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The Documentation of Science Organization as an Emerging New Branch of Scientific Information

I. *Science Organization — Documentation of Science Organization*

It is a theorem practically unanimously accepted that in our age — especially in the second part of the XXth century — *a scientific-technical revolution* is taking place. The essential character of which was thus defined in the columns of the theoretical journal of the communist and worker's parties in a discussion under the title "The crises and the workers": "Its main components are: the automatization and the complex mechanization of production, electrification and chemization of industry, increasing use of atomic energy for peaceful ends. The scientific revolution manifests itself in utilizing new kinds of raw-materials, mainly synthetic and plastics; by the appearence of new consumer goods; by improving machinery at an accelerated pace; by the emergence of new branches of industry; and by the rapid increase in the labour productivity."[1]

The interaction of social progress and the scientific-technical revolution was one of the chief topics of the international East-West meeting of scientists named "What future holds for mankind" held at Royaumont and at the Sorbonne in May, 1961, in which a number of well-known scientists and scholars of various nationalities and ideology took part, like the Nobel-prize winner Academician N. N. SEMYONOV, Professor BERNAL, Josue de CASTRO, Alfred SAUVY, etc. representing a wide-range of natural and social sciences.[2] The main idea of the discussion relating to the progress of science was outlined by Professor LAUGIER: "That time vanished forever, when society could permit individual discoveries and innovations spontaneously intrude upon human life. In our age, it is increasingly valid that social progress does not so much depend on the scientific discoveries themselves as on a reasonably organized utilization of these discoveries for the benefit of mankind".

On the development of the scientific-technical revolution in socialism, one of the most important documents of our age, *The Program of the Communist Party of the Soviet Union*, points out: "Mankind enters the epoch of one of the greatest scientific and technical revolutions that manifests itself in utilization of atomic energy, conquest of space, rapid growth of chemistry and the automatization of production and in many other magnificent achievements of science and technology. The capitalist relations of production, however, are

[1] *Béke és Szocializmus.* (International Marxist Review) 1961. 7. no. 128. p. BAREL, Ives — MENSHIKOV, Stanislav: *Mi van a világciklussal?* (What about the business cycle?) Discussion. From the part „Rectification of the scientific-technical revolution."

[2] *Quel avenir attend l'homme?* Rencontre internationale de Royaumont (17—20 mai 1961). Paris, 1961, Presse Univ. 330 p.

too narrow for the scientific and technical revolution. Only socialism has the ability of carrying out this revolution and of utilizing its fruits for the benefit of society."[3]

The Program deals, in detail, with the utilization of the achievements of science and with problems of science-policy and organization. Its fundamental statement is that "*Science itself becomes a direct productive force.*"[4] (italics mine) *The Program emphasizes that "the most extensive acceleration of scientific and technical progress is a public affair of first importance . . .*" (original italics) and "*that the whole system of scientific and technical information, the study and diffusion of internal and foreign experiences should be examplarily organized*". (italics mine)

The Program deals, also in a separate subdivision, with the tasks of science, the development of theoretical researches (with the most important problems facing the natural and social sciences), the linking of science with production.[5] The problem-complex of organization, of developing productive forces, and raising labour productivity to a higher degree, on scientific principles, runs right through the *Program.*

The size of the apparatus, working to solve this problem-complex comprising the whole of production and the society in the Soviet Union, is illustrated by the following data which at the same time underlines the economic significance of science: there were 3 800 scientific institutions operating in 1960, of which the total of research institutes was 1 500; the number of research workers amounted to 354 000, of which nearly 11 000 have the "doctor of sciences" degree, and the number of scientists with a "candidate" degree is over 98 000.[6]

The immense pace of development can be well seen by the fast growing number of research institutes of the Soviet Union: the number of research institutes in 1951 :1157, in 1960 : 1500 (while only 786 in 1941). The annual increase relating to all scientific institutions was some 86 institutions (1951 : 2848, 1961 : 3800).[7] For the sake of comparison concerning research efforts we took a country with smaller financial resources, than the Soviet Union: Hungary. Data shown below will illustrate the development there. While before the liberation no mention could be made of a system of research institutes, in 1961 organized research work was carried out in 125 institutes and in more than 600 other research workshops (at university and high school chairs mainly). Total number of personnel employed in scientific institutions is 13 792, as of the end of 1960. Of this number the researchers and assistant

[3] *A kommunizmus építőinek kongresszusa.* (Congress of the builders of Communism.) 17—31. Oct. 1961. Budapest, 1961, Kossuth. 502 p. *(The Program of the Communist Party of the Soviet Union :* 355—482. pp.)

[4] MARX refers with a wise foresight to this process. To the elaboration of these references see: KOSEL, G.: *Produktivkraft — Wissenschaft.* Berlin, 1957, Die Wirtschaft. 146 p.

[5] *Program :* II. part V. chapter 3. subdivision.

[6] KELDYSH, M. V.: *Sovietskaya nauka i stroitelstvo kommunizma.* Pravda, June 13, 1961. 1—3. pp.

[7] Data: NYILAS József: *Korunk tudományos-technikai forradalma . . .* (Scientific-technical revolution of our age . . .) Bp. 1961. 208 p. Manuscript. SZERÉNYI Sándor — WIRTH Ádám: *A szovjet tudomány és felsőoktatás a kommunizmus építésének kibontakozó szakaszában.* (Soviet science and higher education in the emerging phase of the building of Communism.) Társad. Szle. 1961. 11. no. 83—96. pp.

staff amounts to more than 10 000.[8] Beside the increasing number of scientific institutions and scientists, data on the budget of science are not less convincing and clear. Taking the United States, the biggest capitalist country, the sums spent on research and development, amounting to $ 900 million in 1940, were increased approximately to $ 12.5 billion for 1959. This sum, expressed in proportion to the gross national product, runs to 2.5 percent.[9] The Soviet Union spent 874 million (new) roubles on science in 1950, while in 1960 3,260 million, and in 1961 expended over 3,800 million.[10] Hungary expended 1.6 million forint on research work in 1961, which amounts to more than 1 percent of the national income, being equivalent of 2 percent of the national budget.[11]

Official sources, and calculations made on their basis show that, from the turn of the century to the early twenties, the number of personnel employed in research and higher education, all over the world, can be estimated at 50 000, of which some 15 000 were engaged in research. Total of research expenditure amounted to half-million pound sterling. (From J. B. BERNAL: *Science in history*. London, 1954.) In 1960 already some 650 000 persons were engaged in scientific research, and the research costs can be estimated at 20 billion dollars. Professor BERNAL also renders valuable estimated informations in his book *World without war* (London, 1959.), on the number of professional scientists engaged in theoretical research in the most developed countries, Soviet Union: 80 000, Unites States: 40 000, United Kingdom: 10 000. The number of scientists engaged in theoretical research, all over the world, can be estimated at 200 000, which number is rapidly increasing. According to these calculations, the number of research workers in the developed countries increases by 7 percent annually, that is, much quicker than in any other occupation.

This ever growing, and in the last decade, *sudden increase* of scientific institutions, research institutes, scientific workers, and the proportion of the share of science in the budget, as compared to any other economic sector in the developed countries, is due to the decisive significance of science in the development of every economic sector (industry, agriculture, transport, communication etc.).

This fact was thus formulated by A. N. KOSIGIN, vice-president of the Council of Ministers of the Soviet Union, at the All-Union conference of scientific workers (Moscow, 12—14 June, 1961.): "*Technology should develop quicker than production, while science should develop quicker than technology*".

Accordingly, a suddenly increased interest is shown all over the world in the planning, organizing and economic problems of scientific research, and — as a result — *its proper subject literature* has come into existence. This is indicated, among others, by the fact that one of the most remarkable western research institutes for social sciences and economics, the Institut de Science

[8] SZERÉNYI Sándor—SZÁNTÓ Lajos: *Politikai munka a Tudományos Akadémián és intézeteiben.* (Political work in the Academy of Sciences and at its institutes.) Pártélet. 1961. 7. no. 19—25. pp. SZERÉNYI Sándor: *Tudományos életünk néhány időszerű kérdéséről.* (On some actual problems of our scientific life). Magy. Tudomány. 1961. 7—8. no. 393—402. pp.

[9] Data: NYILAS J. op. cit. 59—67. pp. KIDD, Charles: *American universities and federal research.* Cambridge, 1959, Harvard Univ. Press. 272 p.

[10] KOSIGIN, A. N.: *Za tesnuyu svyaz nauki s zhiznyu.* Pravda. 15 June, 1961. 2—3. pp.

[11] SZERÉNYI S. — SZÁNTÓ L. op. cit. 19. p.

Économique Appliquée in Paris has started publishing a series of studies in the problems of science organization. The first number of this series "*Problèmes économiques de la recherche et de l'information scientifique et technique*" claims that research *might be considered as an industry* ("research industry")[12] and what is more, as a *basic industry* because of its product character, having the essential function of „producing" scientific and technical knowledge. The most important „products" of this „industry" are the invention and the innovation, the effect of which appears in increasing the production.

The great increase in the literature on science organization — as a collective term — may be seen by the fact that the National Science Foundation in Washington has recently published three bibliographies on these problems.[13]

As to the socialist countries, separate bibliographic and documentary periodicals, giving current information of the modern literature of science organization, are published in the Soviet Union and in Hungary. In the Soviet Union two periodicals have been published since 1947 edited by the Fundamentalnaya Biblioteka Obshchestvennyh Nauk of the Soviet Academy: *Novaya Sovietskaya Literatura o Nauke i Nauchno-Issledovatelskoy Rabote v SSSR* (New Soviet Literature on Science and Scientific Research in the Soviet Union) and *Novaya Literatura o Nauke i Nauchno-Issledovatelskoy Rabote za Rubezhom.* (New Literature on Science and Scientific Research Abroad). Published monthly, they are listing titles of books and articles of periodicals, selected and annotated. These two series cover the entire Soviet and foreign literature. In Hungary, the Library of the Hungarian Academy of Sciences has been publishing since 1961 a documentary review under the title *Tájékoztató a tudományos kutatás tervezésének, igazgatásának és szervezésének nemzetközi irodalmáról* (Bulletin of international literature on the planning, management and organization of scientific research).[14]

In the process of turning science into a direct productive force, there is an emerging, new branch of organization and planning: the *science organization* with its complex problems. We should like to refer to some of these, regardless of the order of importance; terminology of organization of research (covering essentially content-elements of the problems), international division of scientific work, research economics, systematization of research work according to its levels (basic-, applied research, development).

[12] Russo, F.—Erbès, R.: *La recherche-développement.* Concepts et problèmes de base, environnement et propagation de l'information scientifique et technique. Paris, 1959. 80 p. (Cahiers de l'ISEA. Série T. no. 1.)

[13] *A selected bibliography of research and development and its impact on the economy.* (Washington, 1959, Supt. of Docs. 21 p.), *Bibliography on the economic and social implications of scientific research and development.* (Washington, 1959, Supt. of Docs. 52 p.), *Current projects on economic and social implications of scientific research and development.* (Washington, 1961. 124. p.) — Two other bibliographies deal definitely with the literature of science organization: Bush, G. P.: *Bibliography on research administration.* Annotated. (Washington, 1954, Washington Univ. Press. 146 p.) This work, giving nearly full information of the western literature on science organization, is a continuation of the work *Scientific research, its administration and organization.* ed. by Bush, G. P. and Hattery, L. H. (Washington, 1950, Washington Univ. Press. 190 p.), and, in addition *Bibliography on research administration, management, organization and use.* (Houston, 1960, Science Inf. Assoc. 23 p.).

[14] Data of the present article are based on documentation on science organization work conducted in the Library of the Hungarian Academy of Sciences, and on the material of the Bulletin.

During the processing of subject literature of problems of science organization, the documentation of science organization, as a particular branch of scientific information, emerges.

On the next pages, setting out from the problems of science organization, we shall make an attempt to outline briefly the scope and systematization of its documentation.

II. *Scope and Systematization of the Documentation of Science Organization*

Theoretical and practical problems of science organization determine, more or less, those of the documentation of science organization as well. In contrast with some branches of science already developed historically (e. g. agriculture, industry), science organization — as an eventual new discipline — is in the phase of its ever accelerating development. However, this is not the only, nor the most essential distinction to be drawn between the documentation of science organization and that of the specialized branches of science. Real innovation in the documentation of science organization appears much more in its development, affected by every branch of science essentially connected with it.

This qualitatively different character of the documentation of science organization, as contrasted with the documentation of specialized fields of science, lies in its *universality* and *complexity*.

Developing of a new compound in a research institute or at an industrial plant and registering of the related subject literature does not enter the documentation of science organization, but, on the other hand, a paper analysing a new type of collaboration in a research institute or at a plant, describing the proper organizational forms of a new constructive collaboration which aims at the developing of this new compound, should become a subject of the documentation. Taking another example, documentation of literature relating to a new diagnostical treatment worked out at a clinic may be the matter of a specifically medical documentation. But the registering of a work on the financial implications of the research work performed at the clinic and its budgetary relation to the plan of medical researches as a whole, and to the national plan of scientific research, is the particular task of the documentation of science organization. The latter example is significant, because the medical researches (planning of *research* and its budget) appear, for the most part, closely interwoven with the training of physicians (questions of planning and budget of *higher education*), and with the healing itself (questions of planning and budget of *medical supply* in general).

Complexity of the documentation of science organization is the other main aspect in two senses: giving information on the non-technical subject literature on the managing and planning of researches affecting several branches of science or promoting the science in its entirety (e. g. space research or nuclear energy), and further, reporting on the appearance of new branches of science which emerged during the development of productive forces and of science — in the first sense. In the second sense: revealing the manifold correlation of research activities involving the systematical (different levels, basic-, applied research, development and technology), methodological, organizational, and economical aspects as well as their relation to the scientific

manpower problems and to the business management. Merely technological aspects should be omitted.

Mathematics, for instance, which has an impact on nearly every field of science, is not in itself, an object of the documentation of science organization, but, as special possibility to be adapted to various sciences, to science organization itself, as well as to scientific information (logistic, operations research, translation machine, documentation by machine). Questions of development of the engineering industry concern the engineering documentation, but, on the other hand, the demands of engineers for the industry, their estimation and planning in connection with the development of technology and science as a whole, is the specific matter of the documentation of science organization.

While the technological and other specialized documentations are of primarily of analytical character and practically help the actual research work and development, the documentation of science organization is *synthetic* in character, and gives — in the first place — comprehensive information on the management of scientific institutions, organization of research work, problems of science policy, etc.

The documentation of science organization covers the following disciplines:

1. *History, Theory, Philosophy, and Systematization of Science*

This group involves the general theoretical problems of science.

Works on the history of science (including big general works on the history of particular sciences) contain also a number of lessons for the organization of science. History of science is, at the same time, the history of development of productive forces, and thus gives additional material to promote the understanding of the contemporary process of turning science into a productive force.

Works on the theory and philosophy of science analyse the motive forces of the development of science, throw a light upon the connections of social progress and science, the impact of social structure on science (and vice-versa), the status of science, its role in society and the correlations of sciences.

Systematization and classification of sciences raise a number of ideological, and, at the same time, practical problems having strong theoretical effect e. g. on the relation of levels of research.

2. *Science Policy, Government Administration of Scientific Work*

This group embodies all decrees, measures, resolutions which aim at the development and coordination of science as a whole in a country, and at its harmonic and proper adaptation to social and state life connected with the production, in a reasonable way.

In socialist countries, scientific work like other social activity, is a part of the plan of national economy, and its trends and conditions are made and insured by the state. In capitalist countries, the state takes but a partial responsibility for scientific work, while the majority of researches are the "monopoly" of monopolies.

In socialist countries the most important documents of science policy involve the related government and party resolutions, decrees, statutes, and plans of the national economy as well as government budgets.

In capitalist countries, beside the government budget and decrees, resolutions of responsible government agencies of science policy, attention should be paid to the reports and accounts of big industrial organizations, to the reports of foundations, etc., which are but parts, "reflections" of science policy.

Documents of science policy contain the summary of the status of science in a country, its concrete relation to other social activities, the trends and proportions of research as well as its development projects.

3. *International Collaboration in Scientific Work*

Maintaining international relations and setting up international collaboration in scientific work, organizing *cooperative researches* covering several countries — all these are parts of science policy, mainly in socialist countries.

Cooperative researches cause a *qualitative change* in the international relations by which — beside the traditional forms of these, such as organizing international scientific conferences, study trips, international exchange of publications, working out research projects, etc. — a definite international scientific cooperation and specialization make possible that the participant countries would conduct researches of a kind being most appropriate to their conditions.

This chapter of the documentation of science organization embodies the literature of traditional forms of international relations (foreign scholarships, study trips, literature on the activities of international scientific organizations and agencies with special reference to their science organizing activities, etc.).

4. *Planning, Management and Organization of Scientific Work*

Planning, management and organization of scientific work is taking place essentially at two levels: public administration and national economy, and industry (research institutes) respectively. Both levels have their peculiar methods and problems. Thus, no flexible boundary can be drawn between these two levels in respect of problems to be solved or from the methodological standpoint, since the levels are in continuous interaction and their mutual existence is the prerequisite of their individual existence, just as planning, management and organization of scientific work appear in close interaction.

At the same time not only these interactions manifest themselves, but also the fruitful effects coming chiefly from the production (industry, agriculture communication, transport, etc.) in two ways: production as a process continuously demanding research achievements in an ever growing degree, and, on the other hand, as a process continuously rendering experiences, impulses, and achievements necessary for research.

The scope of planning scientific work covers the following fields — without attempting to give a complete enumeration — : survey of research capacity of the country; its coordinations with the research needs of the national economy (including the social, cultural, and hygienic branches as well as all branches of sciences of problems of theoretical nature, concerning their majority.)

Within the national thematic plan, a short- and a long-range plan is worked out in order to realize the goals set forth by science policy, by determining the

trends and proportions of researches, assuring priority to certain more important researches, and coordinating researches. The national scientific thematic plan should be in accordance with the plan of national economy.

Organization and management of scientific work assures the organizational, personal, and material conditions and the control of implementing the plan of scientific work and its practical application.

The individual scientist, working quite isolated is substituted by research-groups (with assistant staff) working in great strength, by complicated and expensive equipments, implements. Similarly, individual researches are substituted by complex researches, touching upon several fields of science, demanding collaboration. Operating and forming such a manifold, complicated mechanism becomes an organizational task, based on scientific principles.

5. *Levels of Research*

The problems of planning, management and organization of scientific work are equally related to the various levels of research which are divided into three main groups by international literature (though their terminology cannot be regarded as definitely elaborated, neither in separate countries, nor internationally, still less the accurate content of each level): basic (theoretical and experimental), applied (in the industrial branches) and development (industrial, technological researches).

These three levels of research cannot be strictly separated, since it is very common in the history of science that a research task started as an applied research or development work (research of industrial or technological nature), under special conditions, which occured during its performance, or as a "by-product", delivered new research result of basic character, and vice versa.

Basic research — as a rule — strives to explore and recognize new scientific laws, while their practical application is performed in an indirect way. Basic researches are of determining character in respect to the whole development of science.

Applied research (in the industrial branches) aims at the use of scientific laws already recognized for scientific and industrial purposes, while the development (industrial research) is done directly for the technological purposes of production.

Definition of these terms — and generally speaking the categories of research — their correlation and systematization — directly or indirectly — is very much a permanent subject of agencies of science policy and of literature.

An official statement of the Council of Science and Higher Education on the definition of levels of research has recently appeared in *Magyar Tudomány* (Hungarian Science), 1962. no. 1. under the title "On the definition of categories connected with the organization of research work".

Beside the correlation of the levels of research, of no less importance is the interaction of the levels and the technological development.

6. *Methodology of Research Work*

The modern scientific research, the "research industry" is operating on large-scale, that is with large outfit, expensive experimental devices, equipments and intricate instruments, etc. In the last decades considerable literature has

come into existence on the material-technical conditions of research as well as on new mathematical methods (cybernetics, theory of games, operations research, etc.)

In our age, we are witness to the mathematization of sciences, to the effort made to quantify the phenomena of social science. Mathematical methods took root in economy, and by machine translation, in linguistics as well. Logistic, mathematical statistics and other methods based on them, are applied to a continuously increasing extent.

These methods help the development of complex "borderline" researches concerning several branches of science — which is one of the most important features of contemporary large-scale scientific work.

At last this chapter concerns itself with the organization and hygiene of brain work, the registration, methods and technique of collecting material as well.

7. *Economic Problems of Scientific Work*

In accordance with the significance of the up-to-date research in the national economy, its economic problems have increased in two ways: research as a social activity has now an important economic impact on every branch of production, and produces values of itself, and, on the other hand, financing, maintaining, operating, and developing of scientific research.

Within the scope of economy of scientific work, distinction should be made between the following main themes: discoveries and inventions (their realization, and practical use in production, questions of their license, system of patents and innovations), and related to them the technological development: science budget (in correlation with government budget, its proportion to the national income and to state budget; proportions of material and personal expenditures; ratio of expenditures by research levels; investments; proportion of scientific and assistant personnel and the administration, norms of expenditure by size of industrial plants); rentability and efficiency (calculatory methods and elaboration of index systems on the economic effectiveness of scientific research work by levels; efficiency of science investments); statistics and accountancy of scientific work (systems of scientific and economic control of research; adequate system of accountancy to the peculiarities of scientific work); management and economics of research (plant like inner organization of research institutes; measurement of efficiency of research).

The process of turning science into a direct productive force makes more and more urgent and important the elaboration and sound foundation of its economic problems; the research economics, with special reference to the fact that the product of research is a *particular product* as well.

8. *Scientific Manpower-management, Scientific Personnel*

This problem embodies the following questions: *educational system* (its democratism, its relation to existing social system, teaching to scientific and technical knowledge, which is of great importance in respect to the development of science both at the elementary and secondary school); higher education (system of higher school and university training, its connection with practice and productive work; adequate curricula to meet the needs of the national economy

and of theoretical research; training of scientists (scientific practice of graduate personnel, organized forms of training, scientific degrees and qualifications); distribution of scientific workers (systematic distribution by levels and branches of science according to the needs of the national economy and the research); material (remuneration of scientific work; awards), and various forms of material stimulation).

The systematic scientific manpower management is closely connected with the long-range thematic plan of science and with that of the national economy and with demography (distribution of population by occupation, by economic sectors; composition of active population by age, etc.)

Planning of scientific manpower, as one of the most important components of the thematic plan of research as well as of the plan of national economy, is a complicated task methodologically too, due to the several subjective factors involved. It is, therefore, a debated subject in the literature of the last decade. Since international comparison in this field is of great importance (its political bearing is the *peaceful competition of the two social systems*, one index of which being the number of qualified specialists) a large quantity of statistical material has been published. Evaluation of this material is also involved.

9. *Scientific Agencies and Organizations*

Research work, in respect to working place, is performed in three large fields: within or attached to plant (development division of an industrial plant, laboratories, research departments, or in case of large industrial organization: research institutes), within the framework of higher education (faculty research institutes, university or college research laboratories, research centers attached to universities), in professional research organizations (research institutes, institutes attached to scientific and productive organizations such as academic, industrial, agricultural, etc. research institutes, — learned societies, academies, scientific centres, foundations, etc.)

Research work, performed in all the three fields, have their proper organizational forms, frameworks which are related to the directions of their research (natural sciences, technology, social sciences) and to their contact with the special branch of science and the national economy. The question, which organizational forms are adequate to certain type of research, and within these forms which one seems to be the most effective, is answered by registration of publications relating to research organizations and their activities (reports on general meetings, annual reports, accounts, descriptions of activities, directories of institutions and other reference works of this kind.)

10. *Scientific Information*

Questions of scientific information, within the documentation of science organization, are discussed in connection with their research aspects in so far, as the scientific information is a part of the process of turning science into a productive force.

Problems of scientific information within the documentation of science organization can be considered from two aspects.

Theory and methodology of scientific communication analyses the forms of publication, methodological-editorial problems of scientific publications

(abstracting, indexing, apparatus), furthermore, analyses the original scientific publication of "the first degree" and their evaluation in respect to use (references to one or other publications, mathematical and other methods for the evaluation), and publications of "second degree" such as abstracting journals, reviews, critical comparison of varying forms of documentary publications, emerging new forms of scientific publications (microfilms, microcards, etc.)

Theoretical questions of scientific libraries, bibliography and documentation from research standpoint (catalogue-systems, subject catalogues, classification on modern scientific foundation to assist in research), modern technical equipments and devices in the scientific information (information retrieval, machine translation), reasonable new methods and forms of compiling subjects bibliographies (selection, classification, indexing), examination of various forms and of economic-scientific efficiency of documentary work, survey and evaluation of the trend of centralization and decentralization of scientific information by branches of science, etc.

The documentation of science organization itself is a new branch of scientific information that developed by setting out from the needs of science policy and organization, relying upon the broad theoretical and methodological experiences of scientific information. Thus scientific information is not a chapter of the documentation of science organization, the opposite is true.

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Those outlined under numbers 1—9 contain the concept, themes, and systematization of the documentation of science organization. This does not fit, however, into any of the developed and usual schemes of science systematization or even library or documentary systematization, and like the science organization itself, appears as a new branch of science, the documentation of science organization appears as a new branch of scientific information.

In accordance with the complexity of the documentation of science organization, the methods of processing and registering this literature should approach continually the creative, original research methods, or more accurately, their data collecting and processing phases without making indistinct the difference between the research and the scientific information. This way, the documentation of science organization is not merely a transmission between the subject literature and the research work, but, following its subject, it may be a transition from the documentation to research work. Taking an analogy from industry the documentation of science organization has not only to provide for the "supply of material", "the raw material requirements" of the research, but has also to provide the "*research semi-products*". This, at the same time, is theoretically speaking a perspective for the development of scientific information work.

Producing „research semi-products" means that the documentation of science organization (and mutatis mutandis other documentations as well) processes thematically, with tabulations, the documents, makes the data methodologically comparable (e.g. statistical data of various countries), evaluates their relative proportions, compares the descriptions (organizational and management schemes, inner structure of research institutes, budgetary systems of science, methods of calculating efficiency. etc., etc.) on an international scale. The documentation of science organization, on the other hand, on the basis of its findings, does not analyse the science policy and organiza-

tion, does not make deductions, does not develop hypotheses, does not conduct experiments — as all these belong to research itself.

Science organization developed as a result of the process of turning science into direct productive force, while the documentation of science organization developed from the science organization. This process may thus be symbolized: *scientific-technical revolution — science as productive force — science organization — documentation of science organization.*

This paper aims at reflecting the last phase of this process, as the supplementary part of the preceding three phases, in its development, complexity, interactions and perspectives, on the basis of present experience. The problems in question, being a part of a process, may contain a great number of problematic elements in respects to its subject, systematization, and of its relation to other documentations.

Besides the organization of a centralized documentation that comprises science policy, organization and every branch of science, there is room for organizing similar activity within a branch of science, and even within the framework of an institute or industrial plant with the proper restriction of the subject. Documentation of a branch of science will be gradually completed with subjects of the documentation of science organization concerning its own branch. This will make possible a continuous, detailed national and international comparison and exchange of working methods. Thus the documentation of science organization, on a unified theoretical and methodological basis, with the working combination of centralization and decentralization, and of the cooperation and specialization, may become a modest promoter of scientific work and the development of the national economy. And this determines its status in the social division of labour.*

METHODOLOGICAL TABLE

on systematization of the documentation of science organization
— outline —

1. History, theory, philosophy, systematization of science
2. Science policy, government administration of scientific work
3. International collaboration in scientific work:
   - co-operative researches
   - international scientific relations
   - international scientific agencies and organizations
   - international scientific meetings, congresses, conferences
4. Planning, management and organization of scientific work
5. Levels of research:
   - basic research
   - applied research
   - development
6. Methodology and technical implements of research work (equipments, experiments, mathematical, mechanical and other methods)
7. Economic problems of scientific work:
   - discoveries, inventions, technical development
   - science budget
   - rentability, effectiveness
   - research management, statistics and accountancy

* This paper is an abridged form of one chapter of the author's book in preparation on the scientific information problems of social sciences.

8. Scientific manpower management, scientific personnel:
   educational system
   higher education
   training of scientists
   distribution of scientific workers
   monetary incentive
9. Scientific agencies and organizations:
   learned societies, academies, foundations
   workshops of science
      production
      higher education
      research institute
10. Scientific information:
   analysing of scientific publications
   scientific libraries, bibliographies, documentation

RÓZSA GYÖRGY: TUDOMÁNYSZERVEZÉSI DOKUMENTÁCIÓ — A TUDOMÁNYOS TAJÉKOZTATÁS KIALAKULÓ ÚJ ÁGA

Korunkban tudományos-technikai forradalom megy végbe. A tudomány közvetlen termelőerővé válik. E folyamat következményeként és összefüggésében a tudomány mind nagyobb népgazdasági jelentőségével kialakul — gyűjtőfogalommal — a tudományszervezés mint sajátos ágazat, ennek pedig egyre növekvő szakirodalma. A tudományszervezés létrehozza saját dokumentációs bázisát, kialakul mint a tudományos tájékoztatás új ágazata — a tudományszervezési dokumentáció. Fő vonásai: egyetemesség, összetettség, szintetikus jelleg. A tudományszervezési dokumentáció köre és rendszerezési lehetősége „kutatási félkész-termék" produkálása. Módszertani táblázat a tudományszervezési dokumentáció rendszerezéséről.