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THE THEORY OF COMPLEXITY AND GEOGRAPHY

Teorie komplexity a geografie. — V příspěvku se soustřeďujeme na objasnění dvou významných kategorií vědeckého poznání — kategorie komplexnosti a rozmanitosti. Správné poznání charakteru a významu těchto kategorií je podle našeho názoru základem pro vypracování teorie geografie. Zároveň však tyto kategorie mají velký význam pro vědecké poznání vůbec. Sledujeme-li současnou klasifikaci věd na jedné straně a problematiku geografických a příbuzných věd na straně druhé, dojdeme k závěru, že komplexnost je obdobným základním principem vědeckého poznání jako vývoj a obecnost. V tomto příspěvku můžeme ovšem sledovat jen nejzákladnější, možno říci „vnější" problémy teorie geografie, kdežto „vnitřní" problematikou se budeme zabývat jinde.

The aim of this paper is to give an opinion of the character of two important categories of scientific knowledge — complexity and diversity — the categories which are of principal significance for the theory of geography. Just an incorrect comprehension of the content and significance of the mentioned categories is the "primary" cause of the non-unity and confusion in the theory of geography of nowadays. Owing to the limited extent of this paper, however, we are only able to follow the problems of the complex character of geography in the broadest sense of the word, which can only be a starting point for the solution of the total theoretical problematics. The "internal" questions of the theory of geography as well as the analysis of the basic literature, therefore, will be discussed elsewhere.

A. The principle of complexity as a cardinal principle of scientific knowledge

The category or the principle of complexity will be discussed first of all from the point of position of geography in the system of sciences. The classification of sciences may not be understood as a formal distribution of the extent of sciences. The main principles, classifying sciences objectively, reflect the cardinal "types" of properties of the world, and they are therefore understood as cardinal (basic) principles of scientific knowledge.

The basis for the modern classification of sciences was already given by Fr. Engels (1). The main classification principle is the determination of the evolutionary degree of the matter, which is followed by this or that science (physic — chemistry — biology — economy, etc., which we call, in the following, elementary sciences). The merit of Fr. Engels lies first of all in the fact that the Marxist science of nowadays respects the complicated character of "transitions" between individual "classical" sciences. The evolutionary viewpoint itself was not sufficient for the creation of the whole system. Of similar importance is also the classification of sciences according to the degree of universality. Only in this way is it possible to explain the special position of philosophy and then the internal differentiation of sciences too. The character of this "first" or "basic" Marxist classification of sciences is preserved also in the modern work of B. M. Kedrov (2).

From geographical papers concerned with the problem of position of geography in the system of sciences, we mention here at least the opinions of two directions of the marxist geography in the USSR — monistic and dualistic (3). It is most important for our considerations that both directions are derived from the above mentioned classification of sciences. The monists understand geography as a transient science between natural and social sciences, the dualists then divide the geography into natural and social geography (physical and economical geography).

From the aforementioned it results that up to date two basic principles of scientific knowledge have been considered or "recognized", that is universality or a "degree of universality" and development or a "degree of development". If we are to range the character of any element into the system of scientific knowledge, we must investigate internal regularities of this element, and, through comparison with others, divide the other elements into lover and higher ones with respect to development and then ascertain what the investigated element has both common and specific in comparison with others. These two principles are cardinal characteristics of each element. To each degree of universality and of development certain properties of the subject in question correspond, that is certain regularities which are not mere abstractions but properties of concrete subjects.

But are these two principles the only cardinal principles or categories o the character of the world? Let us first pay attention to what the Marxist philosophy says to the question of the abstract and the concrete. The author cites from the Marxist textbook: ". . . concrete knowledge reached through the senses does not catch the substance of a thing and therefore the knowledge proceeds to individual abstractions. The process of knowledge, however, does not end with the creation of these abstractions. It is necessary to obtain a concrete universal knowledge. From individual abstractions the science again returns to the concrete. But it is not a return to the concrete sensually but

a reproduction of the concreate in thinking which is a higher form of knowledge (4).

But what does it mean and what character has the process "reproduction of the concrete within ones thinking"? Each science investigates not only internal regularities of the corresponding subject, but also the relations between the subject and its milieu. Science has, up to now, examined more or less only the most simple form of these relations which is the direct relations between individual subjects, examined relations, first of all, individually and recognized only integrities with a minimal "internal" diversity. This further led to the simplification of the comprehension of relations or connections in the world and leads to the non-comprehension of the principal research of the problem.

The character of the connection of each element with the rest of the world is immensely complicated. First of all the influence of other elements is various and variously significant. Mutually connected elements form various integrities — units with the character of a certain complexity. From these units new, higher integrities, more complex integrities are composed. In this manner we successively reach the highest or "complete" complex which comprises all the principal qualitative components of the world. The relation and connection between an element and the rest of the world is not expressed only by the direct and mediated relations between indvidual elements themselves but principally through external relations of more complex wholes, whose parts, the elements in question, form.

Insufficiently elaborated terminology and totally small attentiveness of the science as to the complexity, aggravate the explanation of these problematics. In scientific terminology the following concepts are enough widely spread and explained: element, component and the complex itself, which at least partially shows that the connection of each element with the rest of the world has no simple or "one-level" character (that is not only the relations between the elements themselves are in question). In reality, between the element and "complete" complex there exists not only one but a series of "partial" complexes that is of relatively independent degrees of complexity. Within the frame of the concept of "partial" complex, we understand all integrities with different degrees of complexity and we omit only the lowest and the highest degree, that is the element itself and the "complete" complex. "Gradation" of the connection between elementary knowledge nad complex knowledge, as well as the objective existence of "partial" complexes can be clearly seen on the example of "connection" of biological knowledge with geographical knowledge — biology — ecology — biogeography — natural geography — complex geography. Such "connections" of elementary sciences with complex geography is, however, the whole system.

As to "partial" complexes, such concepts as phytocoenosis, zoocoenosis,

biocoenosis and natural-geographical complex, can be introduced. These are only known and observed nowadays as "partial" complexes. The results of science in the knowledge of "partial" complexes prove their objective existence and also prove that similarly as elements themselves also the complexes possess their "internal" lives. At the same time each complex in relation to its neighbourhood forms one integrity.

Each complex whole has a complicated character as it contains, besides its specific properties, also the properties of its components, that is of elements and "partial" complexes. From this results also its more complicated relative independence or less distinct "separation" from the rest of the world.

We can thus see that two poles or types of scientific knowledge exist, which is elementary and complex knowledge. Both types are not absolutely separated, but there are connected by a magnitude of transient, relatively independent degrees. Both types of knowledge are abstract. The first one is elementary abstract and the other is complex abstract, in other words it is a reproduction of the concrete within ones thinking. Complex science does not investigate the character of the world according to the units comprising the same subjects, nor according to the degree of universality or according to the degree of development, but according to the concrete units — complexes, in which the qualitatively various subjects are mutually related. The resulting character of the complex is a result of internal regularities of all corresponding elements, of their mutual relations and properties and of the relations between "partial" complexes which are contained in a given complex. With this the necessity of the simultaneous investigation of quantitative and qualitative characteristics is connected. The connection of quantitative and qualitative characteristics is much "more animated" here than in elementary sciences.

What conclusions result from the aforementioned considerations? The complication of the connection of each element with the rest of the world and "gradation" of this connection correspond to the objective existence of "partial" and "complete" complexes. This leads to the conclusion that in addition to the up to now recognized and understood basic principles of scientific knowledge that is universality and development, still the third basic principle — principle of complexity — exists. Scientific observation must investigate the character of the world not in two but in three principles and categories of knowledge, that is, according to development, universality and complexity. All three principles are cardinal principles, have a complicated character and are differentiated into a series of relatively independen degrees or levels. The followed basic principles of scientific knowledge are not only chosen abstractedly but they are a reflection of the three "types" of properties of the objectively existing material world. Each subject has on the one hand a character common with other subjects, and on the other hand a character different from other subjects. Each subject is, in comparison with others,

a lower or higher form of the existence of the matter. Finally each subject is connected with the rest of the world not only "elementary" but also by means of various "partial" and "complete" complexes. The world cannot be understood only as a "direct" unity of a magnitude of subjects (or rather elements). It is necessary to comprehend the structure of this unity which corresponds to a concrete system of complexes.

B. A specific character of the subject of geography

In the subject of geography we must, first of all, respect its specific character, which is generally the valid property of the whole world in its concrete form. The fact that a variety is the most important characteristic feature of the complex and concrete observation, is best confirmed and explained in the work of J. Korčák (5). J. Korčák shows on different examples the difference between complex geography and elementary sciences, by means of statistics. Against the equality of element or against the equality of distribution of "elementary" attributes characterized by the Gauss curve, this author places here the variety of the geographical subject or geographical attributes, which is characterized by the course of a branch of hyperbola. This work almost philosophically evaluates the variety as a basic property of the world, the property of the same category as the matter equality of the world.

If we continue these considerations, we come to the conception of the unity of the world as a contradiction in the matter equality of the world and in the qualitative as well as quantitative variety in forms of the existence of matter. The variety is proper for the world as well as is the matter equality, and the contradiction of both stipulates the development of the world. The "geographical variety" corresponds to the highest development degree of the world, as here the co-existence of more qualitative elements of the world is involved. Therefore, its character is the most complicated and investigation of this character is the most difficult. More simple forms of the varieties investigate then other concrete, less complex sciences, the task of which is to explain physical substance of the variety, etc.

The variety of the world is not rigid or "constantly sole". On the contrary, what is various, cannot be investigated by abstractions only but, it is necessary to start from a concrete character and from the evolutionary comprehension of this character. In geographical observation we cannot have fixed units and scales. We can have only a whole series of graduated types of units with different transitions corresponding to different, but always concretely existing "types" of varieties. The abstract "types" of varieties are, however, important in scientific observation, but they must be compared and must again start from

the concrete variety. Then they become valid at a very significant rate, for instance, in the perspective regional planning. Obviously the abstract investigating alone of the variety would be pseudoscientific, as we can construct an infinite amount of the abstract types of variety; we cannot, however, determine the category or significance of individual types without concrete observation.

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