplines and specializations”.

In this place, quoting E. Romer “depth of geography should be based on the number of geographical relations which are a part of a given phenomenon or a concept” (after: Zierhoffer, 1969), we need to highlight the special predisposition of geography to perceive reality as a whole. An expression of that are the common research grounds for geographers. Hence, in the history of development of geographical thought, which requires true engagement from researchers, and concentration on the common areas, there appeared: geomorphology, regional geography, ecology, humanistic geography, and cultural geography. It should be mentioned though that this development, happening quite slowly over the years, sometimes

with long breaks after which it gained its momentum, was not a single act. In its cyclic rhythms it underwent the following stages: sowing, sprouting, growing, blooming, bearing fruit, and dying. It should be also stressed that the stage of dying was not a stage of decay. It was the stage allowing to create elements which brought geography together.

It should be also stated that it much more difficult to be a geographer now than in the past, whether distant or recent. These days there are many more contradictions which should be reconciled. Geographical thought, as it is also the case in everyday life, is richer in a specific stage. This thought draws richly from the century-old heritage and experience, which extend the analysis. This analysis enables to understand science holistically, evolution of its stages, current state, and also a prognosis of the future research. We may only regret we did not take part in the development of geographical thought at the time of Herodotus (5th century BC), an authority in geography in the antiquity and the epoch of humanism; Eratosthenes from Cyrene (about 276–195 BC), who was the first person to calculate the circumference of the Earth, and combined mathematical, physical, and regional geographies into one branch of knowledge; Strabo (about 63–24 BC), who studied the influence of the natural environment on culture, and created the basis of political-military geography; Claudius Ptolemy (AD 100–178), who provided a description of the Ecumene; Bernhardus Varenius (1622–1651), the author of general geography and of the first system of physical geography; Stanisław Staszic (1755–1826), who studied nature not only in its geologic aspect; Jan Śniadecki (1756–1830), who described the Earth in a mathematical and physical way; Alexander Humboldt (1769–1859), who was the co-founder of hydrology, geophysics, and geobotanics, and who divided geography into general and specific geography, and advised environment protection; Carl Ritter (1779–1859), a supporter of regional understanding of phenomena, hence the precursor of regional geography, also called the father of cultural geography; Wincenty Pol (1807–1872), who represented poetic-descriptive trends with his landscape studies, and who advised looking at the space bounded by the Oder and the Dnieper River as a geographical whole; Oscar Peschel (1826–1875), the founder of physical geography; Friedrich Ratzel (1844–1904), the classic anthropologist, the creator of the concept of *Lebensraum*, i.e. the living space; Paul Vidal de la Blache (1845–1918), who paid attention to landscape aesthetics, the founder of regional trends in contemporary geography; William Morris Davis (1850–1934), the author of the theory of a geomorphological cycle; Waclaw Nałkowski (1851–1911), who presented common geography in a reasonable and demonstrative way; Albrecht Penck (1858–1945), one of the founders of common geography; Alfred Hettner (1859–1941), who tried to integrate physical and anthropogenic trends in geography by a chronological approach; F. C. Sauer (1860–1942), who came to a conclusion that all the human traces left in the landscape refer to culture, history, and need some ecological

interpretation; Jean Brunhes (1869–1930), who looked for a socio-psychological basis for the community called nation, or Eugeniusz Romer (1871–1954), who tried to present relational and holistic features of his atlases. We do not know, however, if an isolated perspective facilitates or not, a better understanding of geography, its significance, role, and finding one's own place in the geographical world. It should be highlighted that in finding one's own place, one should be responsible by adapting a "for" approach. Paraphrasing F. Blachnicki's words "possessing oneself in giving oneself", we could adapt a new motto of a holistic geographical development, which could read: "develop your specialization so that you could enrich other specializations in unity".

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## STRESZCZENIE

„W rzeczywistości dokładne ograniczenie pola badań geograficznych jest przedsięwzięciem złudnym. Nauka ta styka się ze zbyt wieloma naukami i jest zbyt zainteresowana pozostawianiu w styczności z nimi, by móc nawet pragnąć tego ograniczenia”.

Emmanuel de Mortonne

Niniejsze opracowanie stanowi próbę wejrzenia w historię myśli geograficznej z punktu widzenia „elementów” scalających poszczególne, wykreowane w czasie, dyscypliny geograficzne. Elementy te stanowią istotne miejsce w strukturze myśli geograficznej nazwanej przez autora modelem geograficznego DNA.

W celu graficznego przedstawienia rozwoju nauk geograficznych zestawiono dwie obiegające się wzajemnie szarfy w kształcie spiral. Jedna z nich, symbolizując środowisko przyrodnicze, reprezentuje geografie fizyczną. Druga natomiast, obrazując środowisko antropogeniczne – geografie społeczno-gospodarczą. Dla ich wertykalnej stabilności model zaopatrzonego w pion, tzw. kręgosłup nauk geograficznych, którym jest kartografia. Zwrócić należy uwagę na to, że rosnąca w schemacie grubość trzech wspomnianych wyżej, w istocie fundamentalnych elementów geograficznego DNA, w ujęciu wertykalnym odpowiada przyrostowi ilościowemu dyscyplin geograficznych, a tym samym ewolucyjnemu rozprzestrzenianiu się ich zakresu badawczego.

Dla wyjaśnienia rozwoju systemu nauk geograficznych w schemacie uwzględniono także dwa wymiary czasu: wymiar linearny i wpleciony weń wymiar cykliczny. Ponadto, pamiętając o niemożliwości rozważania o geografii bez jej dwuzwrotnych związków z innymi naukami, model zaopatrzonego w małe spirale, które symbolizować mają korelacje w świecie nauki.

Wykreowane dwa światy badawcze, geografia fizyczna oraz geografia społeczno-gospodarcza, dynamicznie rozwijając się w obrębie swoich granic, równocześnie tworzyły ze sobą bardziej lub mniej silne związki. Z czasem, w toku komunikowania się pomiędzy sobą, wymagającego m.in. świadomego skupienia się na tym co wspólne, wykreowane zostały płaszczyzny scaleń. Zbudowano coś, czego żaden z partnerów nie stworzyłby sam. Ewolucja niektórych płaszczyzn doprowadziła do takiego stadium rozwoju struktury geograficznego DNA, w którym wytworzyły się oryginalne interdyscyplinarne formy. Do nich zaliczyć należy kolejno: geomorfologię, geografie regionalną, ekologię, geografie humanistyczną oraz geografie kulturową. I właśnie owe formy, zdaniem autora niniejszego opracowania, stanowią istotę jedności geografii.

**Słowa kluczowe:** geografia, historia myśli geograficznej, podział nauk geograficznych, jedność geografii