MOSCOW STATE UNIVERSITY

K. A. Salichtchev

CARTOGRAPHY AT THE XXIIIrd INTERNATIONAL GEOGRAPHICAL CONGRESS AND ITS EFFECT ON THE GEOGRAPHICAL SCIENCE DEVELOPMENT

USSR National Committee of Cartographers
Paper for the VIII International
Cartographic Conference

Moscow, 1976

Cartographical Review of the Congress

The Ist International Geographical Congress was convened in I87I in Antwerp to honour the memory of great cartographers of the Renaissance Abraham Ortelius and Gerarad Mercator. The following Congresses made magnificent contributions to the development of the cartographical science and production; for the whole century the special Section dealing with cartographical problems was permanently included as number one. The XXIIIrd Congress in Moscow has disturbed this tradition. The Congress organizers have withdrawn the Section of Cartography from its structure. Apparently, the three reasons stimulated this decision: individualization of the cartographical science, institution of the International Cartographical Association in I96I, and holding of the Cartographical Conferences conjugately with the Geographical Congresses.

Despite such an excommunication of the Cartographical Section, cartography itself was presented at the XXIIIrd Congress as splendid as never. Cartography has penetrated everywhere, become an organic part of many Sections, benefited their scientific content and practical recommendations, at last, I dare to

say it, happened to be one of the best decorations of the Congress Sections in Moscow. It is impossible in this brief review to consider or even mention the papers, being valuable in the cartographical respect, hundreds of the reports should be refered. Therefore, we shall trace only new and most important aspects of the cartographic-geographical interactions to be displayed in the course of the Congress activity; illustrate them by some examples; basing on them, demonstrate, in a generalized way, the Congress contribution to the cartographical science and then its profound and rapidly growing effect on the geographical sciences development. The idea that I expressed several times will be a leit-motif. Cartography develops and supplies other sciences, primary geography, with a powerful and indispensable method to investigate spatial-and-time relations. A concrete application of this method to other sciences results in its benefication and advancement with a feed-back promoting the further development of cartography, having a formulation of the method of generalizing conceptions[x].

When the XXIIIrd Congress cartographical activity being analysed, our attention will be drawn by: most important original

[x] In this case a deep analogy with mathematics is observed, since the progress of the latter is stimulated by the needs of natural sciences and technique. In their turn they have made a valuable contribution to the development of the mathematical method but its generalization always remains within the sphere of mathematical interests.

maps and atlases extensively expanding our knowledge of the World; some geographical regularities exposed by means of them; new types of thematic maps and mapping; successful employment of traditional means to analyse the phenomena occured in the cartographical research method; cultivation of new techniques of the map use.

Original maps and atlases. With the abundance of original maps and atlases it would be impossible to make a review of them, let it be a brief one, even in a special paper. Some examples of a prominent significance are to limit it.

To begin with, the International Map of the World at I:2 500 000 should be refered. For the first time it has provided for a single comparable image of the continents and World ocean and can serve as a reliable basis for thematic maps of the planet and its vast regions. Work on the creation of international maps of the World, since it is inconceivable to solve the problems of environmental protection with their lack, is in full swing. Such an activity is more intensive in geological sciences but the XXIIIrd Geographical Congress delighted us with the achievements of the Commission on Geomorphological Survey and Mapping resulted in elaboration of the International Geomorphological Map at I:2 500 000 and the manuals on geomorphological mapping.

Within the frames of complex mapping with its aim of representation of the diversity and interrelations of territorial natural and productive complexes (geosystems) the XXIIIrd Congress has manifested once again great achievements in creation

of many complex atlases (for instance, Australia, Bulgaria, Canada, the German Democratic Republic, Japan, Poland, Rumania, etc.), regional ones (namely, in Australia, France, Hungary, etc.) and to be of a special interest it has exhibited the variety of ways for their further advancement, in particular, introducing the maps of natural condition estimation, environmental protection and others promoting scientific and practical value of these works. It is important that recently the regional atlases have rather frequently gain a definitely expressed planning-economic orientation. A vivid example is a series of uniform regional atlases of Hungary, covering the whole country and intented at a development of the Programs with their aim of rational resources use and optimal population service (Rado S., 6). At the same time, the XXIIIrd Congress has corroborated the tendency to expand the territorial range of complex mapping, on the one hand, for the sake of covering rather extensive parts of the planet (fundamental Atlas of the Pacific Ocean and the Geologo-Geophysical Atlas of the Indian Ocean published in I975 can be used as illustrations) on the other hand, detailed studies of the most important areas, especially of large cities and their suburbs.

Thematic maps relating to geographical conditions, earth resources, population, economy, and regional problems have attracted our attention by their abundance, variety of subjects, scales, and territorial frames. Only some of them will be mentioned in the further narration due to their relationship with the discovery of some geographical regularities. Maps of the oceans providing for new perceptions of many features of the World ocean are of

great interest. Exactly, the Bathymetric Map by Prof. Leontyev O.K. (3) allows us to define planetary morphostructures of the oceanic bottom and to work out an objective classification for them; geomorphological and tectonic maps of the Atlantic Ocean bottom exposed a close bond between the underwater relief and geological bottom structure (Litvin V.M., 3)[x].

Effectiveness, power, and cogency of the cartographical method were displayed by the studies of the most complicated phenomena of the World ocean, namely, impact of external and internal bordering oceanic surfaces on the activization of various processes and on the oceanic structure (Aizatullin T.A., o.a., 3); many-year fluctuations of the World oceanic level, in particular, using the map of the present-day earth crust movements in East Europe (I97I, Kligue R.K., 3); regularities of raw material and energy power resources arrangement, etc.

A number of new world maps has laid a solid basis to determine geographical regularities of various earth resources location, exactly, water ones; for instance, the world maps of water elements balance and fresh water resources by Lvovich M.I. (2), allowed to estimate such resources for I28 countries of the World and to specify the regularities of various countries provision for them. At the same time, the maps of individual states and regions (Hydrological Map at I:750 000 from the National Atlas of

[x] The contributors' name and volume number of the "International Geography - 76, International Geographical Congress", Moscow, I976 containing a certain paper are given herewith and further in brackets.

of the G.D.R., Hydrogeographical Map of Rumania at I:I 000 000, Maps of Water Balance for Bulgaria at I:400 000, Mexico, Thailand, etc.) exhibited spatial and seasonal regularities of the river run-off, partly, the ones related to natural and socio-ecological factors.

A growing power of the cartographical method as a most significant instrument to examine features, types, and regularities of settlement; composition and dynamics of the population (Evteev O.A., 7); its ethnographical problems - - ethnic areals, migrations, and processes (Brook S;I., Pokshishevsky V.V., 7) was perfectly exhibited by the field of socio-economic geography, exactly, by the Section of Population Geography. Among a set of papers devoted to the practical application of this method to forecast settlement, territorial planning of economy and localities, urban construction, etc. attention was attracted by complex approaches to population mapping including an employment of modern automation technique (Roubitschek W., 7; Buzzetti L., Staluppi G.,).

New types and subjects of the maps, demonstrated at the Congress, as if focused the most burning problems of to-day. For instance, such is an impressively mournful and already numerous collection of environmental pollution maps of the World ocean, firm land, air basin of the Earth, soils, etc. (Bach O.W., 2, etc.) These maps do not only fix unfavourable technogenic environmental changes threatening mankind's prosperity. They notify of the arising danger or forthcoming aggravation of the perilous phenomena. I think it is one of our tasks to give the force of an alarm

bell to these maps. But their role is much greater - - they are an indispensable prerequisite for a scientific elaboration of measures for the rational employment of earth resources, effective management of economy and population settlement, for preventing dangerous irreversible disturbances of natural equilibrium, for ascertainment of national standards determining allowable pollution, etc.

The maps of natural hazards are like the ones refered; for a number of them such as: sliding processes (Perov V.F., 2) and snow avalanches (Kanayev L.A., 2) the maps embracing vast areas have been created for the first time. They made it possible to determine geographical factors of natural hazards and work their regionalization.

Novelty of many maps is manifested by a geniune geographical approach to the interpretation of special subjects, namely, an account of acting factors of the geographical environment such as: relief, vegetation, soils, hydrogeographical network when climatic conditions being mapped (Bogdan O., and o.a., 2);land use forms (Tsigelnaya I.D., 2) and basic landscape factors (Subbotin A.I.; 2), when the river run-off being presented;energy factors of soil formation (important for calculations of natural processes regulation), when a map of soil zones (Volobuev V.R., 4) being compiled, etc.

But the summit of the geographical approach is achieved, to our mind, by landscape mapping synthesing special maps of separate natural components for the sake of an over-all presentation of natural-territorial complexes and regularities, being characteris-

tic of them, envisaging a successive integration of geosystems with the scales reduction (Isachenko A.G., 5). A peculiar feature of a number of landscape maps is the basic types discrimination of the man-made landscape in dependence with the degree of man's influence (Demek J., 5). The Congress evidenced once again that cartographic modelling of the system is a primary process of perception in the landscape science studying a) bonds between natural components to specify the ways of their management and b) landscape regimes to optimise them. It is in this process of map creation and their further analysis that new ideas arise and regularities formerly unknown become apparent (Sochava V.B., 5; Haase G., 5; Nakano T., 5).

A remarkable feature of many maps of new types and subjects is in their clearly expressed practical orientation. In this respect estimation maps of favourableness of natural conditions for man's life or of their fitness degree to solve certain tasks (for instance, land irrigation) are especially characteristic, including estimation maps of resources determining the possible economic efficiency of their use. A considerable part of these maps, particularly, landscape estimation maps (Isachenko, 5) has a synthetic character and a dynamic aspect.

The XXIIIrd Congress has demonstrated a wonderful variety of the methods to use maps for geographical studies of any territorial scope. We observed with interest the successful employment of the formerly known, so to say, traditional methods, comprising the simplest ones based on a visual analysis of the maps. Let's take as an example the research of the Italian coastal line

changes since the Paleolith up to now by an analysis of the maps containing archaeological and historical data (Palagiano C., 9). As before, topographic maps are regularly employed to analyse the factors determining the distribution of various landscape elements, in particular, timber vegetation in the mountains of the West of the U.S.A. (Stillwell H.D., 5). Topographic maps have a great success with the morphometric relief studies to solve scientific problems (to examine surface denudation and tectonic structures, to analyse neotectonics, etc.) and practical tasks - - search for ore mineral deposits, placer and primary gold accumulations, oil and gas fields, underground waters, etc. In the Ist (Geomorphological) Section of the Congress this problem, i.e. an analysis of topographic maps for the aims mentioned above and the design methods of derivative morphometric maps was dealt in numerous papers (Baumgart-Kotarba M., and o.a. I; Ojany F.F., I; Piotrovsky M.V., I; Shein V.S., Orbera H.L. and o.a. I, Cuba; Sokolovsky I.L. and o.a. I; etc.). Certainly, the thematic map use still more expands the spectrum and possibilities for such studies.

And, naturally, the greatest interest in the cartographical method development is aroused by an energetic cultivation of original modes and trends of map use originated, first, by modern techniques - - electronic computers, automation, by the methods of remote sensing, second, by the present-day problems of geographical sciences, in particular, forecast of natural and socio-economic phenomena and processes. Let's take as a vivid example only mapping of natural conditions using a numerical analysis of multi-

band images of Canadian Arctica scanned from the satellite (Howarth P.J., 5), fixation of spatial data, exactly, the ones obtained from the satellites by parcels of regular territorial network (Coiner J.C., High C.J., 5) that allows its multiple and multiparametric processing for an automated map making. In our opinion, due to the development of these and similar to them research modes cartography can arm the modern science with an obligatory and indispensable component of monitoring that is the systems of measures for observation, control, and management of the environment. At the same time, a regular cartographical presentation of real situations in geosystems of local, regional, and global ranges is in power to supply us with an effective technique to predict them by means of elaboration of cartographical models of the future geosystems state (Sochava V.B., 5). It is the primary goal in the forthcoming progress of geography. Though, the XXIIIrd Congress has already gave a number of examples of particular prediction tasks solution: by foreseeing distributions and properties of some landscape components by easily traced properties of other components (Preobrajensky V.S., Alexandrova T.D., 5; Speight J.G., 5); by the prognosis of environmental changes due to some effect on its separate components, let us say, on transport of a partial run-off of the large Siberian rivers to the South to Kazakhstan and Central Asia (Mikhailov N.I., 5); by forecast of geochemical environmental conditions based on the maps of probable intensity of selfregulation of the technogenetic products (Glazovskaya M.A. and o.a., 5). It is remarkable that automation extraordinary expands the sphere of the map use for

planning-economic purposes. For instance, when statistic information being coordinated in the process of its possession, an opportunity arises to treat and represent it automatically in the form of thematic maps anticipating statistic reference books and exceeding these very reference books by clarity and convenience to use.

Geographical Sciences and Cartography are Indissoluble

Significance and weight of the cartographical component at the XXIIIrd Congress induce to express some ideas on the relationship between geographical sciences and cartography. It is known that for almost two thousand years cartography developed within geography as its organic part. The cartography formation as an independent branch of knowledge is closely associated with the development of higher cartographic education, being definitely shaped only in the current century. But this progressive fact, reflecting the general differentiation of the sciences has acquired a rather unexpected interpretation with some cartographers. They started to proclaim a complete independence and estrangement of cartography from geography and other natural and social sciences and to restrict the maps value by the role of technical communication means, being indifferent to the content of the information transmitted.

After the XXIInd Geographical Congress and the VIth International Cartographical Conference in 1972 in Canada this conception was strongly criticized (presicely, in "The Canadian Cartog-

rapher", volume IO, N 2, I973) but it was demonstrated once again in I974 in the first issue of the newly-instituted journal "The American Cartographer", volume I, N I and was further quoted in various magazines. I think that the results of the XXIIIrd Congress convicingly evidence both the wingless and merely erroneous restrictions of cartography interests by technical problems of communication.

The increasing integration of the sciences (along with their proceeding differentiation) is accompanied by the progress of knowledge, especially strong at the junctions of various disciplines. A vivid illustration is exhibited by the development of thematic branches of mapping, being multispectrally reflected by the activity of all the Sections of the XXIIIrd Congress. As it was pointed out above, many of the maps presented, actually decorating the Congress, have wonderfully expanded our vision of the World. It is quite natural. We appreciate in maps their quality of spatial models, being able to enrich our knowledge of nature, population, and economy in their present, past, and future. But the success of cartographical modelling is based on the two things - - on the properly set task, founded on the comprehension of the essence and peculiarities of the mapped phenomena and processes and on a skilful preparation of the model by the principles, rules, and standards of the cartographical science, in graphic abstraction and forms corresponding the tasks of the research. It means that the progress of thematic mapping is impossible with cartography being isolated, beyond appropriate natural

and socio-economic sciences, without the support of their achievements. Briefly, the matter is in the unity of the form and content.

Life-giving juices for the cartography development penetrate into it through the organic bonds with many sciences and practise but the value of geography is especially important. Studying territorial natural and socio-economic systems (complexes), their structure, elements, and functioning, with a primary stress at the research of spatial-and-time relations, geography, as no any other science, extensively employs the cartographical research method and stimulates the cartography development. It was this fact that once allowed me to give a geographical interpretation to cartography as a science to represent and study spatial systems by means of their cartographical modelling. The bonds between the both sciences are so strong that while the present-day research of methodological geographic problems being implemented, one can come across categorical statements due to which there is no and cannot be geography without maps (Aslanikashvili A.F., Saushkin Yu.G. , p. I8)[X].

Scientific-Technological Revolution Intensifies the Cartography Effect on the Progress of Geographical Sciences

The scientific-technological revolution even more increases

[X]Novye podhody k resheniyu metodologicheskih problem sovremennoi geographicheskoi nauki. Simpozium "Geographiya v Gruzinskoi SSR". Sbornik dokladov, vyp. I, Izd. Metsniereba, Tbilisi, I975.

the comprehensive role of cartography and reinforces its impact on the geographical sciences development. This process is stimulated by, first, enegetic design of new types of maps, being organically associated with the general progress of thematic mapping (the subject has been touched upon in the review of the cartographic papers of the XXIIIrd Congress), second, perfectioning of the cartographical research method, i.e. the maps application to acquire new knowledge of the World. The last problem is not a novice at the International Meetings; it enters as a special subject into the Program of the VIIIth International Cartographical Conference, therefore, we infringe upon only its latest aspects: system approach, mathematical-cartographic modelling, maps application in forecasts, interaction between the cartographic and aerial methods of research, automation introduction.

The core of geographical cartography is known to be complex mapping, being multispectral, and, at the same time, over-all mapping of territorial natural and industrial complexes as geosystems of a different complicity and spatial range. National atlases are its most vivid incarnation. An account of cybernetic principles has resulted in a more thorough comprehension of the essence of complex, in particular, atlas mapping. We face the both tasks to expose elements and structure of geosystems and to exhibit factors and processes determining its functioning and development. Such an approach greatly increases the force of the cartographical method.

The present-day development of the geographical sciences is

greatly dependant on and stimulated by their "mathematization", i.e. introduction of mathematical methods into geographical studies. Mathematical modelling is especially valuable among these methods. It has opened new ways to study quantitative regularities in geographical phenomena and processes and, consequently, to more comprehensive and total cognition of reality. But spatial specification of mathematical models (it means their practical application) is based on geographical maps, it is impossible without maps and it puts forward their own demands to them. In this fact we see an accessory stimulus to the cartography development and consolidation of its ties with geographical sciences.

But it is not enough. In geography mathematization the value of geographical maps is not limited by the role of a supplier with coordinates and other spatial information, being indispensable to make a mathematically formalised abstraction alive. A conjugated use of the both modelling methods, being known in the Soviet Science as mathematico-cartographical modelling, permits to match their strong aspects - - a high degree of abstraction and a possibility to treat any spacious massifs of data with spatial specification and visuality of maps that greatly upsurge the efficiency of the study.

A stress at a geographical map to increase the quality of the mathematical model and a check of reliability of the data obtained by this model due to their representation on a map gives a simplest example of the present-day modelling. In the most general and aggregated form mathematico-cartographical

modelling assumes a successive construction of a number of derivative mathematical and cartographical models for the sake of a more thorough analytic study of geographical phenomena and processes or (and) to get an integral synthetic notion about them. The multiple-stage modelling is beneficial in many respects; it permits to use a relatively simple modes of models construction at separate steps, allows control and correction by means of the maps of intermediate steps of mathematical modelling, facilitates diversified modelling (for instance, when different mathematical methods are used together), protecting against unilateral assessments and conclusions. The experience obtained evidences a convenience of mathematico-cartographical modelling to study territorial systems of various territorial levels and spatial range; a stress at this modelling refers, in our opinion, to one of the factors of the successive introduction of a system approach into geographical sciences.

The maps employment in forecasting has the aim to foresee phenomena - - their arrangements and locations in space and alterations in time. It has become an effective technique of the geographical research, being successfully used to forecast earth resources, natural hazads, outcomes of environmental pollution, economic and demographic development, interaction of the "man-and-environment" system, etc.

Forecast of the phenomena distribution are based on the research of the regularities arrangement of the phenomena over well explored areas and on interpolation or extrapolation of the definite regularities over the areas, being insufficiently

studied. For instance, when the interactions between vegetation and mountain rocks are determined in the etalon plots, a geobotanic map, showing the vegetation well reacted on mountain rocks, can serve as an indicator of these rocks over the whole area.

Forecasts of the phenomena states presume a prediction of their behaviours under the effect of external factors (such as: subsidence of loessial rock when watered or under the weight of constructions). The frequently applied method is a study of behaviour of typical variations of the phenomenon under the influence of certain factors and regionalization of the phenomenon by these variants that forms a forcasting map.

Spatial-and-time prognosis comprises forecasting of the development of the phenomena, i.e. changes in the course of time of their space and state (let us say, hydrometeorological characteristics). The simplest mode to forecast is to clarify the phenomenon dynamics (for instance, coastal line shift) by a set of different-time maps and proceed to extrapolate the regularities revealed.

In a common case, cartographical forecasts are based on an analysis of spatial-and-time regularities by means of maps. Many of these regularities can be presicely quantitatively expressed like strict or approximate functions allowing to pre-calculate the state of phenomena in each point of the map and (or) any moment of time and then proceed to compile specia forecasting charts. In this situation mathematico-cartographi-

cal modelling once again finds a rich soil.

A fruitful influence on the development and improvement of the cartographical research methods is exerted by remote sensing. Its value is tremendous. Remote sensing methods allow to compile directly many thematic maps of mean and small scales (including unique subjects as monitoring), they exhibit definitely spatial regularities of regional and global significance, being frequently inobservable on the analogic maps, obtained by the traditional method using large-scale sources. Moreover, the possibility to get a series of operative homogeneous space data over the whole planet or its large regions opens the way to receive a set of easily comparable maps, being indispensable to study rapidly changing phenomena and to make their forecast. At last, the diversity of the remote sensing methods permits to overcome some limitations, the ones being typical of aerial survey. In the last problem I shall make references to the papers of Commission 8 of the I.G.U. studying new methods to collect geographical data on sensing and their processing.

Mathematico-cartographical modelling, many aspects of cartographical forecast and space data processing are conjugated with enormous calculations, being impossible without electronic computers. Latest electronic computers simplify the treatment of speedily growing information and have initiated "computer mapping" - - the maps reproduced automatically by the digital devices of electronic computer - and most of all they pave the way to over-all advancement of thematic maps, especially the

synthetic and forecasting ones. The effect of an introduction of automatic devices into cartography to prepare origical map images and printing surfaces of geographical traditional maps, to transform the maps into a numerical form, as well as to solve a great deal of problems on the maps application is of no less importance. In general this effect is expressed in the increase of labour productivity, acceleration of the processes of maps preparation and use, including the rise of accuracy of the works. But other perspectives of automation are especially important for the geographical science and practise: potentialities to transform maps and other spatial data into the numerical form; creation by these means of specialized thematic banks of spatially coordinated data for any natural and socio-economic phenomena: conveniency of multispectral processing of such data, namely, to compare, combine, and synthesize various indicators; further automated compilation of derivative maps of various scales and types accounting for the needs of map users; introduction of new types of maps of both the content (estimation ones) and mode to fix the information by means of a statistic data control tie to the regular grids of official maps; at last, elaboration of automation reading techniques, i.e. extraction of the spatial data confined in the maps.

Cartography Position at the Next Geographical Congresses

The final conclusion on the effect of cartography on the

geographical sciences development is a categoric one. Persistently using the achievements of the scientific-technological progress, present-day cartography arms geographers with the mehtods of spatial research of matchless power, flexibility, and speed. At the same time, specification, clarity, and locanism of thematic maps make of them indispensable techniques for a strong bond between geography and practise, to hand in the knowledge to practise, which was stored in the course of geographical studies. These facts have acquired a special sense and significance in respect to new really fundamental problems facing geographers. The previous idea can be well illustrated in regard to the USSR.

The XXVth Congress of the Communist Party of the Soviet Union (February-March, 1976) defining the principal trends of the development of the USSR national economy for 1976-1980 raised a number of tremendous tasks for the science to solve, being profoundly geographical on the content. I refer such of them as: creation of scientific fundamentals for rational use and protection of lands, resources, vegetative and animal world, air and waters; complex study of the World ocean; elaboration of extensive complex Programs accounting for expedient arrangement of productive forces and development of new regions, being rich in raw materials and fuel; advancement of the methods to forecast natural phenomena and socio-economic processes, etc.

Considering the variety of these tasks the two positions are similarly valid for them. First, their solution requires

participation of a complex of natural and social sciences and a system approach. Second, they embrace vast areas and some of them have a planetary range. In this conditions geography gains a managing and generalizing role, taking the rank of a fundamental science. But this task cannot be fulfilled without assistance of cartography and international cooperation to solve global problems.

All said has led us to the final conclusion. Cementing of the ties between geographical sciences and cartography, as well as the experience of the XXIIIrd Congress allowed us to lay down with confidence the place to cartographical problems within the activity of the Geographical Congresses. Each geographical science on nature, population, and economy uses the cartographical research method reflecting it according to their interests and specification of the phenomena to investigate. The evidences of this are the progress of thematic branches of cartography. And it would be quite natural to include cartographical subjects into the Programs of the majority of the Congress Sections (Geomorphology, Climatology and Hydrology, Biogeography, Economic Geography, Geography of Population, Historical Geography and Paleogeography). Particularly, the XXIIIrd Congress evidenced that the geographical interpretation of the present-day features and tendencies of the world economic development requires creation of world economic maps specially oriented at an outlining of basic problems of World economy - - food, energy, etc. (Mayergoiz I.M. and o.a., 6).

In those Sections where the cartographical papers were not included they broke into by themselves. Undoubtedly, cartographical subjects should be included into the Programs of all the Sections of the future Geographical Congresses.

At the same time, general theoretical comprehension and advancement of the methods to create maps and apply them to scientific research and practise, together with the development of progressive technology and apparatus inevitably attracts attention of the International Cartographical Conferences.

But when cartographical subjects of the International Geographical Congresses and Cartographical Conferences being combined, they lack the most important link - - system geographical mapping, being the highest step of complex mapping oriented at an over-all representation of geosystems regarding their elements, structures, functioning, coordination (hierarchies), and bonds with the environment[x]. Such a system approach is missioned not only to incorparate special studies but to serve the highest aims of the present-day geography - - to integrate and synthesize knowledge of nature, population, and economy for the sake of solution of the cardinal present-day problems of the current epoch such as: food, energy, and, especially, observation, control, and management of the environment. Therefore, the Geographical Congresses, having cartographical subjecys in the Programs of all

[x] Naturally, a study of complicated systems reguires their over-all mapping, i.e. construction of many models characterising various aspects of each system. This fact still more increases the value of complex atlases.

their Sections and being held conjugately with the Cartographical Conferences, should include a special Cartographical Section with a new, definitely shaped synthetic orientation - - the Section of System Geographical Mapping.

Отпечатано в ЛИК МГУ
I,0 уч.-изд.л. Тираж 700 экз.
Заказ 476