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SOME PROBLEMS IN CARTOGRAPHICAL INTERPRETATION OF GEOGRAPHICAL SPACE

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In cartography, space is both represented (by means of mathematico-cartographical projections) and reflected, interpreted and expressed by cartographical expression means and approaches. Geographical space, which is the most frequent case of cartographical interpretation is being conceived more widely than in a part of the Soviet literature, namely as relative space (landscape space according to E. Mazúr and J. Urbánek). The compilation of synthetical maps supports the raison d'être of such a conceiving of geographical space.

Out of the relevant properties of space, attention is paid to the problems of both cartographical representation of metrics (two working spaces are distinguished on one thematical map: space I and space II) and the representation of spatial differentation (to the structure, homogeneity-heterogeneity, arrangement, from and to some other properties).

INTRODUCTION

According to the materialist philosophy the space is an objectively real form of existence of moving mass. The concept of space expresses not only a coexistence, but at the same time also a possibility of mutual separableness of things, their extensiveness, a system of their mutual arrangement [5].

In cartography, the space is both being represented (by means of mathematico-cartographical projections) and being reflected, interpreted and expressed by cartographical expressional means and approaches. The map is said to be „a picture" of certain particular space, but this is no picture in the matter is in as for instance a photographic, artistic or another one, but the matter is in a special illustration, which is to a certain measure subjective, transformed by the personality, mentality and knowledge of the cartographer, interpreted, sometimes more or less purposefully selectively. Such an illustration like this may be better named as reflection, interpretation, expression, or representation.

THE PROBLEM OF CONCEIVING THE SPACE IN GEOGRAPHY AND CARTOGRAPHY

In certain part of Soviet literature an opinion has been spread that the subject of map is the geographical space (geospace). This space, however, does not concern only the Earth's surface proper, its upper limit is reaching approximately to a height of 3—4 radii of the Earth and the lower one is identified with the depth of the Moho Discontinuity [4]. The geographical space is an object of investigation in present-day geography, being conceived as „a mutual connection of position of material world s objects connected with the geographical form of mass movement" [3].

It is assumed that the subject of map is a space conceived more widely, i. e. even over the limit of 3—4 Earth's radii (astronomy, astrophysics and so on) and even more deeply than the limit of the Moho Discontinuity (geology, geophysics and so on). So far as to the „vertical" viewpoint. In the „horizontal" sense the map expresses also the space of biology, pedology, geomorphology, hydrology, . . . urbanism, . . . and other non-geographical disciplines and social activities.

In the work of the Czecholslovak geographers E. Mazúr and J. Urbánek [6] a new conception of geographical space as landscape space has been outlined. The authors are reminding that the concept of space in geography does not appear as a classical empty absolute space fulfilled with things, but does appear always as a relative space in a solid tie with other concepts. This image is based on the fact that the landscape space (= relative space) may be conceived as a force field acting on the landscape elements being found „in it". The carriers of properties in such a space like this are not only the things more, the landscape elements, but also the space areas. Geography is producing for itself the concept of space in relation to particular landscape elements (in a monocentric way) as a concept of „medium" surrounding the given element.

The monocentric spaces, however, cannot be considered for identical just as a sum of them to the concept of landscape space, since geography does not examine either the particular landscape elements, or the sums of them, but ti does examine the integrity (totality) of landscape elements, expressed by both the synergetic principle (relationships of elements in a given place) and the chorologic one (interactions with neighbouring elements, or areas). In this way a certain synergetic structure and a certain chorologic structure of the landscape space may be distinguished, this space being conceived as structured continuum, in which a contradiction exists between the integrity of landscape space and the autonomy of its components. At the uppermost hierarchic level a space formation in a form for instance, of the Earth's surface is found, while at the lowest one in turn the space units („elements") with a further disintegration of which is not reckoned.

In the translation into the language of cartography (of map) it means that there is a problem in expressing structured spaces conceived predominantly as complex or synthetic space formations, areas and so on. For cartography such a conceiving of space is fully satisfying, which is being confirmed by producing especially the synthetic (regionalizational, typifying and other) maps.

The following considerations are devoted to some selected spatial aspects.

THE SPATIAL ASPECTS RELEVANT TO CARTOGRAPHY

Materialist philosophy examines space as a bi-single category together with time, enabling abstracting and examining both the components also individually, not forgetting their relative connection and contingency based, for instance, on the theory of relativity. As real forms of mass existence, space and time, according to that, are marked for a series of peculiarities: to be objective (to exist without dependence on our consciousness), to be everlasting (the mass to exist everlastingly in its various forms) and to be also boundless and infinite [5]. As quoted in a footnote by F. Engels in the work „Dialectics of the Nature", where he is invoking the „Popular Astronomy" by J. H. Mädler, to be in space means to be „next to each other" and to be in time does to be „after each other". The psace thus means certain forms of dislocation, distribution, while the time in turn the forms of successivity.

A significant property of space are its three dimensions, which characterize the spaciousness of space. That means that the position of any point in space can be determined, for instance, by three coordinates x, y, z — by perpendiculars to the three mutually perpendicular and non-parallel planes X, Y, and Z. These planes may be chosen in a conventional place of space, whereby also a conventional „origin" of such a coordinate system like this will appear. It is necessary to note that the space position may be determined also by other kinds of coordinate systems, e. g. also by the spatial polar coordinate system and so on, this, however, with no influence on the character of space, as this is not changing. Introducing the spatial coordinate system bears at the same time an immense advantage to enable determining the spatial position of points (objects, phenomena and so on) and at the same time to create assumptions for a measurability of space as well as for ascertaining a series of further spatial characteristics significant for various sciences, thus also for geography and cartography.

In mathematics, theoretical physics and in some other sciences a concept of multidimensional space occurs. Such a space is conceived as an abstraction and besides spaciousness this is characterized, as a rule, by some other properties (sides) of objects and phenomena examined. These properties form a certain set of quantities, which is named as „space", since between them relationships exist that from the formal point of view resemble those between the elements-quantities of the real tri-dimensional space.

In cartography, on the classical map (looking apart from special cases of relief maps, globes and so on), nevertheless, no direct modelling expression occurs, either as to n-dimensional, or even tri-dimensional space, since the whole process of cartographical reflection of objective reality is occurring in an area, in a plane of the map. That means that the expression of the third (or also n-th) coordinate is realized indirectly, through a mediation. As the ways of such mediations like this may be several (even hard to say how many), the cartographical representation of space can be multiform, using various principles, methods and media.

A multi-sidedness (existence of several capabilities) in cartographical representation holds good also for interpretation of time. An opinion exists that the time-space changes are best to be expressed only by series of maps. But the cartographical practice shows also other approaches and ways of expression of spatial position changes to be successful in chronological sequence on one and the same map (for instance, the diagrams of development and so on).

Space (just as also time) is marked for continuity, but from the viewpoint of analytical consideration and expression in cartography it may be considered also as discontinual. It is spoken also about space symmetry-asymmetry, about an idealization, abstraction, generalization, modelling of space, about the forming of spatial systems and so on. When W. Bunge [2] examined non--measurable spatial properties being expressed by maps, he laid out a homogeneity-heterogeneity, orientation, form, pattern, configuration and naturality of the spatial dislocation of objects-phenomena in space. It is assumed that there could be much more such properties like these.

From among these many properties we shall look in short at two of them: at measurability (metricity, scalicity) and at spatial arrangement rate (differentiation).

THE PROBLEM OF EXPRESSING THE METRICS OF SPACE

Measurability is one of important properties that helps us to illustrate a space in the map. In a wider sense, measurability enables us to „work" with the space, to „control" it. Thanks to this possibility a wide field has been opened in cartography for the application of mathematics and its particular branches. Originally only one of these domains was applied to a larger measure, higher geodesy, from the application of which a self-standing theory of mathematico-cartographical projections arose and which has been formed to a self-standing subdiscipline — mathematic cartography. Mathematic cartography solves substantially one aim: the developmentality of spherical (or reference ellipsoidal) surface of the Earth (but also of other celestial bodies) to the surface — the plane of map. This aim could be attained in several ways — by particular cartographic projections. Each of these projections has a series of advantages, but at the same time, also shortcomings — distortions. One of the inevitable characteristics of each projection is the s c a l e, which is both the scale of map and the scale of the space being projected into it. And thus by means of map scale the we can learn which is the metrics of the space being projected. We know the scale constancy to be a rare rather than a current phenomenon on maps. Practicelly constant scale is only in plans and maps of very large scales, while on the maps of small scales the scale holds good frequently only in one direction, only on one line, in the other cases continually changing. What is the matter at such a variable scale like this? Does it mean to be encountered with a variable space metrics?

The answer is not so unambiguous as it seems to be at first sight. If there is an existing map at a variable scale (and we do not know anything of the projection used), then such an impression may arise that there is a representation of space with a variable metrics. Fear for variability may be raised by the knowledge of space curvature known from the theory of relativity.

In reality, if there are the classical maps of this Earth, we need not be anxious, since both empirically, from experience, we can deduce, or in the case of need we can ascertain precisely the kind of the used mathematico-cartographical projection of real space, which has its normal, constant metrics in all dierctions — only its representation on map is distorted. That means the real (non-deformed, non-distorted) space to be perceived by means of map through various kinds of representations disterted. Said in other words: an interpretation of real space is realized by means of plane projections frequently complicated and accompanied with distortions (deformations).

More complicated cases would occur, if there is not present a representation of Euclidean space, but, for instance, the space in Lobachevskian geometry (where, for instance, the sum of angles in a triangle is not constant being lesser than 180° and ranging in dependence on the changes in side lengths), or the space in Riemannian geometry (in which the sum of angles is greater than 180°). Fortunately (or perhaps unfortunately), these geometries remain out of the attention of cartographers and of all who express themselves cartographically. Representation of space in these geometries is different, if the objects and phenomena of one mass system are represented in relation to another mass system in the sense of the theory of relativity, i. e. in different movement conditions.

As a rule, in thematic maps two metrics of Euclidean space are encountered: the metrics (scale) of basic map and that of thematic phenomenon being

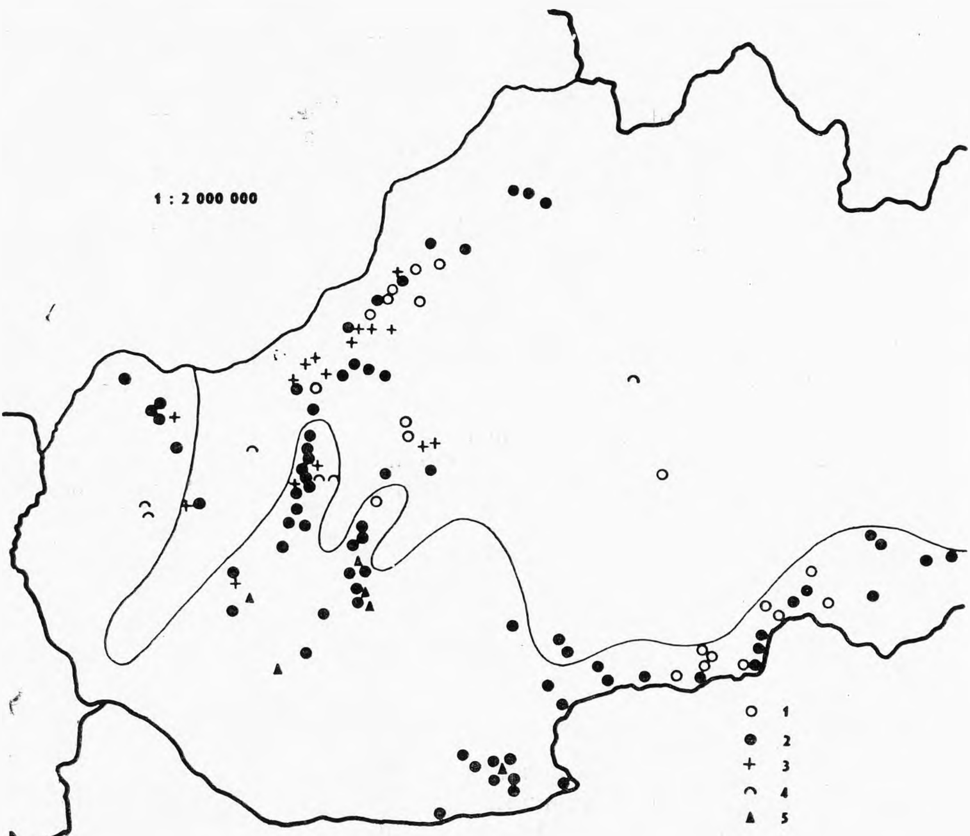

Fig. 1. Illustration of the identity of metrics of space I and space II on example of a representation of settlement in the Paleolithic, Mesolithic and Neolithic Periods.
1—5 — various kinds of settlements, *6* — boundary of continuous settlement (according to the Atlas of the SSR).

represented. In general, it can be stated every thematic map to be bispatial in principle: one space is represented by topographical basis — let us name it basic geospace, our due to working purposes s p a c e I and the other space represented by chosen thematic contents — let us name in space of thematic phenomenon, or s p a c e II.

If we analyze briefly both these spaces from the viewpoint of their metrics in various thematic maps with various methods of cartographical interpretation (representation), we can come to the conclusions as follows:

a) In a symbol-containing, but also areal (chorochromatic) map the metrics of both the spaces are the same. This is so, since the levels of spatial abstraction of topographical basic and that of interpreted theme are identical (Fig. 1).

b) In a diagram-containing map (in a cartodiagram) we can already obviously differentiate between space I and space II represented by quantitative characteristics of a chosen thematic phenomenon — in this case in Fig. 2 — by forest-agricultural establishment ratio.

It is obvious from the illustration in Fig. 2 the metrix of space I is different from that of space II. While in a basic map to a measure of 1 : 2,000,000 1 sq mm is equal to 4 sq km, diagrams represent both a self-standing quality of new space (forest) and its quantitative characteristic (area) according to a scale 1 sq mm = 1,000 hectares (= 10 sq km), and since the breadth of columnar diagram is 2 mm, it goes out the scale of space II is 2.5 times lesser than that of space I.

In thematic cartography a large heterogeneity in the scales of space II are encountered. As a rule, an intermediary of the metrics of this space is usually the scale of diagrammatic symbol, in which the direct intermediary is usually some of its determining dimensions (height, breadth, radius-diameter, unit area, but it could be also central angle, radian and so on). The scale proper as an expression of determining dimension (linear, areal, angular and so on) of the diagrammatic symbol in relation to voluntarily chosen quantitative characteristic of the thematic phenomenon can be either relative (reckoned on the basis of a proportion), or functional (reckoned as a mathematical function). The possibility of applying mathematical dependences of respective quantities, mainly functions, induces a possibility ol occurrence of complicated metrics in space II. The qualitative side of thematic phenomenon in turn induces the possibility of occurrence of various types of space II. Under these „various types“ we have in mind both landscape space in the sense of the study [6], but also a number of other spaces, for instance, from demography, economics and so on (characteristics of population, production, services, etc., which constitute a large group of socio-economic spaces).

The diagram method is an example of discontinuity and discreteness of the cartographic representation of space II. Of an analogical character are also the cartogram (choroplete) method and partly the dot map one.

c) An example of the cartographic interpretation of continuous space II is the isoline method (Fig. 3). The characteristic peculiarity of such a way of expression like this is, on the one had, an interconnection between the metrics and the basic geospace I in the plane of map determined by rectangular coordinates x and y, the metrix in the direction of coordinate z being different. The space II is represented by certain division of values or characteristics of the thematic phenomenon, forming either a field or surface (for instance, if there is a division of statistical values, we speak of a statistical field or surface), or representing a material body (for instance, a body of granites, motorways and so on), or also another non-material system being of an analogical character (for instance, an area of magnetic anomalies, pressure, temperatures and other state quantities of areas, zones, regions, their potentials, residua, trends and so on).

From the so far short analysis of metrics of spaces I and II we can make a conclusion as follows:

— their metrics may be identical,
— metrics of space II is under-dimensioned or over-dimensioned,
— their metrics are mutually non-interconnectable

Considering the identity of metrics of both the spaces (for instance, as in Fig. 1), we have had in mind the cases where the metrix of space II is iden-

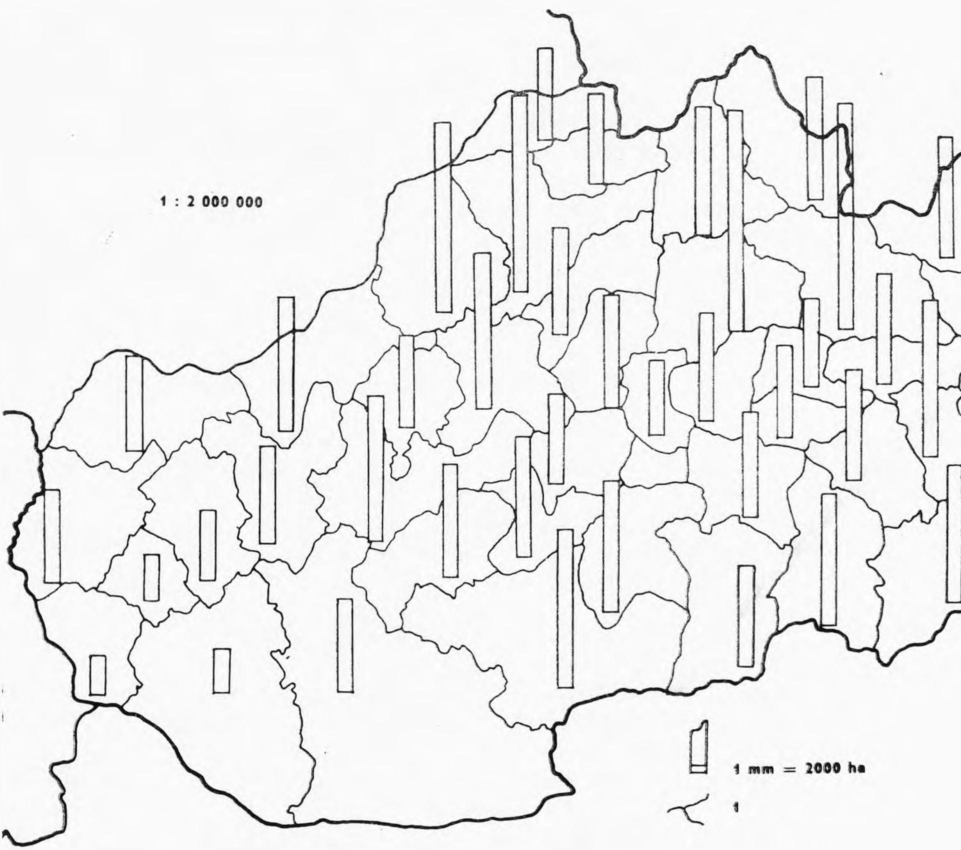

Fig. 2. Illustration of difference in metrics between space I and space II. The diagrams represent forest-agricultural establishments ratio.
1 — boundaries of agricultural establishments (according to the Atlas of the SSR).

tical with that of space I and where the former has a priority, is determining, since it results from the mathematico-cartographical representation. There exists, however, another group of cartographical (better said carto-like, cartoidal) expressions, the metrics of which is identical due to a special way. They are anamorphous expressions or illustrations (geographical or cartographical anamorphoses).

d) Cartographical anamorphosis (Figs 4 and 5) is a special evidence of unifying of space II with space I.

Several cartographical anamorphoses are already known as types. They arose and slowly developed under a considerable lack of interest from the side of cartographers themselves as some map caricatures (an extreme case of them are the so called cartoids), since they are no maps in the classical sense of this concept. They are more map schemes frequently with rather specific and unusual metrics as to the map. They are, however, inclined very strongly to the map, as they both have a common aim: to represent and

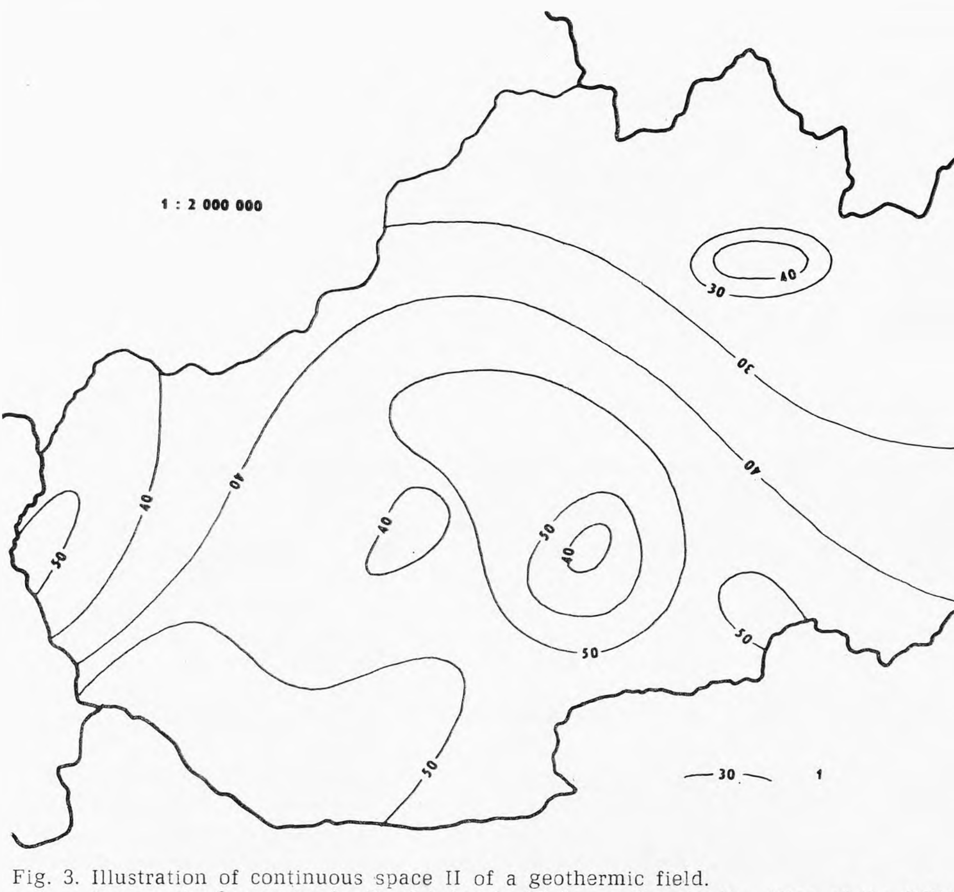

Fig. 3. Illustration of continuous space II of a geothermic field.
1 — geoisotherms in depth of 1 km in °C (according to the Atlas of the SSR).

express certain (mainly quantitative) characteristics of spatial phenomena investigated. They have even a common language with cartography, too.

In Fig. 4 a circular logarithmical anamorphosis is illustrated (centre of Prague with an expression of dislocation of hotel establishments differentiated according to accommodation capacity) and in Fig. 5 an areally equivalent (equidemic, demovalent) anamorphosis of districts of the SSR by economically active population are illustrated. Characteristic for these cartographic anamorphoses is the metrics of space I to be subordinated to the problems of its principal theme (i. e. space II) on the basic of chosen mathematical condition. It is an analogy with mathematico-cartographical projections, which arise on the basic of a mathematical condition, too, they are, however, ones of quite another type. The example of anamorphosis in Fig. 5 is more pretentious only from a graphical point of view, as from the mathematical viewpoint only very simple mathematical condition is fulfilled, at the same time being a scale of this representation, namely

$$p_i = k_M \cdot \sqrt{A_i},$$

where are p_i — area in sq mm of any district in the SSR to scale 1 : M (in this case 1 : 2,000,000),

A_i — number of economically active population in any district of the SSR,

k_M — equivalence coefficient (in this case 1.44), which can be reckoned according to the equivalence condition, i. e.

$$k_M = \frac{Q_M}{\Sigma_1^n \sqrt{A_i}},$$

where Q_M — area of the SSR is in sq mm at the chosen scale (1 : 2,000,000).

THE PROBLEM OF EXPRESSING THE DIFFERENTIATION OF SPACE

Besides the problems with metrics, there is another problem group concerning spatial differentiation coming to the fore of interest just in cartographical expression of space. In general, differentiation is a very wide concept, under which we can understand many important properties of space at all and those of a geographical one especially. As there is no place for a detailed analysis, in this group we shall look in only at some relevant properties of geographical space as structure, homogeneity-heterogeneity, arrangement and form. The problem of cartographic expression at each of these properties is so much comprehensive, that even minimum analysis would claim a place in an extent of a more extensive study. From this aspect we shall confine ourselves only to a short outline of particular problems.

At that time (1962) the above mentioned properties were assigned by W. Bunge [2] to „non-measurable“ spatial ones being expressed by the maps. Since that time much has been changed in both geography and cartography in the sense that several of these formerly „non-measurable“ properties commenced being set for measuring or another more exact characterizing.

In tie-up to the previous problems it is necessary to remind that they are predominantly the properties of space II, i. e. the cartographical reflection of the space of thematic phenomena in a strong interaction with space I. From the viewpoint of landscape space these properties could be named the characteristics of territorial differentiation of phenomena being investigated by geography and expressed by cartography.

The structure. As a linkage of relationships the structure is very important and very multi-significant spatial property of thematic phenomena. In a map the structure is expressed by the method and means of cartographical representation as a bidimensional reflection of structure, as its model, or also as several models. Due to a homomorphous character of map this representation of structure is non-isomorphic, or non-completely isomorphic, which frequently make problems in its interpretation. Owing to regularities or laws holding good in producing a map [8] both a precise reverse reconstruction of the spatial structure is made difficult (the conclusion gained about it from the map need not hold good under all circumstances) and the map representation of structure is stigmatized with certain inevitable deformations, the source of which lies in both distortions of mathematico-cartographical projections and in the semantic sphere of interpretation. The matter is above all in the level of abstracting, in the rate of generalization, in spatial

Fig. 4. Illustration of unifying the metrics of space I and space II on example of logarithmic anamorphosis of the centre of Prague.
1—5 — hotels distinguished according to the number of beds (according to Z. Murdych).

concreteness, associative conventionaly and some other laws valid in map internation as well as in the problem of the depth of declaring possibilities of cartographical language. Appropriate konwledge of the laws of map (of the principles of cartographic reflection, or cartographic modelling) is an inevitable condition removing many problems in examining geographical spatial structures by means of the cartographical form of reflection.

In this connection it is necessary to remind the problem of aggravated cartographical expressibleness or also non-expressibleness of geographical structure, eventually also of some other properties of geographical space (many geographers are complaining of not being able to express quite well some aspects of examined phenomena by means of the map).

Of course, the possibilities of map are not quite non-confined. Also the natural language, in spite of a high degree of universality, is not completely universal and suitable for all occasions. If that were so, there would not exist a reason for the rise of other expression systems — for instance, for that of formalized languages. For spatial structures to be expressed cartographically serve all the expression means, methods, and approaches existing in cartogra-

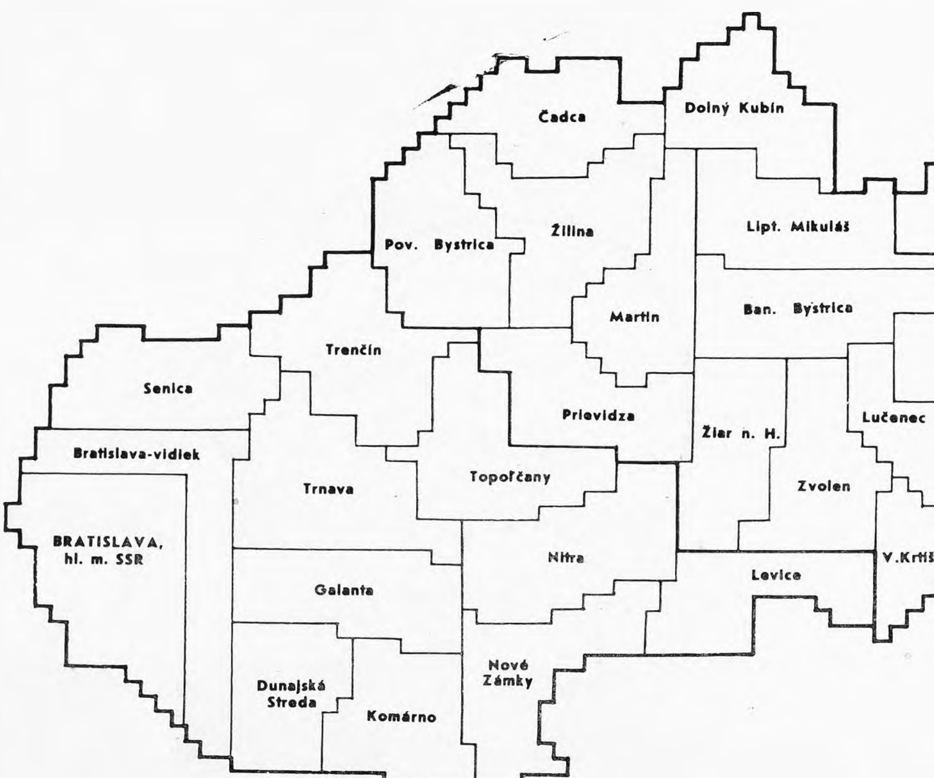

Fig. 5. Illustration of unifying the metrics of space I and space II on example of equidemic anamorphosis of the districts of the SSR (according to J. Pravda).

phy. In those cases when not everything could be expressed in one map, several maps are used as selective expressions of structure. Within the sum of these expressions the structure should be expressible and reflexible. There is, however, another case, if we are judging whether there is the best, the most suitable and most relevant from of reflection from the viewpoint of a given aim. If no, then it is necessary either to search for cartographical language expression possibilities that have not yet been revealed or to choose another expression system.

Other properties of spatial differentiation may be considered as the properties of structure, or also self-standing properties.

The homogeneity — heterogeneity. Of this couple of properties the homogeneity is most interesting. The delimitation of homogeneous formations (for instance, regions) is a very frequent and rather current geographico-cartographical task. Besides equal composition even in space homogeneity, however, still further criteria appear, as for instance, the representation of elements of equal size, the existence of equal distances between elements, an equal orientation, the equal force between linkages, relationships and further properties between spatial elements.

Even as in expressing the structure, also in this case a map helps to the recognition of homogeneity type and degree by means of all its laws (basic principles).

The arrangement rate. A significant attempt to characterize the spatial arrangement rate by means of entropy ratio was made by J. Krcho, [7]. Mathematically, and at the same time also cartographically he expressed the arrangement rate of 6 spatial subsystems within the S_{FG} system (system of physico-geographical sphere) and further the differentiation ratio of particular relief elements as well as that of relief inclination, relief orientation as to the points of compass, horizontal and normal curvature of relief. This attempt of his can be evaluated as successful, although probably it need not be as the only possible. He has proved that the determining of arrangement rate as well as its cartographical expression is not an unsoluble problem.

The form. A beneficial survey on exploring the form and on the problem of its measuring was made by A. Bezák [1]. He went out from the fact that the image of the from of geographical objects is made most frequently on the basis of their cartographical representation into a plane. His considerations can be extended also for tri-dimensional formations in Euclidean space, or also for two-dimensional ones on a spherical surface and so on. In the study [1] the from and the from compactness are defined and the methods of quantitative delimitation of form compactness as well as those of multilateral (complex) delimiting and depicting the character of the form of plane (two-dimensional) geographical formations (inclusively those providing by the map) are analyzed.

The problem of defining, delimiting and cartographical expressing the form, however, remains open for further approaches. In any case, it cannot be assigned to unsoluble ones.

Further aspects of differentiation. According to L. I. Vasilevskiy and P. M. Polyan [9] a series of groups of properties can be explored within differentiation, as for instance, disintegration rate, association rate, zonality, stratification, polarization, relief rate, mosaic-likeness, contrastness and interruption rate. Further also such spatial properties can be explored as: configuration — according to W. Bunge [2] pattern, morphology (morphostructurity) and disposal, within which continuality, compactability, dissection rate inclination rate, network rate, linearity, nodality, centricity, spatial confinement rate, shield-likeness, texture, orientation, extrovertness, topological vicinity (neighbourhood) and stability can be distinquished.

Along with the development of scientific inquiry the number of aspects, spatial properties being ascertained in objects, phenomena, relationships, states and processes will no doubt incessantly increase. And even endeavour to express these properties also by means of map will not stop. In solving these problems by means of map it is necessary to keep in view (and clearly distinguishing) two alternatives: either there is a cartographical expressions by other scientific methods as to the ascertained spatial properties, or there are properties, which are still being ascertained by means of cartographical expression. Each of both these ways lays in front of cartography special problems, or the groups of problems, which differ each from the other by the rates of activity and co-participation.

CONCLUSION

The heterogeneity of space as well as the confinedness of its direct obsservation and exploration are the reason of the development of such approaches, at which various logical forms are used as to ascertaining profiling characteristics, or properties of certain selective parts of space. The sciences, or scientific disciplines, but also other social activities can be distinguisted according to what kind of space, what its portion, or what its side are exploated. Each discipline like this forms for itself its methodical apparatus to explore „its" space, choosing „its own" ways to recognize it. These ways are more and more complicated and mediating.

Cartography provides not only geography, but also other disciplines, with means and some ways to explore the properties of space being examined within them. These means and ways have not yet been exhausted by far. The scale, projection, generalization, map language, methods and expression means of representation provide considerable possibilities for exploring space. The more are controlled these instruments by the exploring subject, the more knowledge about explored space, spatial object, phenomenon, state or process can it gain. Thus one group of problems lies in controling both cartographical means and space exploration methods, the other one, however, remains in a right logical interpretation of the results of such an exploration like this. We assume that the solution of these problems will be supported (and experience does it confirm), if a discipline exploring space (for instance, and above all, geography) joins cartography more closely.

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NIEKTORÉ PROBLÉMY KARTOGRAFICKEJ INTERPRETÁCIE GEOGRAFICKÉHO PRIESTORU

V štúdii sa vychádza z materialistického chápania priestoru ako objektívnej formy existencie pohybujúcej sa hmoty. V kartografii sa priestor jednak zobrazuje (matematicko-kartografickými zobrazeniami) a jednak sa vyjadruje (odráža, interpretuje) kartografickými výrazovými prostriedkami a prístupmi.

Prvá časť štúdie sa zaoberá chápaním priestoru v geografii. V sovietskej literatúre sa rozšíril názor, že predmetom mapy je geografický priestor, ktorý sa uvažuje v intervale do výšky 3—4 polomerov Zeme nad jej povrchom a do hĺbky po Moho-diskontinuitu. Vyslovuje sa názor, že geografický priestor treba chápať širšie, a to čo do vertikálneho i horizontálneho hľadiska. Vyzdvihuje sa význam štúdie autorov E. Mazúra a J. Urbánka [6], v ktorej sa nastoľuje chápanie priestoru nie ako absolútneho priestoru zaplneného vecami, ale ako relatívneho priestoru. Takýto priestor je možné predstaviť si ako krajinný priestor, chápaný ako silové pole, pričom okrem vecí nositeľmi vlastností sú aj priestorové oblasti. Kartografia potvrdzuje tento názor v podobe existencie syntetických máp (regionalizačných, typizačných a iných).

Druhá časť čtúdie sa zaoberá priestorovými aspektmi, relevantnými pre kartografiu. Sú to predovšetkým rozľahlosť a merateľnosť, ale aj celý rad ďalších vlastností, z ktorých sa podrobnejšia pozornosť venuje metrike a priestorovej diferenciácii.

Na mapách sa stretávame prevažne s dvoma metrikami. Sú to:
— metrika podkladového priestoru (prevažne topografického), ktorý autor pracovne nazval priestor I,
— metrika kartografickými prostriedkami vyjadrovaného tematického obsahu (priestor II).

Mapy majú buď totožnú mierku priestoru I a priestoru II, alebo mierka priestoru II je zveličená oproti mierke priestoru I. Existuje ešte tretia skupina kartografických vyjadrení, tzv. anamorfné mapy, ktoré sú reprezentantom zjednotenia priestorov I a II.

Z problémov kartografického vyjadrovania diferenciácie priestoru sa spomínajú iba niektoré: problém vyjadrenia štruktúry, homogenity-heterogenity, usporiadanosti a formy, k riešeniu ktorých pozoruhodne prispeli ďalší slovenskí autori, napr. J. Krcho [7] a A. Bezák [1].

Záverom sa konštatuje, že kartografia poskytuje geografii (ale aj iným disciplínam) prostriedky a cesty na skúmanie vlastností priestoru. Možnosti kartografie (máp) nie sú ešte vyčerpané, mierka, zobrazenie, generalizácia, jazyk mapy a ďalšie kartografické prístupy sú vítanými a často nezameniteľnými pomocníkmi pri skúmaní priestoru. Čím lepšie skúmajúci subjekt ovláda tieto nástroje, tým môže dosiahnuť lepšie výsledky.

Obr. 1. Ilustrácia totožnosti metriky priestorov I a II na príklade reprezentácie osídlenia v paleolite, mezolite a neolite.
1—5 — rôzne druhy sídel, *6* — hranica súvislého osídlenia (podľa Atlasu SSR).

Obr. 2. Ilustrácia rozdielnosti metriky priestorov I a II. Diagramy reprezentujú výmeru lesov podľa poľnohospodárskych závodov.
1 — hranice poľnohospodárskych závodov (podľa Atlasu SSR).

Obr. 3. Ilustrácia spojitého priestoru II geotermického poľa.
1 — geoizotermy v hĺbke 1 km v °C (podľa Atlasu SSR).

Obr. 4. Ilustrácia zjednotenia metriky priestorov I a II na príklade logaritmickej anamorfózy stredu Prahy.
1—5 — hotely, rozlíšené podľa počtu lôžok (podľa Z. Murdycha).

Obr. 5. Ilustrácia zjednotenia metriky priestorov I a II na príklade ekvidemickej anamorfózy okresov SSR (podľa J. Pravdu).

Ян Правда

НЕКОТОРЫЕ ПРОБЛЕМЫ КАРТОГРАФИЧЕСКОЙ ИНТЕРПРЕТАЦИИ ГЕОГРАФИЧЕСКОГО ПРОСТРАНСТВА

Статья исходит из материалистического понимания пространства как объективной формы существования движущейся материи. Пространство в картографии как отображается (посредством математико-картографических проекций), так и выражается (отражается интерпретируется) при помощи картографических средств и приемов изображения.

В первой части статьи рассматривается понимание пространства в географии. В советской литературе распространиольсь мнение, что предметом карты является географическое пространство, рассматриваемое до высоты 3—4 радиусов Земли и до глубины до поверхности Мохоровичича. Высказывается мнение, что географическое пространство нуждается в более широком понимании — как с вертикального, так и горизонтального аспектов. Отмечается значение статьи авторов Э. Мазур—Я. Урбанек [6], в которой выдвигается понимание пространства не как абсолютного пространства, заполненного вещами, объектами, а как относительного пространства. Такое пространство можно себе представить как ландшафтное пространство, понимаемое как силовое поле, причем кроме вещей носителями свойств являются также пространственные области. Картография подтверждает это мнение ввиду существования синтетических (районизационных, типизационных и других подобных) карт.

Во второй части стать рассматриваются пространственные аспекты, важные для картографии. Прежде всего это простираемость и измеряемость, но также и ряд других свойств, среди которых уделяется более подробное внимание метрике и пространственной дифференциации.

На картах встречаются, преимущественно, два вида метрики, а именно:

— метрика основного (преимущественно топографического) пространства, которое автором в рабочем аспекте названо как пространство 1,

— метрика картографическими средствами отображаемого тематического содержания (пространство 2).

На картах встречается или же идентичный масштаб пространства 1 и 2, или же масштаб пространства 2 утрируется по сравнению с масштабом пространства 1. Существует также третьяя группа картографических отображений — так называемые анаморфированные карты — представляющие собой объединение пространства 1 и 2.

Среди проблем картографического отображения дифференциации пространства упоминаются лишь некоторые: проблема выражения структуры, гомогенности-гетерогенности, упорядоченности и формы, к решению которых важной мерой причинились другие словацкие географы: Й. Крхо [7] и А. Безак [1].

В заключении отмечается, что картография предоставляет для географии (но также и для других дисциплин) средства и пути для изучения свойств пространства. Потенциальные возможности картографии (карт) еще не в полной мере исчерпаны, масштаб, способ отображения, генерализация, язык карты и другие картографические подходы представляются как уместные и, зачастую, как незаменимые помощники для изучения пространства. Чем лучше изучающий субъект владеет этими средствами-инструментами, тем лучших результатов он достигает.

Рис. 1. Иллюстрация идентичности метрики пространства 1 и пространства 2 на примере отображения заселения в палеолите, мезолите и неолите.
1—5 — разные типы населенных пунктов, *6* — граница сплошного заселения территории (по Атласу ССР).

Рис. 2. Иллюстрация разности метрики пространства 1 и 2. Диаграммы отображают сумму площадей леса в отдельных сельскохозяйственных предприятиях.
1 — границы сельскохозяйственных предприятий (по Атласу ССР).

Рис. 3. Иллюстрация континуального пространства 2 геотермического поля.
1 — геоизотермы на глубине 1 км в °C (по Атласу ССР).

Рис. 4. Иллюстрация объединения метрики пространства 1 и пространства 2 на примере логарифмического анаморфоза центра Праги.
1—5 — гостиницы, подразделенные в зависимости от численности спальных мест (по З. Мурдыху).

Рис. 5. Иллюстрация объединения метрики пространства 1 и пространства 2 на примере эквидемического анаморфоза районов ССР (по Я. Правде).

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