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15 June 1979

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY
BIOMEDICAL AND BEHAVIORAL SCIENCES
(FOUO 20/79)



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TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY
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CLINICAL MEDICINE

ABSTRACT INDEX OF INVENTOR'S CERTIFICATES AND PATENTS

Moscow NAUCHNO-TEKHNICHESKAYA INFORMATSIYA in Russian Series 1 No 4, 1979 p 29

[Review by M. V. Antonova and G.G. Fillipova of the abstract index of inventor's certificates and patents*]

[Text] The progress of scientific information, and medical-technological information in particular, depends on the effective systematization of experience in the research area accumulated in our country. The Leningrad Scientific Research Institute of Hematology and Blood Transfusion, which was formed in 1932, has become known as a major scientific center, which was the first in the world to conduct the fractioning of blood. Many invention-level recommendations conducted at the Institute have been introduced into the practical work of medical institutions, while the most recent recommendations have been assimilated on a production basis at the plants of medical preparations affiliated with the USSR Ministry of the Medical Industry and at blood transfusion stations.

The index under review here is well structured and contains information on 35 inventions systematized into 9 sections; blood transfusion equipment; methods and devices for blood conservation; blood preparations and hemocorrectors; methods and means of immunohematologic study; curative agents against thrombosis, pathologic hemogenesis; methods of obtaining bone marrow; curative agents against blood diseases; and transfusion therapy for various pathologic states and diseases.

The presentation of the material in the index meets the requirements for information publications: the bibliographic description of each inventor's certificate contains the title of the invention, its number, the date and

* Inventions by the staff members of the Leningrad Order of the Red Banner of Labor Scientific Research Institute of Hematology and Blood Transfusion. Abstract index of the inventor's certificates and patents of the USSR issued from 1950 through 1977, edited by V.S. Suslov. Leningrad; 1977. 25 pp.

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number of the application, the date of publication in the bulletin "Otkrytiya, izobreteniya, promyshlennyye obraztsy, tovarnyye znaki" and the year and number of the bulletin. Readers can obtain information about the inventors and find out to which class the given invention belongs. Comprehensive abstracts reveal the essence of each device and of each method of diagnosis and treatment.

The section on blood examination equipment contains the characterization of the cooling chamber for microscope observations of objects in transmitted and reflected light, as well as the data on the counting chamber intended for hematologic study. Knitted fabric for filtration and the thromboelastometer are also described in this section.

The section on the means and devices for blood preservation contains information on a method of isolating the leucocytes from blood and on two devices, one of which is intended for preservation of isolated organs and the other for low-temperature conservation of biological products.

The major achievements of the Institute are presented in the section on blood preparations and hemocorrectors. They include means for hemostasia (the method of obtaining hemostatic sponge and the method of obtaining human thrombin), medications for the treatment of anemia (the method of obtaining antianemic preparation; preparation for the treatment of hypochromic anemia), blood substitutes for shock control (the method of obtaining the preparation gelatinol) and for parenteral feeding of patients (albuminous plasma-substituting solution and aminokrovin), infusion preparation sorbitol for the treatment of hemolytic states and the preparation of acetylcholinesterase enzyme from erythrocytic stroma.

The section on the methods and means of immunohematologic study includes the method of revealing immune antibodies, the method of obtaining anti-anti-A-antiserum for the diagnosis of hemolytic disease in the newborn according to the ABO system, the method of determining the "A" antigen in erythrocytes in man, the method of obtaining erythrocytic antigens and the method of obtaining antilymphocytic globulin.

Scientists involved in the study of the pathology of the coagulant blood system will be interested to know that such effective preparations for the treatment of acute thrombosis as thrombolytin (inventor's certificate No. 219751) and urokinin (inventor's certificate No. 363917) have been invented in the USSR.

The method of extracting bone marrow from donors (the invention by V.D. Kargin) will undoubtedly help clinical physicians in their work. On the pages 17 and 18 one can read about such means of the treatment of blood diseases as ferkoven, ferroceron and ferbitol. It should be stressed that ferroceron has been patented in 5 countries.

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Transfusion therapy for various pathologic states and diseases has been enriched by new, highly effective means: C cytochrome intended for the treatment of hypoxic states (inventor's certificate No 351546), lyophilized sorbitol for the conservative treatment of thrombo-obliterating diseases of blood vessels and hemolytic states (inventor's certificates Nos 427714 and 427712) and hexosephosphate -- the preparation which raises the level of energy metabolism in the body (inventor's certificate No 454911).

Clarity and completeness of the specification abstracts of inventions are undoubtedly merits of the publication under review. The index of the numbers of invention descriptions for inventors' certificates, the alphabetical index of the applicants and the index of the inventors are extremely convenient.

The above provides a basis for highly evaluating the given information edition and recommending that it be republished for mass circulation.

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CLINICAL MEDICINE

COORDINATION OF SCIENTIFIC STUDIES ON SPECIFIC PROBLEMS OF SCIENTIFIC INFORMATION IN MEDICINE

Moscow NAUCHNO-TEKHNICHESKAYA INFORMATSIYA in Russian Series 1 No 4, 1979
pp 4-6

[Article by Ye. I. Dubynina, A.M. Kapustyan, N.Z. Zubkova, I.E. Shuvalova, V.M. Andreyev and I.A. Shabanova in the column "Information Work in the USSR", submitted 25 Apr 1978]

[Text] The development of medical science and health care, the increase in the effectiveness of scientific investigations and accelerated introduction of their results in practice are determined to a considerable extent by expedient prognosis, planning and coordination of scientific investigations.

Information organs further considerably the increase in the effectiveness of scientific-research work in every branch, successfully using and developing the methods for informational patent study of scientific research work at the planning stage and conducting progressive informational work and preparation of survey information on the condition, achievements and trends in the development of scientific research.

At present about 400 regular subdivisions of scientific medical information [SMI] function within the health care systems; 311 of them are SMI divisions in scientific research institutes and VUZ's, They serve to provide over 60,000 scientists and about 830,000 practicing physicians with information on the state of medical science in the USSR and abroad.

In order to solve these problems, information organs develop scientific research work, the amount of which has increased considerably of late. This brings up the necessity for the constant perfection of purposeful management and coordination of scientific research work in the area of scientific medical information.

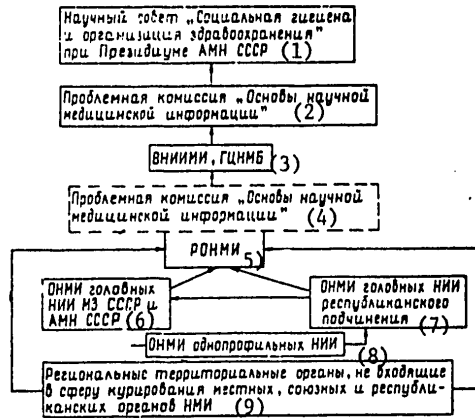
The system of coordination and management of scientific investigations in the area of scientific medical information is represented by the following 7 levels:

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- the USSR State Committee for Science and Technology;
- the Medical Academic Council of the USSR Ministry of Health;
- the Scientific Council for social hygiene and organization of health care of the Presidium of the USSR Academy of Medical Sciences;
- the Committee for the problems of the fundamentals of scientific medical information;
- the All-Union Scientific Research Institute of Medical and Medical-Technological Information [AUSRIMMTI] and the State Central Scientific Medical Library [SCML];
- the SMI divisions in the republics;
- the SMI divisions of the leading branch scientific research institutes developing a certain problem.

The functions involved in the coordination of scientific investigations are allocated in the following way:



Key:

1. Scientific Council for Social Hygiene and Organization of Health Care affiliated with the Presidium of the USSR Academy of Medical Sciences
2. Committee for the problems of the fundamentals of scientific medical information
3. AUSRIMMTI, SCSML
4. Committee for the problems of the fundamentals of scientific medical information.

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5. SMI divisions in the republics
6. SMI divisions of the leading branch SRI's [scientific research institutes] of the USSR Ministry of Health and the USSR Academy of Medical Sciences
7. SMI divisions of the leading branch SRI's of the republics
8. SMI divisions in the SRI's of the same type
9. Regional organs which are not affiliated with the SMI local, and republic organs

The Scientific Council for Social Hygiene and Organization of Health Care affiliated with the Presidium of the USSR Academy of Medical Sciences is a functional link in the system which deals with prognosis, over-all planning and coordination of the activities of scientific institutions in the country. Following the established order, it organizes committees and councils on various problems composed of its members.

In accordance with the present statute, the committee for the problems of the fundamentals of scientific medical information develops plans for various problems and subjects, reviews and evaluates subject and report charts and coordinates scientific investigations of the given problem.

AUSRIMTI, the leading branch institute, conducts scientific methodological guidance and coordination of scientific information activities carried out by the organs of scientific medical information within the health care system and serves as a working tool for the committee for the problems of the fundamentals of SMI.

SCSML directs scientific research work of the SMI organs aimed at the organization of a unified branch reference and information bank, ensures standard methods of acquisition and the development and introduction of data retrieval systems and coordinates, with the assistance from the SMI of the republics, the activities of the libraries within the health care system. Scientific work related to the automation and mechanization of the data retrieval system are conducted under the guidance of, and in a close contact with, AUSRIMTI.

The SMI divisions of the republics coordinate scientific research work conducted by the SMI divisions of the SRI's and the libraries in the republics.

The SMI divisions of the leading SRI's coordinate scientific research work of the SMI divisions affiliated with other institutions of the same type, are responsible for the preparation of annual reports on the achievements of medical science in the USSR and abroad and base their work on the methodological materials of AUSRIMTI, SCSML, SMI divisions of the republics and the standard statute on the SMI division of the leading branch SRI.

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While analyzing the scientific research work plans in scientific medical information, one can obtain an idea of the distribution of research among the participants and the guarantee of the completion of research by the involved scientists, as well as characterize the multi-approach nature of the subjects in each section of the plan.

The scientific research work cumulative plan for scientific medical information is drawn up on the basis of the scientific research work subject charts submitted by the SMI divisions of the republics and the SMI divisions of the scientific research institutions of the USSR Ministry of Health and the USSR Academy of Medical Sciences as well as by SCSML and scientific medical libraries of the republics.

In order to extend and deepen scientific investigations and to increase the level of methodological guidance for the information organs, AUSRIMMTI has developed a long-range SRI plan on the problem of the fundamentals of scientific medical information for 1976-1980 which includes 138 scientific subjects distributed along seven basic directions (individual problems):

1. Organization, management, planning, prognosis and effectiveness of scientific research work. NOT in SMI.
2. Standardization of medical terminology. Development of classification diagrams and data retrieval language.
3. Investigation of the directions, sources and needs in SMI. Analytic and synthetic information processing.
4. Development of the reference and information bank, data retrieval equipment and reference and information service.
5. Patent information.
6. Analysis and summation of the most important achievements in medical science and health care. The state of medical science and health care.
7. International cooperation in SMI, study of foreign centers of medical information.

The plan covers all of the most important research trends which assume the theoretical and methodological grounding of scientific research work in a field, the development of uniform methods for analytic and synthetic information processing, improvement of management and planning of scientific investigations and the introduction of NOT.

Scientific investigations of two specific problems have the most important relative amount: the first one -- organization, management, planning, prognosis and effectiveness of scientific information work (26.8 percent) and the fourth one -- development of the reference and information bank, data retrieval equipment

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and reference and information service (21.7 percent). Investigation of the directions and needs in SMI constitutes a considerable part of the investigations (16.6 percent).

Thus, the subject matter of scientific research is basically related to the main trends in the organizational methodological and actual work of the SMI organs.

Theoretical aspects of scientific research which form the bases for the development of such forms of scientific information work as data analysis, as well as problems related to the development and introduction of automated SMI data processing systems, are largely planned on the level of AUSRIMMTI and some major SMI divisions, while among the research subjects of the SMI divisions in most of the leading SRI's theoretical investigations are either represented insufficiently or not represented at all.

An extremely low percentage (5.1 percent) of scientific investigations of the patent information problem brings up the necessity for considerable reinforcement of this section by personnel and technological equipment.

A multiple approach is very important for the successful implementation of research problems and the increase in the effectiveness of investigation: 43.5 percent of all subjects in the plan are of a multi-approach nature.

Having a large share of multi-approach subjects is characteristic of almost all specific problems, except for the fifth section, i.e., patent information. A low level of over-all approach to scientific research work in the third (22 percent) and sixth (14 percent) sections can be explained by the specific nature of the current investigations: study of information trend and needs as well as analysis and generalization of the most important achievements in individual branches of medical science.

Scientific research planned by AUSRIMMTI and SCSML is characterized by the highest of over-all approach (81 percent), while in the plans of the SMI divisions of the republics and especially of the SMI divisions in the leading branch SRI's it is considerably lower and constitutes 48 and 26 percent, respectively.

The subjects planned by AUSRIMMTI and SCSML constitute 23 percent of all research in the five-year plan; the SMI divisions of the republics plan 21 percent of research subjects and the SMI divisions of the leading branch SRI's plan about 56 percent.

It is necessary to note that the SMI divisions of the leading branch SRI's do not participate enough in the drafting of the plans for scientific research. This can be confirmed by the following figures: 15 out of 31 SMI divisions of the SRI's of the USSR Academy of Medical Sciences conduct scientific research work on some aspects of the fundamentals of scientific medical information,

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while the remaining 16 SMI divisions do not plan such work. 17 out of 22 SMI divisions of the leading branch SRI's of the USSR Ministry of Health carry out research developments, while 5 SMI divisions of the leading branch SRI's have not planned scientific investigations in the area of scientific medical information. Similar conditions can be observed in the information divisions of the leading branch SRI's of the republics (only 26 out of 31 SMI divisions of the leading branch SRI's conduct scientific investigations).

Insufficient participation by the most numerous category of institutions in the implementation of the SRW plan reflects the initial period of the work in this direction.

Analysis of the results of SMI developments and of the ways of their introduction into practice has demonstrated that most works are supposed to be utilized in the practical work of information organs in concrete forms, i.e., in the first place, as publications. Various methodological materials and scientific articles have the largest proportion among them -- 46 and 38, respectively. The preparation and defense of 5 doctoral and 20 candidate dissertations have been planned; this attests to a sufficient depth of current research.

Along with the positive aspects there are some shortcomings in the planning and coordination of plans by both the higher and the subordinate SMI organs. Thus, an insufficient breadth of the multi-approach SMI research, the dissipation of research resources, the narrow subjects which bring about the necessity of strengthening some small scientific research work and the necessity for a coordination of subject structure within specific problems of the plan should be mentioned.

Difficulties in coordination occur on every level of the system. We find it expedient to develop such forms as reviewing the SRW plans and subject charts within the coordination system of the AUSRIMMTI, the SMI divisions of the republics and the SMI divisions of the leading branch SRI's.

While the SRW plan of the SMI division of the RSFSR Ministry of Health has been drafted in full concordance with the research trends for the problem of national importance -- that of the SMI fundamentals, the SRW plans in the SMI divisions of other republics have many drawbacks. Not all SRW's are submitted for state registration, approved by the scientific councils and included in the scientific research plans of their institutions; the SMI divisions of the republics are not active enough in the preparation of cumulative plans for their republics; the positive experience of the leading SMI services is not sufficiently utilized; there is no precise order in the receiving of plans and reports from the leading branch SRI's. Ties between the SRI's leading the research of a problem and the other SRI's of the same type still remains a weak link in the coordination.

Coordination conferences of the leading branch SRI's and the other SRI's of the same type where basic trends of SRW are delineated and the problems of multi-approach research are brought up are extremely important for the

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coordination of scientific research. However, this form of interaction between SMI divisions which facilitates a correct evaluation of the possibilities and goals of each information subdivision and a clear-cut distribution of responsibilities between them has not become common.

In order to improve SRW planning and coordination in scientific medical information and to eliminate the present shortcomings, it is expedient, in our view, to include in the cumulative plan only multi-approach or general subjects which represent major elaborations of a problem and can be utilized in practical work, at least on the level of the preparation of methodological materials. The remaining subjects can be listed in the supplement of the basic plan. The SRW plan of problems and subjects in SMI for 1978 was drafted on the basis of this principle.

For each specific problem it would be efficient to single out groups of subjects for investigation for major divisions of information work and to develop uniform methodologies for their representation in the plan.

The principle of subject distribution for specific problems in accordance with the groups which combine general trends of investigations on the basis of their goals, may become the base for the strengthening and generalization of subjects in compliance with the objectives of purposeful planning.

In order to regulate the work on SRW management and coordination in scientific medical information, it is expedient and timely to bring to the attention of the Scientific Council of the USSR Academy of Medical Sciences a question of the formation of the republic-level committees on the problems of scientific medical information affiliated with the Ministries of Health of the RSFSR, UkSSR, Latvian SSR, Lithuanian SSR and other republics in which scientific research is developing most successfully.

The introduction of a functional link which would coordinate SRW on the level of the republics, will allow for a completion of the organization of the SRW planning and coordination system in scientific medical information.

In order to implement a more clear-cut organization and expert evaluation of research in scientific medical information, it seems expedient to assign for each problem an expert who would be a member of the committee on the problems of fundamentals of scientific medical information. This proposal was approved at the plenum of the problem committee (Kiev, 1977).

In order to provide the conditions for the development of scientific information work, including scientific investigations in scientific medical information, it is necessary to develop a plan of measures for the technical equipment of SMI divisions of the leading branch SRI's and, in the first place, those that participate in the SRW long-range plan.

The concentration of the resources of information organs on all levels will facilitate further development of scientific information work and increase the

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role of information organs in the planning, implementation and raising of effectiveness of scientific research in the area of medical problems.

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ECOLOGY

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A CRITERION FOR THE STATIONARY COEXISTENCE OF CLOSED MICROBE POPULATIONS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245 No 4, 1979 pp 987-990

[Article by A. G. Degermendzhi, N. S. Pechurkin, and I. A. Terskov,
Corresponding Member of the USSR Academy of Sciences]

[Text] One of the major problems in population biology is studying the ecological mechanisms that regulate the number of species and the structure of a community. At present, there are several modifications of "Gause's law of species elimination," which is the basic theoretical principle used to define the structure of a community. For communities of the predator-prey type, this law states that for n types of predators to coexist, there must be at least n types of prey which serve to limit the increase in predators (¹). For populations that compete for food resources, it has been proven that the possible number of existing forms will not exceed the number of independent resources (^{2,3}).

Principles of this nature on the formation of communities could be widely applicable and stand up to verification in the artificial creation of mixed cultures in the controlled conditions of a closed experiment (^{4,5}). However, the interactions of populations in mixed cultures occur through various factors of environment which can include not only the limitational reserves but also the modifiers of growth--the inhibitors (⁶) or stimulants (^{7,8}).

We will examine a community consisting of m populations growing in a closed system of the chemostat type and interacting through n chemical factors of environment. The latter means that the specific rate of increase for each species is dependent on or is controlled by a certain number (n) of environmental factors, which, in turn, remain under the control of the densities (strengths) of the noted species. Thus, factors of environment are density-dependent and their transformation is proportionate (with a plus or minus) to the growth activity of each species. A system of differential equations will then have the form

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$$\dot{x}_i = [g_i(A_1, \dots, A_n) - D]x_i, \quad i = 1, 2, \dots, m;$$

$$(1) \quad \dot{A}_j = D(A_j^0 - A_j) + \sum_{k=1}^m a_{kj} f_{kj}(A_1, \dots, A_n)x_k, \quad j = 1, 2, \dots, n,$$

where $g_i(A_1, \dots, A_n)$ represents the specific rate of increase for the i -th species; D is the rate of circulation; A_j^0, A_j represent the concentration of the j -th factor controlling growth upon entry and within the environment, respectively (some A_j^0 will be zero); the term $a_{kj} f_{kj}(A_1, \dots, A_n)x_k$ measures the rate at which the k -th species will utilize or absorb the j -th substance; f_{kj} is the specific rate of transformation of the j -th substance by the k -th species.

It is difficult, of course, to assign any sort of explicit "universal" form to the function g_i because of the factors A_1, \dots, A_n , proceeding from the form of system (1), it is possible to demonstrate that the possible number of permanently coexisting species does not exceed the number of independent growth-control factors determined by the densities (x_i) of these species (that is, $m \leq n$). We will stipulate that the factors are independent if there are no variables such as z_1, \dots, z_p which are functions of A_1, \dots, A_n ($p < n$) and that g_i can be expressed as a function of z_1, \dots, z_p . If this is possible, then the values z_1, \dots, z_p can be considered to be independent factors and we will retain the symbols A_j for them.

We will agree that the number of coexisting species equals the number of factors ($m = n$). System 1 might have the steady-state solution determined from the following equations:

$$(2') \quad g_i(A_1, \dots, A_n) = D, \quad i = 1, 2, \dots, n,$$

$$(2'') \quad \sum_{k=1}^n a_{kj} f_{kj}(A_1, \dots, A_n)x_k = D(A_j - A_j^0), \quad j = 1, 2, \dots, n.$$

The steady-state solution for the concentrations of factors in the environment $\{\bar{A}_j\}$ and the densities of the species $\{x_i\}$ are found from system (2') and (2''), respectively.

For there to be a single-value solution for $\{\bar{A}_j\}$ definable from a system of implicit functions (2'), in some range (point) of the values $A_j \in I_j$, the functional determinant must be other than zero:

$$(3) \quad \frac{D(g_1, \dots, g_n)}{D(A_1, \dots, A_n)} = \begin{vmatrix} g'_{1A_1} & g'_{1A_2} & \dots & g'_{1A_n} \\ g'_{2A_1} & g'_{2A_2} & \dots & g'_{2A_n} \\ \dots & \dots & \dots & \dots \\ g'_{nA_1} & g'_{nA_2} & \dots & g'_{nA_n} \end{vmatrix}$$

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where $g_{iA_j}^1$ is a partial derivative of the function g_i for the variable A_j .

System (2') then defines $\{\bar{A}_j\}$ as an identical function for the rate of circulation D : $\bar{A}_j = r_j(D)$. It is also necessary that the stationary concentrations of the factors \bar{A}_j be positive.

$$(4) \quad \bar{A}_j = r_j(D) > 0, \quad j = 1, 2, \dots, n.$$

Then, from the heterogeneous system of linear algebraic functions (2'') and a matrix of the elements $a_{kj} f_{kj}(\bar{A}_1, \dots, \bar{A}_n)$, it is possible to find the fixed values for the strengths of the species

$$(5) \quad \bar{x}_i = U_i(A_1^0, \dots, A_n^0, D) > 0, \quad i = 1, 2, \dots, n,$$

which must also be positive. The condition of stability in these solutions requires specific limitations (at a fixed point) on the matrix of the adaptations $\|g_{iA_j}^1\|$ and the matrix of substance transformation $\|a_{kj} f_{kj}\|$, lack of which can lead to the elimination of certain species (9).

Thus, in some area of change in the parameters--the rate of circulation, D , and the concentration of input factors A_j^0 --the coexistence of n number of species is possible in the presence of the control factors.

Let there be one other species with a specific rate of increase of $g_{n+1}(A_1, \dots, A_n)$ at the same trophic level in the model ecosystem being examined. Here, it is essential that the number of growth-control factors remain the same and equal to n . Is a balanced coexistence for the (n+1)th species then possible?

In this situation, the fixed values for \bar{A}_j must be determined from the system for the (n+1)-th equation (6)

$$(6) \quad g_i(A_1, \dots, A_n) = D, \quad i = 1, 2, \dots, n+1.$$

We introduce the designator

$$(7) \quad y_i = g_i(A_1, \dots, A_n), \quad i = 1, 2, \dots, n+1.$$

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According to condition (3), A_j can be identically expressed through y_1, \dots, y_n from the expressions in (7) through the first n functions

Then we have

$$(8) \quad y_{n+1} = g_{n+1}(r_1(y_1, \dots, y_n), \dots, r_n(y_1, \dots, y_n)) \equiv W(y_1, \dots, y_n),$$

that is, the function y_{n+1} is dependent on the set of functions y_1, \dots, y_n (according to (3), the functions y_1, \dots, y_n are independent). Obviously, this dependence (8) can also exist in the derivative form $g_{n+1}(A_1, \dots, A_n)$ although this dependence must have that "infinitely improbable property" that will change expression (8) to an identity in some area of the change in the rate of circulation D when $y_i = D$ ($i = 1, 2, \dots, n+1$)

$$(9) \quad W(D, D, \dots, D) = D.$$

The difficulty in satisfying the identity (9) is associated with the fact that, when the dependence of the specific rate of growth (g_{n+1}) for a species being introduced is derived from the environmental factors A_j , its simultaneous intersection with the other functions in g_i and the rate of circulation is a low-probability occurrence.

Thus, it is improbable that the set $\{\bar{A}_j\}$ which converts (6) into an identity will stand up for system (6). The absence of values in \bar{A}_j , in turn, make it impossible to define $\{y_i\}$, $i = 1, 2, \dots, n+1$ which also leads to the conclusion that system (6) must ultimately have form (2') or the form of a system in which the number of populations is strictly less than the number of growth-controlling factors (that is, $m < n$). As can be shown in the latter case, the fixed concentrations of factors of the environment $\{\bar{A}_j\}$ and species density $\{\bar{y}_i\}$ may likewise be defined, but, in contrast to the preceding situation ($m = n$), the equilibrium levels for these factors are also determined by the values for input flow $\{A_j^0\}$.

In summarizing the above, it is possible to show that the number of equally coexisting species cannot exceed the number of density-dependent growth-control factors of environment. This proof may be viewed as a modification of Gause's principle of the elimination of species "adapted" to systems for the continuous culture of microorganisms.

In regard to extending this proof to situations of fluctuating cyclic patterns (with a period of T), the following may be said of system (1)

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(enlisting the theorem on environment). The linear dependence of the specific rate of population growth g_1 on the factors A_1 is sufficient grounds to satisfy the provision as to the number of coexisting species. It is not possible to say anything specific about the correlation of the number of species or the number of factors in the case of other possible solutions for system (1) since there are separate theoretical examples that are exceptions to Gause's law for these situations (^{10,11}).

The experimental data available in published material descriptive of the mechanisms of equal coexistence among species in closed systems relates primarily to two-way associations. At least in these particular variants, the theoretically stated law of coexistence has an experimental proof. Thus, the essential associations between the bacteria *Lactobacillus plantarum*, for example, which is limited by glucose and the lactic acid being liberated which determines the growth of *Propionibacterium shermanii* (¹²), bacteria of the *Pseudomonas* species which are limited by deficiencies of oxygen and available methanol which, [in turn] inhibits the growth of *Pseudomonas* sp and is consumed by the *Hyphomicrobium* sp. (¹³); the yeasts *Candida mycoderma* and *Candida tropicalis* which are limited by glucose with the first strain giving off a product which stimulates the growth of the second (⁸) and other similar experiments (^{14,15}) were described some time ago.

The theoretical results presented in this work and their experimental proof make it possible to draw a number of conclusions of substantive value. First, if a balanced coexistence such as that between two species of microorganisms and a single growth control factor is found experimentally, then, of necessity there must exist at least one density-dependent factor. Secondly, the artificial establishment of a closed, mixed culture made up of a given m number of species necessarily demands the presence of at least m growth control factors in the system whose input flow determines the percentage composition of species (see expression (5)). Third, in studying the mechanism responsible for the coexistence of species in closed systems, attention must first be focused on the factors whose stationary levels do not change (or change only slightly) with changes in the input concentrations (A_0^i) of these factors (according to expression (4)). It is precisely the factors of this nature that can insure prolonged cultivation of mixed closed populations as opposed to the external parameters (t^0 , the rate of circulation and so on) whose presence does not increase the diversity of species. And, fourth, the dynamics of species strength in a mixed culture is described by a system of type (1) where the system of equations for factors include just those factors that are responsible for the coexistence of a given number of species.

Institute of Physics imeni L. V. Kirenskiy,
Siberian Division, USSR Academy of Sciences,
Krasnoyarsk

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GENETICS

UDC 575.155

ADENOVIRAL INDUCTION OF GENE MUTATIONS IN MAMMALIAN CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian, Vol 245, No 4, 1979 pp 970-973

[Article by L. L. Lukash, T. I. Bushiyevskaya, N. V. Varshaver, N. I. Shapiro]

[Text] Establishing the ability of the SV-40 oncogenic virus to cause gene mutations in mammalian cells (^{1,2}) has brought about some question as to whether this ability is a specific characteristic peculiar to SV-40 alone or whether it is a reflection of a general principle and is likewise characteristic for other DNA-containing oncogenic viruses. Finding the answer to this question is of paramount importance for the sake of understanding the potential role of virus-induced gene mutations in the process of malignant cell transformations. It is of no less importance in assessing the genetic risk of viruses as factors in the external environment.

In conjunction with this, we have studied the mutagenic activity of one other DNA-containing virus--the type 3 bovine adenovirus (BAV-3) (³). In the systematic sense, adenoviruses are vastly different from the papovaviruses. Their genome is approximately 10 times larger than the genome of the SV-40 virus and has been given considerably less study. It consists of a linear molecule in contrast to the circular DNA molecule of the SV-40 virus (⁴).

We studied mutagenesis in a model of resistance to 6-mercaptopurine (6-MP, a compound manufactured by the Czech firm "Chemapol").

A strain of cells from the 237-8 Glu-ts Chinese hamster nonpermissive to BAV-3 was used as the model (the modal number of chromosomes is 18) (⁵).

The cells were cultured in an Eagle medium with 10 percent cattle serum inactivated at 56°C, penicillin (100 units/ml) and streptomycin (50 units/ml). At low culture densities, the serum content was increased to 30 percent.

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Once a month, the cells were incubated with tetracycline (50 units per ml) for 1-2 passes to prevent contamination by mycoplasma.

A clone of the BAV-3-3 virus which is a derivative of the WBR-1 strain was developed at the Institute for Molecular Biology and graciously placed at our disposal by Ye. S. Zalmanzon.

The infection titer for the virus was $1.6 \cdot 10^8$ b.o.e/ml with titration in bovine kidney cells (MDBK, strain obtained from the United States through J. J. Trentin). Undiluted virus and dilutions of 1:10, 1:100 and 1:1,000 were used to inoculate the cells.

The Chinese hamster cells were removed with trypsin during the logarithmic stage of growth and placed in suspension. The cells were incubated with the virus for 2 hours at 37°C with intermittent vibration. Cultures were then made up on Petri dishes (100 mm in diameter) with 500,000 cells per plate.

Control specimens were subjected to the same procedures as the test samples, being processed in a culture medium using degenerated MDBK cells but without the virus.

The rate of effectiveness for infecting the Chinese hamster cells was measured by the infection centers technique. Following incubation with the virus, the cells were rinsed off and fractionated by rapid freezing and thawing. They were then inoculated onto a layer of sensitive cells and given a coating of agar. In light of the fact that not all the viral particles could be rinsed, a suitable control was set up. For this purpose, the cells were washed, fractionated and inoculated onto a layer of sensitive cells immediately after addition of virus-containing fluid but without incubation. The plaques were counted and the viral titer was compared to the original titer after infection of the cells.

Forty-eight hours after infection, cells from all variants of the experiment were placed in selective conditions. The results from similar experiments with the SV-40 virus (^{1,2}) were taken into account in selecting the optimum periods to check for mutants. Cells were shifted in groups of 25,000 to Petri plates (70 mm in diameter) containing selective media and in groups of 400 cells to plates without an analogue to determine the effectiveness of inoculation. Every 2-3 days, the medium in the plates was replaced with 6-MP.

Resistant colonies were stained in vivo with methylene blue 12-16 days after inoculation. The colonies on plates without 6-MP were stained 7 days after inoculation. Colonies containing at least 100 cells on the numbered plates were considered.

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The frequency of mutants was determined with correction made for their survivability in the test and control, respectively. The number of mutants induced was evaluated on the basis of the differential between the frequency of mutants in the infected and control cultures. The reliability of the data obtained was assessed on the basis of the Fisher χ^2 criterion where \bar{x} is allowed to represent the maximum number of cells per plate in the selective conditions.

The infectious centers technique demonstrated that approximately 10 percent of the virions are adsorbed and apparently penetrate the cells. This is commonly found in nonproductive systems where there is an absence of specific cellular receptors (6).

Table 1 shows the results of 3 experiments to study the frequency of mutants resistant to 6-MP in populations of Chinese hamster cells infected with the BAV-3 virus.

Cell replication in the selective conditions did not cease immediately. The cells were able to divide approximately one time before degeneration set in. In counting the number of generations produced by the cells after infection, we counted an additional division of the cells in the selective medium as this might be of importance in determining virus-induced mutations.

The yield of resistant colonies was measured while testing various viral dosages. With a maximum infection factor of 80 b.o.e. per cell and 8 b.o.e. per cell in all cases, there was a reliable increase in the frequency of mutants resistant to 6-MP. A dosage of 0.8 b.o.e. per cell was the least effective and the difference between the frequency of mutants in the experiment and the control was reliable in two of the three experiments. With an infection factor of 0.08 b.o.e. per cell, the frequency of resistant mutants did not differ from the control level. In this way, the direct relationship between mutant yield and the viral dosage is traceable. The results obtained, however, do not make it possible to resolve the question of whether this relationship is of a linear nature.

It should be noted that the first experiment differed from the other two by its higher spontaneous reserve and also by a stronger mutagenic activity on the part of the virus. In this experiment, the frequency of resistant colonies increased by a factor of 3-6, depending on the multiple of infection and the difference between the test and control was reliable in all instances. The highest rate of induction with the highest level of spontaneous mutants has been noted in the somatic cells of mammals by a number of authors.

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Table 1
Induction of mutations resistant to 6-MP in Chinese hamster cells by exposure to the bovine adenovirus type 3 (BAV-3)*

Repetitions	Variants	Virus titer b.o.e./cell				Number of generations	Survival of infec- ted cells relative to control, %	Frequency of mutants with cor- rection for survi- vors, X 10 ⁻¹	Frequency of induced mutants, X 10 ⁻¹	p ***
		0.08	0.8	8.0	80.0					
I	a	-	-	-	-	1.50	100.00	14.37	-	
	b	-	-	-	+	1.48	84.26	94.79	80.42	> 0.999
	c	-	-	+	-	1.52	84.89	91.02	76.65	> 0.999
	d	-	+	-	-	0.48	78.67	40.26	25.89	> 0.999
II	a	-	-	-	-	1.75	100.00	5.50	-	
	c	-	-	+	-	2.12	55.05	12.80	7.30	> 0.999
	d	-	+	-	-	1.97	43.02	9.93	4.43	> 0.99
	g	+	-	-	-	2.15	89.19	7.50	2.00	< 0.90
III	a	-	-	-	-	1.69	100.00	2.20	-	
	b	-	-	-	+	1.65	96.73	7.05	4.85	> 0.999
	c	-	-	+	-	1.14	118.68	4.92	2.72	> 0.95
	d	-	+	-	-	1.21	80.36	3.82	1.62	< 0.95
	g	+	-	-	-	0.68	91.35	2.46	0.26	< 0.95

* Time after infection equals 2 days

** Total number of generations passed on by cells before transfer to selective conditions and during remaining growth process

*** Reliability in difference between test and control evaluated by the Fisher method

For the purpose of ascertaining whether or not resistance is retained during cell replication in the absence of a selective agent, two colonies of the control variant and 7 [test colonies] were isolated after infection. The colonies were cultured without 6-MP. An inoculation of cells from each clone was made after 20 and 100 generations in parallel to the plates with 6-MP and those without an analogue.

All of the clones retained their resistance. A comparison of the effectiveness of inoculation in the selective conditions and in the medium without analogue demonstrated that the level of resistance was rather high. The survival rate for cells from different clones in the medium with 6-MP was 30-100 percent in comparison with the control. Retention in the resistance indicator during prolonged cultivation of the cells outside the selective conditions therefore indicated that this is the result of mutational development and that the clones being studied were mutants.

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Karyotypes of the two controls and five of the seven clones isolated after exposure to BAV-3 did not differ from those of the parent clone. A new marker chromosome (large and submetacentric) appeared in the chromosome makeup of one of the clones (No 9). Another clone (No 3) showed an increase in the number of chromosomes and an increase in the frequency of chromatid breaks and crossovers. During the course of cultivation, the karyotype for this last clone normalized and did not differ from the original later on. Thus, the absence of any one specific change in karyotype for the mutants is indicative of a lack of correlation between the onset of resistance and gross chromosomal restructuring.

The data obtained through this effort therefore demonstrates that even a single randomly chosen oncogenic virus--BAV-3-- is capable of inducing gene mutations in mammalian cells. This makes it possible to conclude that mutagenic activity is characteristic not for the SV-40 virus alone, but probably for a number of, and possibly, for all DNA-containing oncogenic viruses.

In addition to establishing the fact of gene mutation induced under the influence of PAV-3, it is important to note that it is manifested at exactly the same early date after infection as was the case for SV-40, that is, during the period of the virus' active interaction with a cell and its incorporation into the cell's genome. This is yet another indication of the usefulness of the above-stated hypothesis that the same phenomena that follow infections also determine the integration of viral DNA and viral mutagenesis.

Since mutagenesis resulting from exposure to BAV-3, as in the case of SV-40, was studied in a nonpermissive cellular system, it is believed that this process is not linked with either the synthesis of virus DNA or the formation of virus particles. As of right now, the mechanisms of the mutagenic action of oncogenic viruses on the cells of mammals have not been studied. However, it is entirely probable that they have features in common with the mechanisms operating on the moderated bacteriophage in a similar system. Incorporation of the phage genome takes place by means of a recombinant process during the splitting of the cellular DNA with subsequent junction of the broken ends. During the process of incorporation, mutations are induced at both the sites of integration and at other points under the influence of the enzymes which allow this process to take place (7,8).

It is also necessary to note that the activity of lygase and endonuclease, the enzymes needed for recombination (9), increases at precisely the moment of integration in the cells of mammals infected with various oncogenic viruses.

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In conclusion, we note that a number of infectious viruses also possess a mutagenic activity (10). If this property is common to all viruses, then there is an added problem of evaluating their genetic risk as factors widely distributed in man's environment. By the same token, it is essential to take note of the fact that viruses can apparently make a substantive contribution to determining the level of "spontaneous" mutagenesis.

Finally, the authors express their gratitude to Ye. S. Zalmanzon and I. V. Vavilina for their help in this project.

Institute for Molecular Biology and Genetics,
Ukrainian SSR Academy of Sciences, Kiev

Institute for Molecular Genetics
USSR Academy of Sciences, Moscow

Submitted
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MICROBIOLOGY

UDC 576.858.75A.098.322:577.35

ASSOCIATING THE RIBONUCLEOPROTEINS OF THE INFLUENZA VIRUS WITH NUCLEAR CHROMATIN IN INFECTED CELLS

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245, No 4, 1979 pp 974-975

[Article by A. B. Bukrinskaya, N. K. Vorkunova, presented by Academician A. I. Oparin, November 15, 1978]

[Text] In contrast to other large RNA-containing human and animal viruses in which reproduction takes place in the cytoplasm, the cell nucleus is necessary for replication of the influenza virus. There is an accumulation of data indicating that the first transcription of the virus genome is brought about in the nucleus by the transcriptase of the including virus ⁽¹⁾.

Since expression of the genome among viruses in this group takes place in the form of viral ribonucleoproteins (RNP) ⁽²⁾, it may be expected that they penetrate the nucleus and are fixed there by the RNP of the inducing virus. However, the viral structures have not been isolated and studied and their localization in the nucleus has not been proven. There is recent information to the effect that the RNP of the virus which causes influenza has been isolated from the nucleoplasm in conditions of incubating the infected cells at 4°C ⁽³⁾.

We have studied the structures of the influenza virus that penetrate the nucleus by infecting cells with a tagged virus and then subsequently extracting the subviral particles from the nuclear fractions. Type a WSN influenza virus was marked in monostratal cultures of chick embryo cells with H³-uridine (100 micro-Curies/ml, specific activity of 20 Curies/mole) or a mixture of C¹⁴-amino acids (25 micro-Curies/ml, specific activity of 1 micro-Curie/ml) and purified as described ⁽⁴⁾ or by centrifuging in a 20-60 percent linear gradient of glycerine. After the virus had been adsorbed onto the cells at 4°C for a period of 1 hour, the cells were incubated for 1 hour at 37°C, removed mechanically from the glass, rinsed with a hypotonic buffer (10 mM tris [hydroxymethyl amino methane], pH 7.4, 10 mM NaCl, 1 mM MgCl₂) and fractionated in a Daunas homogenization unit.

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Table 1
Distribution of cellular DNA and virus RNA and protein in the subcellular fractions (average data for three experiments, %)

Subcellular fractions	Uninfected cells, H ³ -DNA	Infected cells		Uninfected cells + virus	
		H ³ -RNA	C ¹⁴ -protein	H ³ -RNA	C ¹⁴ -protein
Cytoplasm	3.5	52.3	58.2	94.3	96.3
Nucleus	96.5	47.7	41.8	5.7	3.7
Nuclear fractions					
0.16 M NaCl dissolved chromatin	4.4	20.2	19.1	-	-
remaining fraction	68.2	33.8	32.6	-	-
2 M NaCl supernate	27.4	46.0	48.3	-	-
sediment	96.4	-	82.8	-	-
	3.6	-	17.2	-	-

The nuclei were purified with a triple rinse of 1 percent triton X-100 and subsequent centrifuging over 2 M sucrose. The purified nuclei were triple extracted with an isozonic buffer (0.16 M NaCl, 10 mM tris at a pH of 8.0, 1 mM MgCl₂, 3 mM dithiothreitol (DTT) to remove the ribonucleoproteins from the nucleoplasm.

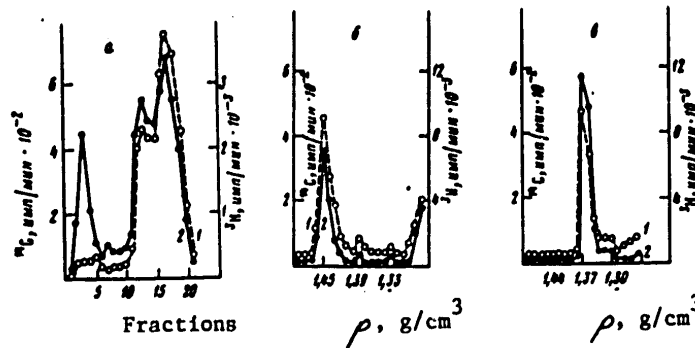


Figure 1. Sedimentation and density analysis of the nuclear fractions from cells tagged with H³-thymidine (1) and infected with influenza virus tagged with C¹⁴-amino acids (2). a-analysis of 2M NaCl extract in a 5-60 percent linear gradient of sucrose concentration; b-recentrifuging the 13-th fraction of the gradient in cesium chloride; c-analysis of the dissolved chromatin in cesium chloride, fraction of the sucrose gradient.

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To obtain the chromatin, the nuclei were processed with desoxyribonuclease I (100 mkg/10⁷ nuclei) at 37°C for 15 minutes and were then suspended in 10 mM tris at a pH of 8.0 and 1 mM EDTA. The undissolved chromatin and the other structures of the remaining fraction were removed by centrifuging at 1,000 g. In order to judge the distribution of chromatin in the fractions, the uninfected and infected cells were tagged with H³-thymidine (10 micro-Curies/ml, with a specific activity of 21 Curies per mMole) for a period of 1 hour prior to infection. Uninfected cells to which the tagged virus was added prior to homogenization were used as a control for the distribution of the tagged virus in the subcellular fraction.

It is apparent from Table 1 that 40-60 percent of the RNA and protein from the influenza virus penetrates the nucleus while only 4-6 percent of the tagged viral structures were observed in the nuclei of the control cells. In a later fractionation of the nuclei, approximately 20 percent of the virus structures were extracted with 0.16 M NaCl while the residual radioactivity is distributed among the dissolved chromatin and the remaining fraction; a significant percentage is extracted from the remaining fraction with 2 M NaCl, 10 mM tris at a pH of 9.0, 1 mM EDTA, 3 mM DTT (the buffer used to obtain the chromatin shell (5)).

All the nuclear fractions were analyzed by centrifuging in a 5-60 percent linear gradient of sucrose at 3,000 rpm for a period of 45 minutes at 4°C in a "Spinko" SW-41 rotor; the radioactivity in the acid soluble material was determined in aliquots, the fractions were then diluted, up to 4 percent formaldehyde was added and it was recentrifuged in a preformed linear gradient of cesium chloride containing 4 percent formaldehyde (4). While the extract obtained during the processing of the remaining 2 M NaCl fraction was being centrifuged in the sucrose gradient, virus radioactivity was observed in two zones of the gradient (Figure 1a).

A part of the virus radioactivity was found close to the bottom of the gradient where there was only a negligible level of cellular DNA. The sedimentation rate for this material corresponded to the sedimentation rate of the protein chromatin shell to which the superspiral DNA loops are attached according to the latest findings on the structural organization of chromatin (5,6). It is possible that the virus structures are associated with the shell since their sedimentation rate is lower by two orders of magnitude (50-70 S) and is partially extracted with the 2 M NaCl.

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MICROBIOLOGY

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THE GENERATION OF A DIFFERENTIAL IN ELECTRICAL POTENTIALS BY THE CHROMATOPHORES OF RHODOSPIRILLUM RUBRUM INDUCED BY A LASER FLARE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245 No 4, 1979 pp 991-994

[Article by L. D. Drachev, A. Yu. Sumenov, and V. P. Skulachev, Corresponding Member, USSR Academy of Sciences]

[Text] The generation of a photoinduced differential in potentials in the chromatophoric membranes of photosynthesizing bacteria was initially investigated through several indirect methods such as measuring the shift in the maximum for absorption of carotenoids⁽¹⁾ and bacteriochlorophyll⁽²⁾, the transport of penetrating anions⁽³⁾, and the fluorescence of certain pigments⁽⁴⁻⁶⁾. The use of one of these techniques, to wit, measuring the carotenoid response, has made it possible to study the rapid kinetics of the generation of a differential in potentials by chromatophores^(7,8).

A method for direct measurement of the generation of a current and a differential in potentials by chromatophores was developed earlier within our group. Chromatophores from *R. rubrum* were affixed to a flat phospholipid membrane by means of Mg^{2+} ions and then the difference in electrical potentials ($\Delta\psi$) was measured as was a current sent across the flat membrane by using silver chloride electrodes connected to a voltmeter or amperemeter⁽⁹⁾. The results obtained with stationary illumination of the chromatophores associated with the flat membrane allowed us to conclude that a transformation of light energy into electrical energy does occur in this system and that the presence of oxidation-reduction mediators is needed to observe the maximum photoelectric response⁽⁹⁾.

In this project, an effort was made to apply the technique of direct $\Delta\psi$ registration for the purpose of studying the rapid kinetics of the process of generating a $\Delta\psi$ by chromatophores from *R. rubrum* in response to a laser flare.

Chromatophores were isolated from washed bacterial cells of the purple nonsulfur-bearing bacteria *Rhodospirillum rubrum* by means of an ultrasound technique based on the method described previously⁽¹⁰⁾. In lieu of the flat man-made membrane, we used a colloidal film impregnated with

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a solution of azolecthine in n-decane prepared as described in a recent project by our group (11). To measure the rapid kinetics involved in a $\Delta\psi$ generation, we used silver chloride electrodes ($R = 1 \text{ k}\Omega$) screened with black polyethylene and immersed in an electrolyte solution on both sides of the colloidal film ($R = 10^8 \text{ }\Omega/\text{cm}^2$). The electrodes were connected to an "Analog device 48A" operational booster (with an input resistance of $10^{11} \text{ }\Omega$, an input capacity of $<5 \text{ pF}$ and passband with an amplification factor of $I = 15 \text{ MHz}$). The electrical signal was recorded on a C8-13 recording oscilloscope and transcribed with a TZ 213S recording device. This was made possible through the use of the "Data Lab 905" digital converter.

A quantum optical generator (with a wavelength of 530 nm, light impulse halfwidth of 15 ns and pulse energy of 10 megajoules) was used as the source of light impulses. The entire system for recording the $\Delta\psi$ passed electrical impulses with an accretion front duration $>0.3 \text{ }\mu\text{s}$ without attenuation which was determined by the parameters of the digital converter.

Fixation of the chromatophores to the man-made membrane was achieved by incubating them in the presence of 40 mM MgSO_4 at room temperature with continuous mixing for a period of 10-15 hours.

The kinetics of the accretion and decline in the $\Delta\psi$ generated by the chromatophores as a result of a laser flare at various time sweeps are demonstrated in Figure 1. A photoelectric response with an amplitude of about 25 mV consisted of one phase of $\Delta\psi$ accretion characterized as $\tau < 0.3 \text{ }\mu\text{s}$.* We know that the transfer of an electron in the reaction center from bacteriochlorophyll to a primary acceptor takes place in a period of about 200 picoseconds (12). Since there are no other processes in the chromatophore network that take place more rapidly than 1 microsecond, we consider it probable that the $\Delta\psi$ seen in Figure 1 is brought about by transfer of an electron from the primary donor (P870) to the primary electron acceptor.

The curve for the $\Delta\psi$ decline occurring as a result of a laser flare (Figure 1) was of a rather complex nature. In order to answer the question of what processes caused the observable decline in $\Delta\psi$, we undertook the following experiment. A voltage of 25mV from an external source was applied to a colloidal film impregnated with a phospholipid solution and then withdrawn. The process of passive discharge over the resistance

* The constants of time τ were defined as the intervals of time over which phase amplitude reached $(1 - e^{-1})$ maximum value.

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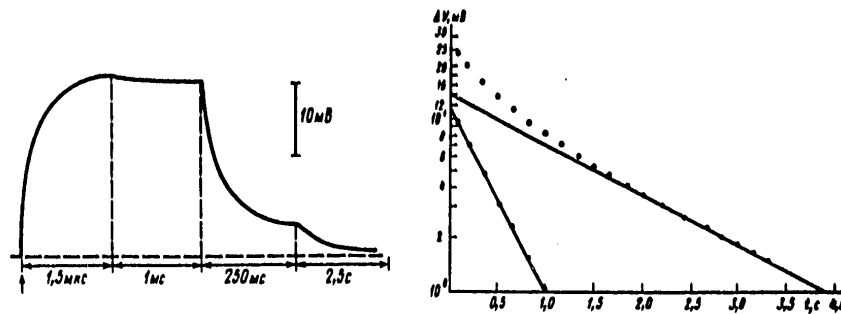


Figure 1. The kinetics of the accretion and decline of the differential in electrical potentials generated by chromatophores associated with a colloidal film in response to a laser flare. Incubation medium: $5 \cdot 10^{-2}$ M tris-HCl buffer (pH 7.5); $4 \cdot 10^{-2}$ M $MgSO_4$; chromatophores - $\lambda_{880 \text{ nm}} = 1.9 \cdot R_{film} = 9 \cdot 10^8 \text{ Ohm}$

Figure 2. Breakdown of the discharge curve of voltage supplied from without through the resistance of the colloidal film impregnated with azolecthine into numerical components. At the zero moment in time, the external voltage source was shut off. $R_{film} = 9 \cdot 10^8 \text{ Ohm}$

of the colloidal membrane was recorded and then broken down into exponents. As can be seen in Figure 2, the curve for the colloidal film's massive discharge is divided into exponential phases characterized by $\tau' = 400 \text{ msec}$ and $\tau'' = 1,400 \text{ msec}$. This result is indicative of the existence of two different RC-circuits in the colloidal film.

We also made a similar exponential breakdown for the curve of the decline in $\Delta\psi$ generated by the chromatophores under the influence of a laser flare. The process of decline in the $\Delta\psi$ presented in Figure 1 as it appeared consists of three exponential phases characterized by the constants of time $\tau_1 = 30 \text{ msec}$, $\tau_2 = 350 \text{ msec}$ and $\tau_3 = 1,300 \text{ msec}$. The rather close coincidence of τ_2 and τ_3 with the constants of time for the discharge phases of the colloidal film without chromatophores (400 and 1,400 msec) allows us to assume that the part of the process of decline characterized by τ_2 and τ_3 is brought about by the passive discharge of a transmembrane differential in potentials through the RC-circuit of the colloidal film. In regard to the more rapid exponent of $\Delta\psi$ decline ($\tau_1 = 30 \text{ msec}$), this is probably the result of a discharge from the first dipole in the chromatophoric membrane.

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According to our findings, there is a deficiency of components capable of oxidizing the first electron acceptor in the membranes of the chromatophores associated with the man-made membrane. Under these conditions, the electron is "forced" to return to the first oxidized donor P870⁺. The constant of time for this process is known to be 20-60 msec (13). It should be noted that the ratio of amplitude in the rapid phase of $\Delta\psi$ decline which is presumably brought about by discharge of the first dipole in the reaction center ($\tau_1 = 30$ msec) to the total amplitude of the discharge phase caused by the passive discharge of the colloidal film ($\tau_2 = 350$ msec and $\tau_3 = 1,300$ msec) is equal to 1.6. This means that, in a setting where the chromatophores are united by secondary electron acceptors, the process of the first dipole's discharge prevails over the transmembrane stages of discharge transfer.

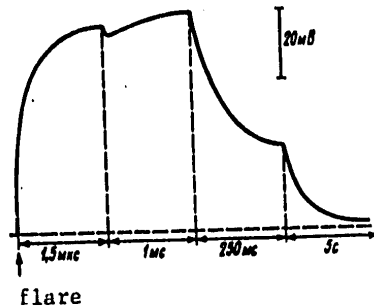


Figure 3. The effect of PMS, vitamin K and ascorbate on the kinetics of the generation of a differential in potentials by chromatophores in response to a laser flare. Incubation medium: $5 \cdot 10^{-2}$ M tris-HCl buffer (pH 7.5); $4 \cdot 10^{-2}$ M $MgSO_4$; chromatophores - A_{880} nm = 1.9; $4 \cdot 10^{-4}$ M PMS; $2 \cdot 10^{-3}$ M vitamin K; $5 \cdot 10^{-3}$ M ascorbate $R_{film} = 8 \cdot 10^6$ OHM

The results that we obtained earlier while studying the photoelectric activity of chromatophores associated with a flat membrane under stationary illumination showed that the maximum $\Delta\psi$ is found in the presence of phenazine metasulphate (PMS), vitamin K₃ and ascorbate (9). According to our findings, compounds of the vitamin K₃ type replace endogenous KoQ (which is a secondary electron acceptor in the chromatophore membrane) which is extracted from in the hydrophobic void of the artificial membrane. The effect of PMS is probably caused by the fact that this component is able to by-pass the cytochrome sector in the chromatophore circuit of electron transfer. Ascorbate is possibly required to sustain the specified ratio between the oxidized and reduced forms of the restoration equivalent carriers.

Figure 3 shows the electrical response from chromatophores induced by a laser flare in the presence of PMS, vitamin K₃ and ascorbate. The addition of these components causes an increase in the amplitude of the rapid stage of $\Delta\psi$ accretion ($\tau \leq 0.3$ microseconds), the appearance of a new, slower phase of $\Delta\psi$ accretion characterized by $\tau = 200$ microseconds and a reduction in the ratio of the amplitude of the rapid phase of decline ($\tau_1 = 30$ msec) to the total amplitude for the two slower phases of decline ($\tau_2 = 350$ msec and $\tau_3 = 1,300$ msec) to 0.4.

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As we know, after restoration of the primary electron acceptor in the chromatophore membrane, its oxidation by ubiquinone (KoQ) takes place with a time constant of 150 microseconds and rapid proton-bonding of the semiquinone anion of KoQ over a period of 150-300 microseconds (¹⁴). These times are close to the constant of time for the new phase of $\Delta\psi$ accretion (- 200 microseconds) that we observed in the presence of PMS, vitamin K₃ and ascorbate. We should look back at one other process that takes place in the chromatophore membrane that might explain the second electrogenic stage that we observed. There is some thought of P870⁺ restoration by the C₂ cytochrome. The constant of time for this process in *R. rubrum* is 400 microseconds (¹⁵) and, therefore, exceeds the constant of time for the electrogenic phase that we found by a factor of approximately two. In addition, the chromatophores available to use were deficient in C₂ cytochrome. These circumstances lead us to assume that the reduction of KoQ accompanied by its acquisition of a proton is the most probable second electrogenic stage in the chromatophore circuit.

In regard to the decline in the ratio of the amplitude during the primary dipole discharge phase to the amplitudes of the passive phase of $\Delta\psi$ discharge over the resistance of the colloidal film, this effect is probably explained by the fact that the electrons forced earlier to return from the primary acceptor to P870⁺ now move to the reduction of vitamin K₃ in the presence of vitamin K₃ which replaces the secondary KoQ acceptor. This leads to the association of a proton from the outside environment and a transmembrane transfer of discharges.

In this way, studying the rapid kinetics of the process of generating by chromatophores has made it possible to see two electrogenic stages in the system being investigated. The first of these stages ($\tau \leq 0.3$ microseconds) can be linked to the primary breakdown of the charges in the photosynthetic reaction center while the second stage ($\tau = 200$ microseconds) is associated with restoration of the secondary KoQ electron acceptor. The rapid component of $\Delta\psi$ decline ($\tau_1 = 30$ msec) is probably the result of an electron returning from the primary acceptor to the initial oxidized donor (P870⁺).

We should like to thank V. D. Samuilov for providing the chromatophores of *Rhodospirillum rubrum*.

Moscow State University imeni M. V. Lomonosov

Submitted
4 November 1978

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MICROBIOLOGY

UDC 576.851.252.094.7

STUDYING THE INTERACTION BETWEEN GRAMICIDIN S AND BACTERIAL MEMBRANES BY THE PROTON MAGNETIC RESONANCE TECHNIQUE

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245, No 4, 1979 pp 994-997

[Article by V. A. Yeremin, N. F. Sepetov, L. A. Sibel'dina, A. Ye Lordkipanidze and D. N. Ostrovskii, presented by Academician A. I. Oparin, 1 Nov 78]

[Text] The mechanism of the action of the cyclodecapeptide antibiotic gramicidin S on bacterial membranes is interesting as a model of the interaction between a physiologically active agent and a bacterial cell. It has been demonstrated in a number of projects that gramicidin S does not exhibit a specific affinity for membranal protein. It is believed the result of an ion interaction between positively charged residues of ornithine and the negatively charged residues of phosphoric acid in lipid molecules (1,2). Gramicidin S reacts with lecithin vesicles, causing them to disperse (3) while the action of gramicidin on bacterial membranes at high concentrations (1 mg of antibiotic per milligram of membrane protein) is accompanied by a break in the topography and activity of the enzymes in the respiratory network of bacterial cells with condensation of large sectors of the membrane (4-6).

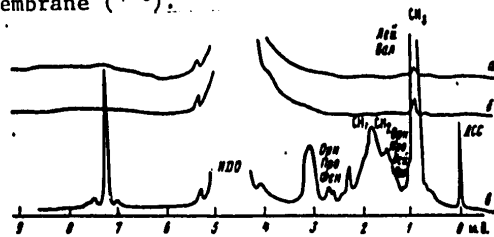


Figure 1. Proton magnetic resonance spectra (90 MHz) for deuterated bacterial membranes of *M. Lysodeikticus* in a D_2O -deuterophosphate buffer in the presence (a) and absence (b) of gramicidin S. Tracing c shows the proton magnetic resonance spectrum for gramicidin S in D_2O at a temperature of $30^\circ C$, the number of agglomerations is 1,000. The concentration of membrane protein in the preparation is 10.5 mg/ml and the antibiotic strength is 5 mg/ml

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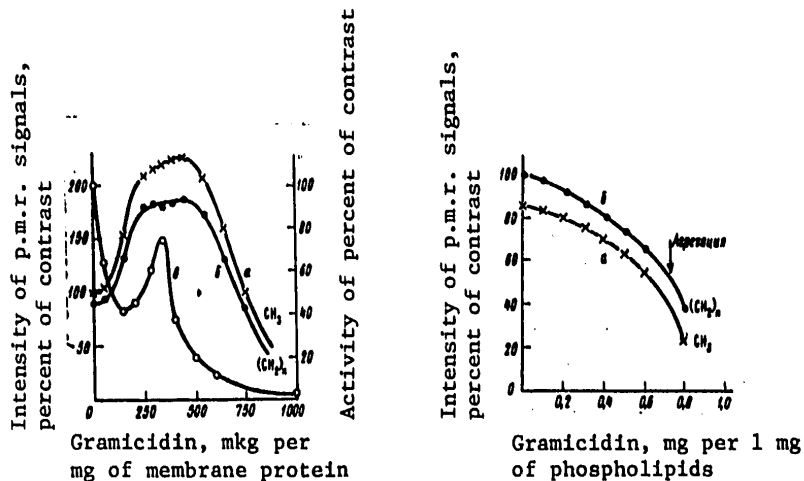


Figure 2. The effect of gramicidin S on signal intensity for the CH₃(a) and (CH₂)(b) lipid groups in the p.m.r. spectrum (90 MHz), for bacterial membranes in a D₂O - tris - DCl buffer, and on the activity of the membrane enzyme malate dehydrogenase (c). T = 30°C, the number of spectrum accumulations for the membranes in various antibiotic concentrations was 3,000.

Figure 3. The effect of gramicidin S on signal intensity for the CH₃(a) and (CH₂)(b) lipid groups in the p.m.r. spectrum (90 MHz) for vesicles of total bacterial lipids in a D₂O - tris - DCl buffer. T = 30°C, the number of lipid vesicle accumulations at various antibiotic concentrations was 500

For the purpose of explaining the mechanics of gramicidin S's reaction with the membranes of bacteria sensitive to it, changes in the mobility of the lipid component of bacterial membranes as influenced by the antibiotic were investigated in this project.

Membranes from *M. Lysodeikticus* bacterial cells, Fleming strain (2665) were obtained by the method in (7). Deuteromembranes with a deuterium enrichment level of about 85-90 percent were isolated from deuterated cells of the micrococcus cultivated by method (8) in deuterated media consisting of 99.8 percent D₂O and deuterated nutrients with a deuterium enrichment in excess of 85 percent. The total lipid fraction of the micrococcus was obtained by the Bligh-Dyer technique (9). Vesicles from

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the total micrococcal lipid fraction were obtained by sonic irradiation in cold in a nitrogen atmosphere (22 kHz, 30 minutes) in a D₂O - tris- DCI buffer, 0.01 M, pD 7.8 with 0.001M MgSO₄. Titanium powder was precipitated by centrifuging at 22,000 g for 10 minutes. The concentration of membrane protein in the preparations was determined by the Louria method while the phospholipids were measured by the Bartlett technique (10). The enzyme activity of the malic acid dehydrogenase was measured in a SF-4A with a logarithmic intensifier (11). The p.m.r. spectrum for the gramicidin S, the membranes and the lipid vesicles in the D₂O - tris - DCI buffer were photographed on a "Bruker Physik" HX-90E spectrometer with a Fourier conversion system. The number of accumulations averaged 1,000. Spectra for the lipid vesicles were also photographed on a WH-360 spectrometer. A substitution of H₂O for the D₂O was made by reprecipitating the membrane suspension three times in a D₂O-KD₂PO₄--NaOD buffer, 0.01M, pD 7.8, with 0.001 M MgSO₄. Measurements were made at temperatures of 4-30°C and the concentration of membrane protein generally amounted to 10 mg/ml. A solution of gramicidin S in deuterio-DMSO (dimethyl sulfoxide) was added to the specimen being examined 5-10 minutes before measuring. The final concentration of deuterio-DMSO in the membrane and lipid vesicle preparations did not exceed 3 percent.

A study of the bonding process of gramicidin S was done on the deuterated and protonized bacterial membranes and vesicles from the total bacterial lipids. Figure 1 shows the p.m.r. spectrum for the deuterated bacterial membranes at 30°C in the presence (a) and absence (b) of gramicidin S in a D₂O-deuterophosphate buffer. The same illustration (Figure 1) also shows the spectrum for gramicidin S in D₂O (c). The p.m.r. spectrum for the suspension of deuteromembranes discloses essentially no signals characteristic for the protonized membranes which corresponds to an 85-90 percent enrichment in deuterium. The addition of gramicidin S to the deuteromembranes is accompanied by the disappearance of signals from the antibiotic. The latter is evidence that gramicidin S is sorbed onto the surface of the membranes immediately following its addition to the membrane suspension, that is, within 2 minutes or less, and is severely immobilized in the process. This last phenomenon agrees with the known fact of the rapid inhibiting effect of gramicidin S on the enzymes in the respiratory tract of a bacterial cell. Since aggregation of the membrane material occurs only at high concentrations of the antibiotic (in excess of 500 micrograms per mg of membrane protein), this aggregation apparently is not the reason for the disappearance of p.m.r. signals for gramicidin S when it is added to the membranes.

The antibiotic's bonding with bacterial membranes is apparently primarily the result of an ion-ion reaction between the ornithine radicals and the phosphate groups of the bacterial phospholipids (3). However, it is not possible to exclude the possibility of the involvement of a hydrophobic reaction between the antibiotic's lipophilic amino acids--phenylalanine, proline and leucine and the fatty acid components of the bacterial

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phospholipids. An observable decline in the inhibiting action of gramicidin S on the enzymes of the respiratory tract in the presence of the non-ionic detergent Triton X-100 is evidence of the advantages of the existence of a hydrophobic reaction's contribution to the bonding of gramicidin S with the bacterial membranes. In this situation, where the membranes are rinsed with salt solutions and water, the inhibiting effect of the antibiotic on the membrane enzymes is slightly reduced (5). At 5°C, a similar loss of p.m.r. signals from the gramicidin S is noted when it is added to the bacterial membrane suspension. This corresponds to the temperature range below the point of phase shift for the bacterial membrane lipids (10°C) where the lipid matrix is basically in a pseudo-crystalline state. Apparently the dynamic state of the lipid component of the bacterial membranes has no effect on the antibiotic's bonding in the temperature interval of 4-30°C. Since the inhibiting effect of gramicidin S on the enzymes of the respiratory tract of the bacterial cell is noted throughout the temperature range of 4-30°C, it follows that the frozen state of the lipids in the bacterial membranes is not a hindrance to either the process of antibiotic bonding or the development of the action of this agent on the membrane enzymes. Clearly, the bonding of the antibiotic substantively changes the superficial charge of the membrane which can lead to a disruption in the ordering of the lipid perimeter of the membrane proteins. For the purpose of verifying this assumption, the effect of gramicidin S on the parameters of the p.m.r. spectrum for the suspension of protonized bacterial membranes in the buffer within the antibiotic concentration range of from 0 to 1 milligram per milligram of membrane protein (Figure 2) was investigated. In a concentration of 250-500 micrograms per milligram of membrane protein, the gramicidin S caused a two-three-fold increase in the signal intensity for the $(CH_2)_n$ and CH_3 groups of phospholipids with a chemical shift (σ) of 1.15 and 0.85 m.d., respectively, without any noticeable change in the width of the lines. We do know that the membrane protein functioning in natural membranes in the form of lipid-protein complexes essentially immobilizes the boundary lipids with protein. This is basically due to a hydrophobic reaction (12-14). While the percentage of lipids bonded with proteins in the lipid-protein complexes can amount to as much as 70 percent of the protein weight, we also know that this percentage increases as the system is chilled (15). The observable increase in the intensity of the phospholipid signals is apparently brought about by the increase in the relative share of mobile lipids contributing to the p.m.r. spectrum and reflect the fact of a breach in the high level of orderliness in the proteinic layer of the bacterial membranes. As may be seen from Figure 3, the intensity of the p.m.r. signals from the CH_3 - (a) and $(CH_2)_n$ -lipid groups in the vesicles obtained from isolated total lipids of the micrococcus decreases monotonically as the antibiotic concentration increases, clearly as the result of the gradual condensation of the liquid-crystal lipid bi-layer (4-6) and the aggregation of vesicles which begins at high concentrations of the gramicidin S.

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In this way, the sorption of gramicidin S onto the membranes of the micrococcus where negatively charged phospholipids dominate leads, on one hand, to a break in the lipid "coat" surrounding the proteins and, at the same time, contributes to the condensation of the liquified areas of the lipid bi-layer. The combination of these occurrences also leads to a complex dependence of the p.m.r. signals and the activity of the membrane enzymes on the concentration of the antibiotic as reflected in Figure 2.

The data obtained makes it possible to conclude that gramicidin S rapidly bonds with the bacterial membrane and, as a result of the breach in the arrangement of the lipids included in the lipid-protein complexes, causes a three-dimensional rearrangement of the components in the bacterial membranes. Obviously, the result of this is a differential inhibition of the activities of enzymes and a break in the permeability of the bacterial membranes.

Institute for Biochemistry
 imeni A. N. Bakh,
 USSR Academy of Sciences,
 Moscow

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PUBLIC HEALTH

THE CONSTITUTION OF THE USSR AND PROBLEMS OF GOVERNMENTAL LEGAL DEVELOPMENT.
LIFE AND HEALTH OF THE SOVIET MAN AS THE OBJECT OF CONSTITUTIONAL PROTECTION

Moscow SOVETSKOYE GOSUDARSTVO I PRAVO in Russian No 1, Jan 79 pp 5-12

[Article by F. M. Rudinskiy, docent of the Volgograd Higher Investigative School, USSR MVD, candidate of juridical sciences]

[Text] The life of man and his health are the highest values on earth and their comprehensive preservation is the embodiment of the genuine humanism flowing from the very essence of Marxist-Leninist teaching, from the nature of socialist, public construction, from the spirit and letter of the Soviet constitution. The principle of protection of the life and health of the people runs like a red thread in the works of V. I. Lenin /1/, in the decisions of the CP SU/2/. This article deals with the constitutional regulation of social relations in the sphere of protection of the life and health of the Soviet people, with the basic right of citizens in this area, secured in the new constitution of the USSR, and with realization of constitutional positions on national health under present conditions.

Constitutional Regulation of Social Relations in the Sphere of Protection of the Life and Health of Citizens. In the system of social values, the life and health of man are the highest, absolute and natural values /3/. The level of economic, social and cultural development, the class structure of society and its political system, exert an essential influence on the length of life, the decrease or increase of illness of the people, and so on /4/. Maintenance of social relations in this sphere is predetermined by the social character and social determinations of the life and health of the people, although, it is understood, the action, hereby, of biological patterns of human development are not changed. Four groups of factors exist which act upon health: social-economic, natural (geographical environment, climate, flora, fauna), biological (genetic) and psychological (adaptational qualities, temperament, etc.) /5/. The norms of Soviet law, which regulate various social relations, exert a serious influence on the first group of these factors. In addition, the law is becoming, increasingly, an active means of affecting, also, the second group of factors (for example, laws on protection of the environment). Being an instrument of

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socialization of the personality, in particular, of adoption by man of definite standards of thinking, of behavior /8/, law acts upon, in an essential manner, the psychological factors of health. The most important aspects of social relations in the field of protection of the life and health of man are the object of constitutional regulation. The new Basic Law of the USSR, embodying and cementing the achievements of developing socialism, along with intensification of maintenance of the above-cited laws, has substantially broadened the limits of constitutional regulation in this sphere of social relations, it has stipulated new means of protection of the life and health of the citizen. Two new basic civil laws of the USSR have been established: on protection of health (article 42) and on legal defense against encroachments on life and health (article 57), wherein the object of constitutional defense appears in the various aspects of these very important social blessings.

In stipulating the possibility of development of a governmental system of public health, mass physical culture and sport (articles 24,41), the Constitution of the USSR, 1977, facilitates provision of protection of the people's health. Life and health of each citizen are the object of constitutional protection (articles 42,57). A system is provided of special constitutional guarantees of protection of health of the workers. Thus, the Constitution entrusts to the state the responsibility for improvement of the conditions, and protection, of labor, reduction and complete displacement of heavy physical labor (article 21). The basic law has set down special guarantees on protection of the health of women (article 35). Special attention is devoted to responsibility for the health of the rising generation (article 42), for physical development of youth (article 25).

Soviet law has always protected and will protect the life and health of man, in particular, at his birth and in the event of sickness, notwithstanding the level of health and viability. The Constitution of the USSR, 1977, is permeated with these humanistic beginnings and guarantees the widest system of measures for preserving the life and health of citizens of all generations, from children (articles 35,42) to old citizens and invalids (article 43). Fixing the conditions for legal protection, material and moral support of motherhood (including allowance of various privileges to pregnant women), the Basic Law provides the same protection for future life. The great, communist ideal "Free development of each is the condition for free development of all" is raised to the rank of a constitutional principle (article 20).

Marx regarded sickness as an impediment to his free life /7/. In this determination, two moments of force can be separated. First, Marx associated the state of health of man, i.e., sickness, with his freedom and, second, with his life. Improvement of mental and physical possibilities of man is an important aspect of his free development. Many of the constitutional laws guarantee this or that aspect of protection of the health of man. Thus, the law on selection of a profession, kind of occupation and work (article 40), permits a citizen to choose work in correspondence with his calling, capabilities, occupational training, also considering here, of course, the possibilities of his health; the law on recreation (article 41) and, the

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law on housing (article 44), provide restoration of powers consumed in labor, reinforcement of health. The law on inviolability of the person (article 54) guarantees preservation of life and health as an inalienable part of the physical inviolability of the citizen from illegal arrests and other measures of coercion.

As indicated in the preamble to the Constitution of the USSR, in the development of socialist society, "the advantages of the socialistic form of life-- --are being more and more fully revealed, the fruits of the great revolutionary victories are being more and more widely used by the workers". The creation of favorable natural biological possibilities of human existence is a component part of the socialistic form of life. Increase in the material and cultural level of life of the workers is regarded in the Constitution of the USSR as one of the main tasks of the general socialist government. Hence, the very category "life of man", at a new stage of development of socialism, is being filled with profound humanistic content.

The constitutional civil laws on protection of health (article 42) and on legal protection from encroachment on life and health (article 57) stipulate their possibilities, guaranteed by the state, for defense of the normal biological existence of man. The object of legal protection here is the health of man, the length of human life, its inviolability. However, in the first case (article 42), what is meant is protection of the person from disease, from industrial injury, from harmful conditions of the environment, and, in the second case (article 57), defense against encroachment of law transgressors. There are differences, too, in content, guarantees, forms of realization of the cited laws, their place in the system of constitutional laws and civil freedoms.

Right to Protection of Health. The right to protection of health is a part of a number of very important social economic civil laws. Analysis of its internal structure permits the separation of four of its basic competencies (elements): 1) the right to protection of the inviolability of life and health; 2) the right to free, qualified medical care provided by governmental institutions of health; 3) the right to assurance of the possibility of long years of active life; 4) the right to the highest achievable level of physical and mental health. The constitutional right to protection of health is assured by a system of special guarantees: economic, ideological, organizational and legal. The most essential of these is raised, in the new Basic Law, to the rank of constitutional.

Economic guarantees are comprehended in a system of economic measures directed to material, financial assurance of this right, a system shaped by the Soviet social order, by socialistic ownership of the means of production. The Constitution of the USSR fixes the most important of these guarantees: creation and broadening of a network of institutions for medical care of and strengthening the health of the citizens, the evolvement of scientific research directed to prevention and decrease of morbidity

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(article 42), material care in the event of disease, or loss of ability to work (article 43). In correspondence with the decisions of the 25th Congress of the CP SU, a material base of health in the USSR is being developed on the basis of rational combination of construction of multiprofile and specialized medical institutions, increase in the number of hospital beds, and so on /8/.

The sense of the ideological guarantees of the right to protection of health lies in broad expansion of medical knowledge, improvement of sanitary-hygienic education of the population, and so on. This aspect of ideological guarantees involves an increase in the general culture of the population. But still another aspect exists which makes up a definite part of awareness of the right. What is meant here is a profound realization, by all, of the idea of inviolability of human life, of the value of health as the most important personal blessing. The essence of ideological guarantees is this--in order for the guarantees to contribute actively to the work of all state organs, social organizations, jobs of people and citizens --that work is to be based on a genuine respect, a careful, attentive attitude to the life of a man.

Juridical guarantees include national-law, administrative-law, criminal-law and civil-law guarantees. The national-law guarantees are the constitutional (article 42) and other norms of state law which secure the right to protection of health and regulate the work of the Councils of Peoples Deputies and their Standing Commissions for assuring this right. In correspondence with laws on local Councils, accepted in recent years, the organs of state power direct the business of health, physical culture and sport on the local scene, they set up measures for monitoring sanitary rules, prevention of spread of infectious diseases, for protection of nature, and so on (see, for example, article 24 of the Code of the RSFSR on the Rayon Council of Worker Deputies of the RSFSR). The administrative-law guarantees have to do with norms of administrative law which regulate the activity of the Ministry of Health, of organs and health establishments, of executive committees of local Councils, etc. Tangential to this view of the guarantees are, also, the administrative-legal norms which assure conditions of realization and means to defend the rights to protection of health, for example, administrative prohibition against engaging in medical, pharmaceutical activity by people who have not been admitted to such work in the established legal way; disciplinary responsibility of medical workers for infraction of professional duties (articles, 12,17 of the Bases of Legislation of the Union SSR and union republics on public health). Criminal-law guarantees are the norms which stipulate responsibility for criminal disruption of the right to protection of health, for example, withholding of help to the sick (article 128, UK--Criminal Code--of the RSFSR), illegal action as a physician (article 221, UK, RSFSR), etc. Civil-law guarantees include norms of civilian law which determine property responsibility for causative damage, involving compensation for recovery of health (articles 459-468 GK--Civil Code--of the RSFSR, ff.).

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An essential role in assurance of the right to protection of health is played by Organizational Guarantees, i.e., a system of corresponding measures of a social-economic and medical-sanitary character. The most important of these are set down in article 42 of the Constitution of the USSR, article 5 of the Bases of Legislation on health, in particular, provision of broad curative and prophylactic measures, ways to sanitize the environment, creation in industry and in daily life of expedient sanitary-hygienic conditions, the removal of causes of industrial injuries.

Great importance in assurance of the right to protection of health is attributed to the foreign political activity of the CP SU and the Soviet state on intensification of defusing and removal of the threat of a world war. The principles of Lenin's foreign policy, set down in chapter 4 of the Constitution of the USSR, are directed to the preservation of the life of millions of people from an atomic catastrophe, the realization of their right to life /9/. The USSR, in its Basic Law, set down the principles of its relations with other nations, including the principle of honoring the rights of man and of basic freedoms (article 29). They include the fixing-- in international pacts on rights of man--the right to life, the right to the highest achievable level of physical and mental health.

Right of Citizens to Legal Defense of Life and Health. This right, set down in article 57 of the Constitution of the USSR, is a juridical embodiment of the Marxist-Leninist idea on allowing citizens the possibility of legal protection of their rights as the first condition of all freedom /10/. The basic principles of the cited right are set down in current legislation /11/, and the sense of the general concept of legal defense of subjective rights, a sense which issues in the framework of any one branch of the right, was formulated long ago in the consciousness of jurist-scientists. The uniqueness of the right to legal defense against infringement on life and health is that it is an element of a broader constitutional right which also guarantees other personal goods of the citizen: honor and virtue, personal freedom and property (article 57). This right belongs to a number, --set down, for the first time, by the Constitution of the USSR, 1977, --of a special group of rights and guarantees (articles 57,58) which assure the realization of all remaining constitutional rights and freedoms.

The right to legal defense of life and health is the guarantee, by the Basic Law of the USSR, of the possibility of recourse to the court, of participation in a legal dispute (right to defense in a trial proceedings sense), and, also, of the possibility of cutting off--with the help of the court-- of any infringement on the life and health of the citizen (right to defense in a material sense). Realization of this right assumes both civil-trial and, also, criminal-trial forms of defense. The right to legal defense of life and health is comprehensively assured by a system of special guarantees. Thus, material guarantees are expressed by liberation of the citizen --in realization of this right--from financial expenses (for example, in examination of civil matters on compensation of an injury, caused by mutilation or other damage to health, the plaintiffs are freed from payment of court costs--article 23 of the Bases of civil legislation--).

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The number of criminal-law guarantees should include, first of all, the norms of criminal law, establishing the responsibility for crimes against life and health of citizens (chapter III of the Special Section, UK--criminal code--RSFSR). A decisive struggle with such crime is viewed by the Supreme Court of the USSR as one of the important tasks of court organs /12/. It must be noted that such crimes as hooliganism, breaking laws of safety and traffic, a number of crimes against socialist and personal property, long-time criminality, can entail quite dangerous consequences to the lives and health of people. Slander or insult in some cases can impinge on the health of the victim more seriously than infliction of bodily harm. Consequently, the range of criminal-law norms, the guarantees of this right, is significantly broader than the system of norms set down in chapter III of the Basic part of the UK RSFSR. The criminal-proceeding and civil-proceeding guarantees should include a combination of trial norms which assure a prompt and valid legal action and review in court of civil and criminal matters involving infringement on life and health.

The creation of favorable conditions for recourse of citizens to law for defense of their life and health assumes a rise in the level of legal awareness of the people, sequential translation into life of the democratic principles of Soviet legal proceedings, fight against red tape, bureaucracy, and a formal attitude toward subjective rights of civilians. It would be desirable to allow the victim, in a matter of crimes against life and health, the right to complain in court about unfounded refusal of a policeman or prosecutor to proceed in a criminal matter. Such a story in criminal procedural legislation would correspond to the sense of articles 57 and 58 of the Constitution of the USSR, it would promote an increase in the role of the court in defense of the rights of citizens, it would strengthen their guarantees and release the facts about an unfounded refusal to prosecute a criminal matter.

Problem of Realization of Constitutional Aspects on Protection of Life and Health. As L. I. Brezhnev has emphasized, the Constitution of the USSR "should be satisfied and will be satisfied in all of its parts" /13/. The basic ways to realize the rights of citizens to protection of health are defined in the resolution of the 25th Congress of the CP SU and decrees of the CC CP SU and Council of Ministers USSR "On measures for further improvement of the peoples' health", (1977). The goal of a complex program of measures stipulated in these resolutions is the further improvement in guarantees of this constitutional right. Thus, strengthening of economic guarantees assumes, in particular, an increase in capital investment allotted to construction of ambulatory-polyclinic establishments, of hospitals, the extension of release of medical technology, medicines, the establishment of additional advantages for uchashtok and rural physicians. Since 1978, there has been an increase in scheduled outlays for food, purchase of medicines and bandages in a number of medical establishments. Special attention is being assigned to organizational guarantees, improvement in organization of work at organs of public health with the intent to improve the quality of medical care (subdivision of territorial therapeutic and

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pediatric uchashtoks, improvement of selection and training of directing personnel in public health and raising requirements for them, introduction into medical practise of the achievements of science, and so on).

Of decisive importance is provision of a prolonged active life of the people. In the years of Soviet rule, the general mortality of the population, as compared with the prerevolutionary period, decreased by a factor of 4, the average duration of life reached 70 for all of the population and 74, for women. Further, in the problem of prolongation of life, there are some questions which await study and solution. Thus, since the mid-sixties, a tendency has been noted to some growth in the total index of mortality /14/. Study has shown that this is caused, for the most part, by a growth, in recent years, in the number of people of older years, a growth exceeding that of the total population. Increase in number of older people involves an increase in the index of mortality from chronic diseases (in particular, from cardiovascular and cancerous diseases), and this promotes growth of the general coefficient of mortality. Also to be noted is the different level of mortality in various areas of the nation. Thus, in rural locales, the level of child mortality is higher than in cities, as is also true with respect to mortality for injuries and accidents. This involves, in particular, the level of medical care, technical training of key personnel, inadequate control of observation of rules of safety engineering in rural locales. On the other hand, here, there is a low level of mortality of people beginning with age 50. In this case there are the negative consequences of urbanization, in particular, contamination of the air of cities and industrial centers, the more intensive tempo of life, etc. Solution of the problem of prolongation of the life of man involves many complicated tasks, in particular, intensifying the control of cardiovascular and oncological diseases, improvement of medical service in the rural locale, organization of special polyclinics, sanatoria for old people, increase of output of gerontological physicians, prevention of road accidents, correct organization of recreation and social nutrition, control of air contamination in cities, and so on.

Man is a component part of the living world; his connection with surrounding nature is natural and organic. Expressing the interests of current and future generations, the Constitution of the USSR confers on the state the task of protection, and the scientifically-based, rational use, of the earth and its resources, available water, plant and animal world, of preservation of the purity of the air and water, of assurance of reproduction of natural wealth and improvement of the human environment (article 18). The environment is the medium of life and its sanitation is an essential guarantee of the right of citizens to protection of health (article 42 of the Constitution of the USSR). Modern scientific technical progress involves such negative phenomena as contamination of reservoirs, disruption of biological equilibrium in nature, and the like. The Constitution of the USSR, setting down the conditions which exclude ecological crisis, inflates, with new content, the right to protection of the health of man. The Polish jurists, I. Moysevich and S. Vykrentovich separate 5 groups of rights,

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related to the scientific-technical revolution which must be considered by legislation: the right of the citizens to food and medicine of corresponding quality; the right to use of pure air; the right to use of pure water of rivers and oceans, not poisoned by industrial and urban sewage; the right to quiet, undisturbed by technical mechanisms; the right, associated with definition of the boundaries of intervention of medicine into the life of man (heart transplantation, and so on) /16/. Analogous views have been expressed in the Soviet juridical literature /17/. With the prospect of development of laws on protection of the atmospheric air, of the animal world, the restoration of legislation on protection of nature /18/ will facilitate and enrich the systems of guarantees of the right to protection of health.

The decree of the CC, CP SU and Council of Ministers USSR "On measures for further improvement of peoples' health", poses the task of increasing the requirements on the administration of enterprises for fulfillment of norms on protection of their environment. In the light of the decree, in the improvement, administrative-legal norms which regulate the activity of the organs of public health are needed. This is an important aspect of development of administrative-legal guarantees. Other problems exist, too. A number of new legal questions are advanced by the transplantation of tissues and organs. The great social interest and attention to this medical measure require corresponding refinement and improvement of legislation /19/. Academician N. P. Dubinin has noted that modern genetics poses the task of maintenance of first class inheritance of man and freeing him from the consequences of inherited biological defects /20/. However, increase of freedom of man with respect to his nature ought to be placed under strict social control /21/. It is necessary to turn particular attention to legal forms of this control.

Needed, too, in the development are criminal-law measures of defense of life and health of the citizens. In particular, worthy of support is the suggestion on acceptance of special norms for responsibility for creation of hazards to the health of the people with improper fulfillment of responsibilities in the area of design, construction, industrial activity and sanitary inspection /22/. One of the indispensable conditions of assuring the right to protection of the health of man is an implacable fight against drunkenness and alcoholism. In our view, it would be desirable to set increased criminal responsibility for dispensing alcoholic drinks to minors. It would also be expedient to broaden the rights of commissions for control of drinking in the executive committees of Councils, giving them the right to suspend laws of local organs of trade which break the rule of sale of strong alcoholic drinks, and to stir up the activity of these commissions.

Life and health of man are regarded, in a socialist society, as a personal good, and as a social property of the nation. It is characteristic that the Bases of legislation on health define protection not only as a right,

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but, also, as a duty of the citizen (article 3). In the special, seventh session of the Supreme Soviet of the USSR of the ninth meeting of the deputies, Academician B. V. Petrovskiy spoke on increase of the responsibility of citizens for their health and the health of the people around them. Realization of this task requires translation into life of many measures but a special role here belongs to perfecting the ideological guarantees of the right to protection of health. It finds expression in the needs for improvement of sanitary hygienic care of the population, intensification of interpretive work of medical personnel, introduction of new measures of moral encouragement (in particular, the institution of the honorable title "Peoples' Physician of the USSR"). A careful attitude to life and health of neighbors is a constitutional responsibility of citizens which flows from the sense of article 65 of the Constitution of the USSR.

"Among the social tasks", said L. I. Brezhnev at the 25th session of the CP SU, "none is more important than care for the health of the Soviet people". The New Soviet Constitution guarantees the conditions for first class harmonic development of the personality, the physical, mental and moral condition of the Soviet man, his active and versatile creative vital activity, and herein, is the highest manifestation of its real democracy and true humanism.

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3. See: Tugarinov, V. P., Values of Life and Culture (in Russian), Leningrad, 1969, p 15, 27, 30; Popov, M. and Mikhaylov, P., Health as a Social Value, in the book: Philosophical and Social-Hygienic Aspects of Teaching on Health and Disease (in Russian), Moscow, 1973 pp 52-53
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5. See: Lysitsyn, Yu. G., Social Hygiene and Organization of Public Health (in Russian), Moscow, 1973, p 105
6. See: Yavich, L. S., General Theory of Law (in Russian) Leningrad, 1976. pp 281-283

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7. See: Marx, K. and Engels, F., Collected Works (in Russian) Vol 1, p 64
8. See: Materials of the 25th Congress of the CP SU (in Russian), p 220
9. The juridical literature contains two approaches to understanding the essence of the right to life, proclaimed in Article 3 of the General Declaration of the Rights of Man and in Article 6 of the Pact on Civic and Political Rights /article in Russian/. In a narrowly-juridical understanding, the right to life is viewed as a system of guarantees for the inadmissibility of arbitrary deprivation of human life, in particular, illegal use of capital punishment (on this, see: Kartashkin, International Protection of Human Rights--in Russian--Moscow, 1976, p 86,87). This idea, A. I. Denisov notes, "is interpreted now, rather, as the right of man to the conditions of life (an apartment, food, and so on)". (Denisov, A. I., General System of Socialistic Democracy--Russian --Moscow, 1975, p 224, 225). In such a broad aspect, the right to life can be defined as a stipulated and guaranteed--by juridical norms--possibility to appeal to the government on questions of providing the citizen with the necessary material and cultural blessings which compose the conditions of his existence. In such a sense, the right to life almost blends with the idea of legal status of the person and is provided to all by Soviet juridical norms.
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11. See: Article 2 of the Bases of Legislation and the Judicial System of the Union of the SSR, Union and Autonomous Republics ("Records of the Supreme Soviet, USSR", 1959, No 1, p 12), Article 2 of the Bases of Civil Law Making of the Union of the SSR and Union Republics ("Records of the Supreme Soviet, USSR", 1961, No 50) --all in Russian
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21. See: Izutkin, A. M., Disease as a Constraint on Life's Freedom, in the book: Philosophical and Social-Hygienic Aspects of Teaching on Health and Disease (in Russian). Moscow, 1975, p 175
22. See: Malein, N. S., Legal Protection of Nature and of the Health of the Population of the USSR, "SOV. GOSUDARSTVO I PRAVO" (in Russian) No 6, 1976, p 84

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PUBLIC HEALTH

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AN INVESTIGATION OF THE KINETIC LAWS OF HUMAN MORTALITY IN THE HISTORICAL ASPECT

Moscow DOKLADY AKADEMII NAUK SSSR in Russian Vol 245, No 4, 1979 pp 1017-1020

[Article by L. A. Gavrilov, N. S. Gavrilova, presented by Academician N. M. Emanuel']

[Text] During the past few years, data from studying the survivorship of organisms have become widely used in gerontology to determine the effectiveness of the action of geroprotectors (1,2) and to verify the various theories on aging (3-6). In this project an attempt has been made to utilize the kinetic approach to investigate the three questions that follow in relation to human ecology.

1. Why has there been an increase in man's life expectancy?
2. What has brought about the end of the increase in life expectancy currently found in the developed countries?
3. What are the prospects and the means for a further increase in human life expectancy?

For the purpose of resolving the problems set forth, we have used the method of linearizing statistical data on age-related dynamics of mortality which we had proposed previously (5). This method is based on plotting the relationship of the logarithm of increase in the probability of death ($\lg \Delta R_t$) to age (t). In order to verify the applicability of this linearization technique, we made up 285 short tables of human mortality by making use of data published by the United Nations (7) on all geographic regions of the world: (Africa, America, Asia, Europe, the USSR, Australia and Oceania [the central and South Pacific]. It appeared that, among the coordinates that we proposed, 242 functions had the form of straight lines with a correlation factor of $r \geq 0.98$. Straight lines with $r \geq 0.99$ accounted for 74 percent of all the situations examined.*

* Each straight line contained 9 points with a 5-year interval between them. The age range for the linearization was 35-75 years.

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As demonstrated previously (5), the linear nature of the relationship to the coordinates $\lg \Delta R_t$, t shows that the probability of death increases with age according to the Gomperts-Meikkhem equation. This equation has the following form

$$(1) R_t = A + R_0 \exp(\alpha t),$$

where R_t is the probability of death (mortality) in persons of age t during a set period of time; A , R_0 and α constants for the given biological species and the known constant conditions of existence. The variable element of the equation, $R_0 \exp(\alpha t)$, characterizes the increase in mortality that comes with increasing age brought about by the aging process. The familiar Gomperts is a special instance of equation (1) when $A = 0$. However, it is possible to show that the background mortality level cannot be neglected for human populations and, for this reason, Gomperts' equation is not applicable in this situation. Figure 1 shows the relationships for the logarithms of mortality ($\lg R_t$) and the logarithms for the increase in mortality ($\lg \Delta R_t$) to age in humans. It can be noted that there is a valid linear relationship in the second instance alone; this means that the increase in mortality that comes with age is described by equation (1) when A is not equal to zero. It is necessary to mention that the Gomperts-Meikkhem holds true not for human population alone (5) and can be shown theoretically through an element of the theory of reliability (5,8). This provides the basis for using the Gomperts-Meikkhem equation to analyze statistical data on human mortality in the historical aspect. The prospects of this approach were demonstrated by us earlier (9).

We have applied the Gomperts-Meikkhem equation to research on the statistics of mortality among men in Sweden over the period from 1911 to 1975. The choice of Swedish statistics was associated with the exceptional level of detail in these data published in the form of eighteen complete tables of mortality (10). The results are shown in Table 1. To begin with, it appeared that all the functions in the coordinates proposed by us had a

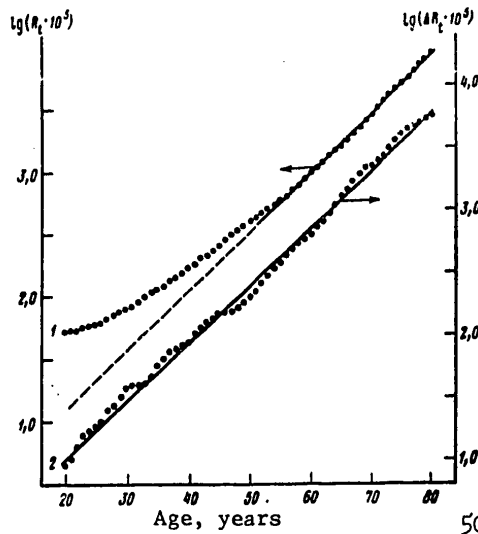


Figure 1. The relationship of the logarithm of mortality (1) and the logarithm for the increase in mortality (2) to the age of women in Italy during 1964-1967. This was plotted on the basis of complete published tables of mortality (11). A five-year interval was chosen to calculate increases in mortality (ΔR_t)

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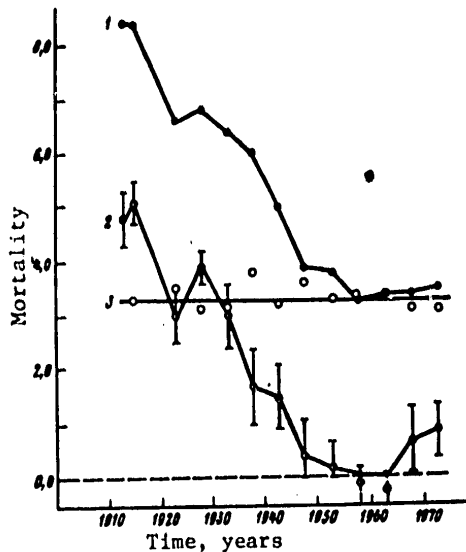


Figure 2. Changes in overall mortality (1), background mortality (2) and the level of mortality dependent on age (3) for the period from 1911 through 1975. The values for mortality correlate to the number of deaths per year per 1,000 men 45 years of age.

correlation factor of $r > 0.996^*$ which proves the applicability of our method of linearization in this particular concrete situation. However, the most astonishing fact is that the coefficient A was the one parameter of the Gomperts-Meikkhem equation that varied reliably over the period from 1911 through 1975. Figure 2 illustrates the biological meaning of this fact.

It may be said that the reduction in the background mortality rate (A) is the only reason for the decline in overall human mortality. The mortality rate as a function of age, $\Delta R_0 \exp(\alpha t)$, remained virtually unchanged from 1911 through 1975. During the 1946-1950 period, the background mortality rate for men in Sweden declined to the minimum level which is close to zero and for this reason, the room for increase in life expectancy appeared to have been exhausted. As a result, there was a stabilization in the mortality rate and life expectancy. The results that are available force us to conclude that an essentially new route must be taken that has not been previously used for there to be a further decline in mortality and increase in life expectancy. This

* Each straight line had 31 points with an interval of 1 year between them. The age range for the linearization was 45-75 years. A 5-year interval was chosen to estimate the increment of increase in mortality (ΔR_t).

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Table 1
 Values for the parameters of the Gomperts-Meikkhem equation and the factors of correlation for populations of men in Sweden*

Years	Factor of correlation	$\lg(R_0 \cdot 10^6)$ (for year)	$\alpha(\text{year}^{-1})$	$(A_{\text{av}} \pm \sigma) \cdot 10^3$ (for year)
1911-1915	0.998	1.63	0.099	4.8 ± 0.5
1911-1920	0.998	1.55	0.101	5.1 ± 0.4
1921-1925	0.998	1.62	0.098	3.0 ± 0.5
1926-1930	0.999	1.47	0.103	3.9 ± 0.3
1931-1935	0.996	1.48	0.103	3.0 ± 0.6
1936-1940	0.996	1.66	0.098	1.7 ± 0.7
1941-1945	0.996	1.56	0.100	1.5 ± 0.6
1946-1950	0.996	1.63	0.098	0.4 ± 0.7
1951-1955	0.997	1.59	0.099	0.2 ± 0.5
1956-1960	0.998	1.60	0.098	-0.1 ± 0.3
1961-1965	0.998	1.61	0.099	-0.2 ± 0.3
1963-1967	0.997	1.57	0.099	0.2 ± 0.5
1966-1970	0.997	1.52	0.101	0.7 ± 0.6
1967-1971	0.997	1.52	0.101	0.8 ± 0.6
1968-1972	0.997	1.50	0.101	1.0 ± 0.7
1969-1973	0.998	1.53	0.100	0.8 ± 0.7
1970-1974	0.998	1.55	0.100	0.7 ± 0.5
1971-1975	0.999	1.52	0.101	0.9 ± 0.5

* Values for parameters calculated for an age interval of 45 - 80 years using the linearization technique proposed by us. The method for determining the coefficients R_0 and α was described in detail in a previously published paper (5). Standard errors for α and $\lg(R_0 \cdot 10^6)$ were a - 2 and $2 - \frac{1}{75}$ respectively. The coefficient A was calculated by the formula $A_{\text{av}} = \frac{1}{31} \sum_{t=45}^{75} (R_t - R_0 \exp(\alpha t))$.

course assumes a decrease in the mortality rate that is a function of age, $\Delta (R_0 \exp(\alpha t))$. Thus, the prospects for a further increase in life expectancy in the developed countries are presently bound by the capabilities of experimental gerontology.

In conclusion, it must be noted that the method of analyzing the age dynamics or mortality that we have proposed makes it possible to solve demographic but ecological questions as well. This method can be extensively applied in the biology of aging since it provides a means for judging the active mechanisms of a number of factors in life expectancy based on survivorship tables. The clarity and unambiguity of the results

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obtained in this effort attest to the fact that splitting the overall mortality rate into two components (background mortality that is not a function of age and age-related mortality which increases with age) is neither formal nor artificial but rather, reflects an objective reality. Finally, because of the very fact that a background mortality does exist, it follows that a judgment as to the rate of aging in terms of the value of life expectancy is not possible.

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Moscow State University
imeni M. V. Lomonosov

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SCIENTISTS AND SCIENTIFIC ORGANIZATION

ACADEMY OF SCIENCES REVIEWS ACTIVITY OF GENERAL BIOLOGY DEPARTMENT

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 4, 1979 pp 3-10

[Report, discussion and decree of a session of the Presidium of the USSR Academy of Sciences concerning the activities of the Department of General Biology]

[Text] The Department of General Biology which was separated from the Department of Biological Sciences by the Decree of the General Assembly of the USSR Academy of Sciences of 15 May 1963 at present directly includes 10 institutes and laboratories, and, in addition, provides scientific procedural leadership over the activities of 7 scientific institutions of the Siberian Department of the USSR Academy of Sciences and 13 scientific institutions of the scientific centers and affiliates of the Academy, and a number of institutes and laboratories of the Union republic academies of sciences.

Within the department are nine scientific councils, seven all-Union societies, the National Committee of Soviet Biologists, and the Commission for the Preservation and Development of the Scientific Heritage of Academician N. I. Vavilov. From 1964 through 1976, within the Department there has been at work the Soviet National Committee on the International Biological Program (IBP), and since 1974, work has developed under the UNESCO "Man and the Biosphere" Project which directly replaced the IBP. The department publishes 13 scientific journals, and, in addition, is in charge of three journals from among those published by the Section for Chemical Engineering and Biological Sciences of the Presidium of the USSR Academy of Sciences.

At a session of the Presidium, the Academician Secretary of the Department, Academician M. S. Gilyarov, gave the accountability report on the activities of the Department of General Biology.

The Report of M. S. Gilyarov

The Department, the speaker said, covers virtually all the disciplines concerned with the study of the living world on an organism level and on the level of superorganism systems. These are the basic, classic, so-called

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descriptive disciplines: zoology, botany which incidentally have long since gone beyond the descriptive level, paleontology, embryology understood as the biology of organism development, genetics, ecology, including hydro-biology and a special study of forest biogeocenoses. The institutions of the department are also concerned with studying the evolutionary process, its mechanisms, paths and regularities. Practical questions are also being worked out such as, for example, the introduction of plants; problems of forests are also being widely and comprehensively studied.

M. S. Gilyarov emphasized that recently, particularly since the 25th CPSU Congress, primary significance has been given to research in the area of genetics, ecology and biogeocenology, to the use and reproduction of natural resources and environmental conservation. The Department has participated in the elaboration of a coordination plan for the activities of the Scientific Council on the Problems of the Biosphere Under the Presidium of the USSR Academy of Sciences, as well as measures on the problems of environmental conservation, including the compilation of interdisciplinary research programs on certain of these problems.

Having described the creative scientific ties of the department and its institutions within the country (with the institutes of the other divisions of the USSR Academy of Sciences, the Union republic academies of sciences, the VASKhNIL [All-Union Academy of Agricultural Sciences imeni Lenin], the USSR Academy of Medical Sciences, the ministries, various departments and higher institutions of learning), as well as their international scientific ties (joint research with the institutions of the socialist countries, the holding of international congresses, symposiums and so forth), M. S. Gilyarov told of certain of the most significant research results achieved by the department's institutions over the 9 years, that is, over the time which has passed since the previous discussion of the department's activities by the Presidium of the USSR Academy of Sciences.

The speaker took up in particular detail the results of work in the area of genetics and breeding and, in particular, announced that a forecast had been worked out for the genetic consequences of biosphere pollution up to 1980. As followed from the report, there have been substantial achievements in studying hereditary diseases, in their detection, in seeking out the ways for treating people suffering from these diseases, as well as in the struggle against viral diseases. The state pharmacopeia has received medicines against a number of virus-caused illnesses (encephalites, skin diseases, eye diseases and so forth) based upon the use of ribonuclease. It has turned out that viruses cause genetic mutations along with chromosomal ones in the somatic cells of man.

In the cells of microorganisms and the higher plants, a role has been proven for certain types of damage to the primary and secondary DNA structure in the formation of a certain type of mutation changes. This is very important for understanding the mechanism of mutagenesis. It has been established that there is a definite sequence in the activities of a number of genes in ontogenesis, and that it is possible, using either hormones or environmental

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factors particular photoperiods, to alter this sequence. Using the Chinese silkworm, the possibility has been shown of creating a new type of animal with an altered chromosome set and the obtaining of offspring with a fixed sexual ratio. As a result of related breeding and genetic work, a many-year program has been completed in developing monosome wheat lines which are deficient in each of the 21 chromosomes. A method has been worked out making it possible to replace any pair of soft wheat chromosomes, and this is of important breeding significance. A theory has been proposed explaining the phenomenon of resonance mutagenesis.

With the aid of such methods of influencing the hereditary properties of plants as ionizing radiation and chemical agents as well as using polyploidy methods, a number of new varieties of cultivated plants has been obtained. The radiation variety of spring wheat, Novosibirskaya-67, has been developed and regionized, the high-yielding feed oat variety "Zelenyy" has been developed, and the new early variety of potato "Vesna" is being tested with increased resistance to diseases and a high yield. Varieties of polyploidy sugar beet have been developed with a 10 percent higher sugar yield, the Grekum-114 wheat-wheatgrass hybrid has been developed, as well as the grain-feed wheat Otrastayushchaya-38, and others. The work of Academician V. N. Remeslo has provided colossal profit to agriculture.

Of interest, continued M. S. Gilyarov, is the work related to changing certain breeds of farm animals. For example, a hybrid animal has been obtained from crossing the Kirgiz fine-fleeced sheep with the Australian merino; the size of the hybrid herd has exceeded 1 million head. On the basis of the established data on the regulation of fecundity in domestic, domesticated and wild animals, additional offspring have been obtained in certain very valuable fur-bearing animals. The hypothesis proposed by Academician D. K. Belyayev on destabilizing selection links the domestication of animals with a study of certain forms of their behavior. A study of the patterns of the individual development of animals and control of the processes of ontogenesis (in particular, using the Chinese silkworm) have made it possible to work out effective methods for obtaining parthenogenic and androgenic offspring, allopolyploids, interspecific nucleocytoplasmic and bipaternal androgenic hybrids, and so forth. An important problem for medical embryology has been solved. Principles have been established for detecting teratogens (that is, substances which cause deformities) among the chemical factors of the environment. The results have been turned over to the USSR Ministry of Public Health. A study has been made on the systems of modifier genes, and this has made it possible to explain in what manner the genotype is gradually realized in the formation of the phenotype.

Having mentioned a number of other substantial results in the area of genetics and breeding, M. S. Gilyarov moved on to describing the achievements of the department's institutes in the area of studying the biological bases for the rational use, transformation and conservation of the plant world. First of all he announced that the system proposed by Academician A. L. Takhtadzhyan for the higher flowering plants, in synthesizing the modern achievements of

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botany, is presently recognized throughout the world. Our scientists have carried out detailed floristic zoning of the entire land mass of the world, and they have studied the formation of species in the tropics.

Many different compendiums have been published on the most important plant groups; one of the most valuable compendiums is on the cytology of algae. The regional floras which are now being published are assuming ever greater significance. Interesting general monographs and the five-volume manual "Polevaya Geobotanika" [Field Geobotany] have been published, and these are widely being used in many agricultural institutions. The first maps for the plant cover of the European USSR have been created on a scale of 1:2,500,000 and for the nonchernozem zone on a scale of 1:1,500,000. Forecasts have been worked out for certain changes in the plant cover in our nation, and a "Red Book of Plants" has been published, and this includes a list of particularly endangered species. Methods have been prepared for the introduction of plants, and recommendations proposed on the landscaping of industrial areas.

A number of problems has been worked out related to understanding the biological bases of the animal world. In particular, a theory has been developed for fluctuations in insect populations. Based on the notion of the automatic regulation of this process in nature, it has become the basis for forecasting the mass multiplying of insects as well as for creating a system for the integrated combating of agricultural and forest pests. The use of this system makes it possible to save up to 1 million rubles a year just in reducing the consumption of poisons used for the chemical treatment of cotton fields. Data have been obtained on the action of various insect hormones on insect development, and this is very important for combating the pests and for understanding the phylogenic development of certain insect forms. Methods have been worked out for the geological melioration of soils. Academician V. Ye. Sokolov has obtained interesting data on chemical signaling in higher vertebrates, and at the Zoological Institute A. V. Ivanov has done interesting work on the origin of certain groups of multicelled animals.

The report also mentioned certain research results in the area of hydrobiology and ichthyology. An evaluation has been made for the role of the coastal zone in the process of the self-purification and secondary pollution of inland waters, a forecast for water quality in the reservoirs has been worked out up to the year 2000, and criteria have been established for evaluating water quality in terms of hydrobiological indicators. Of great practical significance is the work done to study the hydrobiological, biochemical and hydrochemical conditions of the Volga, to establishing the fish stocks in it and the rate of their reproduction. Also promising is the work in the area of the biological purification of water-polluting substances (microorganisms have been established which remove cobalt, petroleum and so forth from water). Particularly valuable have been the results of introducing herbivorous fish from the Far Eastern rivers into the reservoirs, ponds and irrigation systems for clearing out plant growth.

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A number of substantial results has been achieved in studying the problems of biogeocenology and the conservation of nature. For the European USSR the directions and degree of variation in the structure and function of natural cenoses under the influence of various anthropogenic factors have been determined. A system has been worked out for reestablishing green zones around large cities. Methods have been established for improving the pastures of Central Asia, forecasts have been prepared for the ecological consequences of large construction projects, and so forth. A forecast has been compiled for changes in biological resources for the period up to 1990.

Great work is being carried out on forest problems. In particular, the basic directions have been outlined for the organization and management of forestry in the zone of the BAM [Baykal-Amur Mainline]. The Institute for Forestry and Wood imeni V. N. Sukachev of the Siberian Divisions of the USSR Academy of Sciences is using information on the condition of forests gained from satellites and aircraft. In terms of the European plain, a scheme and system have been worked out for landscape statistical methods for inventorying and mapping the forests and their state. The Forestry Management Laboratory has acquired important results on dust-retaining plantings in Western Kazakhstan and the Southeastern European USSR, and on optimizing reforestation conditions for the various areas of the European USSR for retaining water runoff.

The scientific institutions of the department, as was pointed out in the report, have carried out many other studies, the results of which are of interest for science and practice. For example, the data established in the course of studying the historical development patterns of animal and plant organisms are of essential theoretical significance and of certain practical importance.

M. S. Gilyarov gave a number of figures describing the economic effect from introducing the results of certain studies carried out by the department's institutions jointly with institutions of other departments.

The report commented on shortcomings in the activities of the department's institutions. Work has not been properly developed on soil science, and in particular, for biological soil science, for biogeocenology and certain other areas of general biology. The problems studied by the institutes are too diverse and general, the remnants of already obsolete subjects are often preserved, unpromising studies sometimes appear, and certain promising ones cannot be properly developed. The scientific councils under the department often duplicate each other.

Work should be strengthened in the area of taxonomy as a basis for studying the evolution of the biosphere and its components, said M. S. Gilyarov. We are losing the genofund of our planet and our nation, and we should give thought to the fate of the biosphere and our biocenoses, he stated. Not molecular biology will play the decisive role for the fate of mankind in providing man with food, clean air, and so forth, but rather precisely the

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ecological areas of research. But our research is not sufficiently provided with a physical plant.

The speaker drew the attention of the session participants to the weakness of the physical plant for conducting certain other important areas of research covered by the department's institutions.

Discussion of the Report

Academician Ye. M. Lavrenko who spoke at the session sketched out the situation in which the Botanical Institute imeni V. L. Komarov finds itself. One of the oldest and world renowned institutions of the USSR Academy of Sciences, this institute is concerned with all areas of botany, but it has long since "outgrown" its quarters which in addition are obsolete in all regards.

Ye. M. Lavrenko felt that it is essential to strengthen the profound stationary research on the plant cover of our country, and for this it is essential to set up stationary facilities in all the basic regions which are extremely diverse in terms of natural conditions. The work of these facilities should be coordinated. Only a knowledge of the processes occurring under natural conditions within the biocenoses and between them, Ye. M. Lavrenko asserted, makes it possible to maintain the qualitative multiplicity of life, that is, the diversity of the genofund, without which a further existence of the biosphere is impossible. Many factors related to man's activity jeopardize this qualitative diversity of life. Ye. M. Lavrenko also developed the notion that the USSR Academy of Sciences should be more concerned with human biology, and in particular anthropology and human ecology, again considering that the nature of our country is very diverse and the people must work under the most different conditions.

Academician V. Ye. Sokolov devoted his comments to the tasks of ecology in the broad sense of the word. He said that in recent years more and more attention has been paid to studying not the individual organism systems, but rather the superorganism ones, the ecosystems. An explanation has been provided for the reasons and limits of their stability and their extended existence, and the relationships of their component elements have been studied. In this regard, V. Ye. Sokolov acquainted the session participants with certain research carried out by the Institute for Evolutionary Morphology and Animal Ecology imeni A. N. Severtsov which he heads. For example, the role of soil animals has been elucidated in the various ecosystems, and it has been established that under normal conditions, herbivorous animals (large ungulates and rodents) cannot harm the plant cover. For such problems as the control of animal behavior and the combating of animal pests, of interest is the work in studying the relationships of one species of animals within the ecosystem, and particularly the methods of their communication (acoustical, electric and chemical). Recently the researchers have literally begun to discuss the possibility of using the methods of animal communication in taxonomy.

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Also promising is a study of the ecosystems altered by man. For example, it has been established that in ecosystems with increased radiation, certain species of soil fauna are eliminated. However, the soil fauna itself survives, although in an altered form. In rodents it has been shown that in such an ecosystem on the organism level there is no adaptation to increased radiation, but the population as a whole in some manner adapts, and reproduction at times is even accelerated. These examples were given by V. Ye. Sokolov in substantiating the need to create a unified system (service) of ecological control and a unified system (service) of ecological forecasting in the nation for the purpose of maintaining an optimum state of the ecosystems and increasing their productivity.

V. Ye. Sokolov then went on to describe briefly the organization of work in our nation under the UNESCO "Man and the Biosphere" Program and the setting up of biosphere sanctuaries. The USSR has set up seven such sanctuaries which differ from the ordinary ones in the fact that in addition to the protected zone they also have a zone with anthropogenic impacts. These two zones will be compared, and the research in all the biosphere sanctuaries will be carried out under a unified system.

V. Ye. Sokolov supported the request of the speaker that the Presidium of the USSR Academy of Sciences undertake measures to strengthen the physical plant of the department's institutions and for improving the working conditions of the existing biostations and the setting up of new ones.

V. N. Bol'shakov, director of the Institute for the Ecology of Plants and Animals of the Urals Scientific Center of the USSR Academy of Sciences, voiced the opinion that the time has come to be concerned with elaborating a general theory of ecological forecasting. Tyumen'neftegaz [?Tyumen' Oil and Gas Association], Uralgiprommez [Urals State Institute for the Planning of Metallurgical Plants], Yuzhnouralgiprovdokhoz [?Southern Urals Design Institute for Water Management]; and Lengidroyekt [?Leningrad Design Institute for Hydraulic Engineering Projects] turned to the institute headed by him with a request to provide an ecological forecast for the influence of their activities on the animals, plants and natural complexes as a whole. But we are unable, noted V. N. Bol'shakov, to work constantly just on producing forecasts for individual institutions and enterprises. In addition, for work in ecological forecasting we presently use mainly the analogy principle, that is, we elucidate how one or another type of human economic activity would influence one or another ecosystem over an extended period. At the same time recently there have appeared environmental-impact factors which previously did not exist, for example, atomic power or electromagnetic devices, and for this reason a study of their influence on nature is impossible using the analogy principle. Moreover, it is now essential to establish how energetics and the productivity of the various levels of the ecosystem are changing.

V. N. Bol'shakov proposed that the Department of General Biology be more actively concerned with coordinating work in the area of ecological

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forecasting and which is carried out by different scientific institutions, and that the forecasting itself should be carried out on a higher level, and this necessitates the creation of new biological stations and new, modern equipment.

Academician D. K. Belyayev raised a number of fundamental questions related to the further development of general biology in his speech. According to him, it is essential to achieve a correct balance and a correct combination of research on the molecular level and on the level of supermolecular phenomena. At present, in our nation, in the words of D. K. Belyayev, a united front of genetics and breeding has been created. In this regard he noted, in particular, the importance of the work of V. A. Strunnikov and I. A. Rappoport for introducing genetic methods into breeding. However, D. K. Belyayev went on to say, there is still much to be done for the reinforcing of this front, and it should also include molecular biology. The development of the theory of the morphogenic process and its practical application, that is, the control of morphogenic processes will consist precisely in the integration of the ideas, methods and methodology of genetics, breeding and molecular biology. This is one of the most important tasks of biology.

D. K. Belyayev then took up the question of the training of personnel. He felt that the time had come to set up a new type of training institute similar to what the physicists at one time did in creating Fiztekh [Physical-Technical Institute]. The agricultural educational network is unable to solve the problem of training modern biologists for work in the system of applied agricultural scientific research institutions. The universities must also be involved in the training of such personnel, by integrating the instruction of biological and other areas of the natural sciences, particularly chemical sciences. D. K. Belyayev took up the example of Novosibirsk University, where they have created a system for a unified chemical-biological education up to the third year, with a differentiation in the subsequent years. This experience was viewed by him as worthy of attention.

Corresponding Member of the USSR Academy of Sciences L. V. Krushinskiy recalled that I. P. Pavlov repeatedly pointed to the enormous importance of behavior genetics, and in the last years of his life set up a special laboratory for studying the genetics of higher nervous activity and behavior. At present, the importance of behavior genetics, in the assertion of L. V. Krushinskiy, has increased. It is particularly important for certain aspects in studying human behavior, and is of great significance for agriculture.

In summing up the discussion of the activities of the Department of General Biology, the President of the USSR Academy of Sciences, Academician A. P. Aleksandrov, termed excellent in fundamental and applied terms the work done by the department's institutes in androgenesis, in developing the radiation wheat varieties ("Novosibirskaya-67"), and remote hybridization (the Grekum-114 wheat). In dealing with other work mentioned by the speaker

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among the achievements of practical significance, the president drew attention to the need to provide documentary proof for announcements of the savings which the introduction of the various results of scientific research into the national economy provides or could provide.

The president voiced a number of considerations on the possibilities of a further improvement in the physical plant of the department's scientific institutions.

Decree

The Decree of the Presidium listed in detail the achievements of the department's scientific institutions and pointed out that these achievements show the high effectiveness of the work done by the institutes and laboratories comprising the department, and that its scientific institutions play a leading role in the development of the new and most urgent areas of research on the problems of general biology.

The Presidium approved the report of the Department of General Biology, and recognized that the main task of the department is a further concentration of efforts on working out the problems of ecology and biogeocenology, hydrobiology, genetics and evolution, in being based on a further development of research on botany and zoology, and a broadening of research on the use and reproduction of natural conditions and the preservation of the environment.

It was proposed that the department pay particular attention to the development of ecological research in working out the problems of the rational use and reproduction of biological resources, and more actively carry out interdisciplinary research with the other departments of the USSR Academy of Sciences.

The Presidium pointed out to the Department the necessity of further raising the efficiency and quality of scientific research, and stressed that the most important task of the scientific institutions in the department is to successfully carry out the scientific research plan for 1976-1980.

It was recommended that the department provide a broader use of chemical, physical and mathematical methods and approaches in solving the problems of general biology. There should be the broader practice of organizing research by creating programs on the basic scientific areas and more energetically involve the scientific institutions of the Union republic academies of sciences, the other departments, above all the VASKhNIL and the USSR Academy of Medical Sciences, in this research. Work should be continued on improving the forms for coordinating scientific research activities by the institutions of the department with the institutes of the Union republic academies of sciences and the affiliates and centers of the USSR Academy of Sciences, achieving an optimum combination of the elaboration of regional problems with the solving of fundamental problems of a general nature. The practice of providing scientific and procedural aid to the scientific

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institutions of the affiliates and centers of the USSR Academy of Sciences and the Union republic academies of sciences should be continued and broadened.

The Presidium instructed the Department to review the question of organizing an ecological service in the nation.

A decision was approved to consider the request of the department for capital construction in the 11th Five-Year Plan in preparing the capital construction plan of the USSR Academy of Sciences for 1981-1985.

The Presidium Decree provides for the carrying out of a number of other measures to improve the physical plant of scientific research activities carried out by the department's institutions.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

JUBILEE DATES, AWARDS OF ACADEMY OF SCIENCES DESCRIBED

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[Announcement of awards and prizes of the USSR Academy of Sciences]

[Text] Academician B. Ye. Paton, Twice Hero of Socialist Labor

For outstanding successes in the development of Soviet science and on the occasion of his 60th birthday, Academician Boris Yevgen'yevich Paton, Hero of Socialist Labor and president of the Ukrainian Academy of Sciences, by an Ukase of the Presidium of the USSR Supreme Soviet of 24 November 1978 has been awarded the Order of Lenin and the second gold Hammer and Sickle Medal.

In commemoration of the labor feats of the twice Hero of Socialist Labor, B. Ye. Paton, a bronze bust will be erected in the homeland of the hero.

The winner of the Lenin and State prizes, B. Ye. Paton, is a major Soviet scientist in the area of metallurgy and metals technology. His fundamental works have served as the basis for the development of new progressive directions in welding technology and high-quality metallurgy.

Linked to the name of B. Ye. Paton are the creation and broad practical use of many welding methods: Automatic hidden-arc, semiautomatic shielded arc, electroslog, continuous butt welding, pulsed-arc welding with a melting electrode, electron-beam, microplasma, and others. These types of welding have made fundamental changes in the production of heavy and precision machine building products, in machine building, instrument building and in the practices of pipeline construction.

B. Ye. Paton has also worked out the theoretical bases for creating automatic and semiautomatic welding machines. Upon the initiative of B. Ye. Paton and under his direct leadership, research was instituted and widely developed to employ welding heating sources in special melting units, and these led to the development of a new promising sector of high quality metallurgy, special electrometallurgy.

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The new scientific directions created by B. Ye. Paton are being successfully developed at the Electric Welding Institute imeni B. Ye. Paton of the Ukrainian Academy of Sciences, as well as in many other research institutions in our country and abroad.

In the post of president of the Ukrainian Academy of Sciences, B. Ye. Paton has carried out extensive work to develop and deepen primarily the fundamental scientific research, to improve its effectiveness and quality, and to better the management of science. Under his leadership a large group of measures was carried out aimed at a changeover to new principles for the planning and organizing of research on the basis of major specific scientific and scientific-technical programs, by improving the training of scientific personnel, and by strengthening the physical plant of the scientific research organizations.

B. Ye. Paton has devoted great attention to the questions of strengthening ties with production, to rapidly introducing scientific achievements into the practice of communist construction, and to searching for new forms for cooperation between scientists and production workers and the improving of existing ones.

B. Ye. Paton heads the Coordination Center which provides multilateral cooperation among the CEMA countries in solving scientific and technical problems in the area of welding, as well as the USSR National Committee for Welding.

International recognition of the scientific achievements of B. Ye. Paton has been his election to the academies of sciences of Bulgaria, Czechoslovakia, Bosnia and Herzegovina.

B. Ye. Paton is a member of the CPSU Central Committee and the Central Committee of the Ukrainian Communist Party, and a Deputy to the USSR and Ukrainian Supreme Soviets.

In congratulating B. Ye. Paton on his 60th birthday, the Presidium of the USSR Academy of Sciences wished for him in a congratulatory address good health, many years of active creative life and new scientific discoveries.

Academician N. V. Tsitsin, Twice Hero of Socialist Labor

The Presidium of the USSR Supreme Soviet by the Ukase of 15 December 1978, awarded the Order of Lenin and a second gold Hammer and Sickle Medal to Hero of Socialist Labor and winner of the Lenin Prize and the USSR State Prize, Academician Nikolay Vasil'yevich Tsitsin for outstanding achievements in the development of Soviet science and on the occasion of his 80th birthday.

Under a decree of the Presidium of the USSR Supreme Soviet, a bronze bust will be erected in the hometown of the scientist.

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The botanist, geneticist and plant breeder, Academician N. V. Tsitsin, has elaborated the theoretical bases for developing new species and varieties of agricultural crops by the remote hybridization method; these principles have been successfully realized by him in practice. "In the great Soviet granary," said the General Secretary of the CPSU Central Committee and Chairman of the Presidium of the USSR Supreme Soviet, L. I. Brezhnev, in presenting the high award to N. V. Tsitsin, "there is a large share of the many years of work by Nikolay Vasil'yevich Tsitsin, a world-renowned scientist."

For many years N. V. Tsitsin elaborated the theory and practice of remote hybridization and the introduction of plants. His research holds a leading position in this area of world science. For the first time in the world he obtained fertile intergeneric hybrids of wheat-wheatgrass, wheat-lymegrass, rye-wheatgrass, and others. For this work 10 years ago the scientist was awarded the title of Hero of Socialist Labor. Since then he has done a great deal to elaborate the theoretical and methodological bases of remote hybridization. He has disclosed new facts explaining the role of remote hybridization and polyploidy in the evolution of plants, and he has established important provisions on the role of the hereditary code in the evolution of grasses.

Over the last 8 years he has developed eight new wheat varieties, including the particularly intensive winter varieties of "Snegirevka" and "Istrinka" which produce harvests over 70 quintals per hectare and possess a grain with outstanding processing qualities. There has also been the spring wheat-wheatgrass hybrid Grekum-114 with a yield up to 50 quintals per hectare and this has now been regionized in several eastern oblasts of the nation.

An enormous achievement in recent Soviet biological science has been the creation of a perennial wheat on the basis of research carried out under the leadership of N. V. Tsitsin as well as the development of a grain-feed wheat which possesses the ability for regeneration. One of the varieties of grain-feed wheat, Otrastayushchaya-38, which produces up to 500 quintals of green bulk per hectare or 100-110 quintals of hay per hectare per season, in 1978 was regionized for raising in Belgorodskaya Oblast.

N. V. Tsitsin has also made a great contribution to the development of experimental botany, to elaborating the theoretical bases of the introduction and acclimation of plants, and to organizing introduction work in the nation. For over 30 years he has directed the Main Botanical Garden of the USSR Academy of Sciences which was built under his initiative and direct participation, and has now gained international renown. Of important significance is the scientific organizational work of N. V. Tsitsin as the chairman of the USSR Council of Botanical Gardens and the Scientific Council of the USSR Academy of Sciences on the problem "Introduction and Acclimation of Plants."

The scientific achievements of N. V. Tsitsin have been highly praised abroad. He is a member of the Czechoslovak Academy of Sciences and the Czechoslovak

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Agriculture Academy, a foreign member of the Bulgarian Academy of Sciences, an honorary member of the Hungarian Academy of Sciences and the Romanian Academy, a corresponding member of the German Academy of Agricultural Sciences, an honorary member of the Yugoslav Academy of Sciences and Arts in Zagreb, an honorary doctor of Jena University and the Agricultural and Forestry Institute in Brno.

The Presidium of the USSR Academy of Sciences, in the congratulatory address sent to N. V. Tsitsin on the occasion of his jubilee birthday, noted his scientific achievements and wished him good health and further creative successes in the development of Soviet science.

Academician S. A. Khristianovich

For achievements in the development of theoretical and applied mechanics and on the occasion of his 70th birthday, Academician Sergey Aleksayevich Khristianovich by an Ukase of the Presidium of the USSR Supreme Soviet of 4 November 1978 was awarded the Order of the October Revolution.

Hero of Socialist Labor S. A. Khristianovich is our nation's most prominent scientist in the area of mechanics, states the congratulatory address of the Presidium of the USSR Academy of Sciences sent to the hero. He is responsible for classic works on the movement of waves in channels, the theory of ideal plasticity, filtration and gas dynamics.

The continuer of the work of N. Ye. Zhukovskiy and S. A. Chaplygin, S. A. Khristianovich at the TsAGI [Central Institute for Aerohydrodynamics] carried out fundamental theoretical research on high-velocity aerodynamics, he directed the development of the first transsonic wind tunnels in the USSR, and carried out applied work making it possible to improve the famous "katyushas" rockets during the war years. At the TsAGI he created a presently well-known school in the area of aerodynamics.

The range of scientific interests of S. A. Khristianovich is extremely broad. He has worked out the scientific bases for a major technological operation, the hydraulic fracturing of an oil formation. The scientist has also conducted research on steam-gas turbines which is of great practical significance.

Recently S. A. Khristianovich has carried out important research related to solving the problem of plasticity in compound loading, as well as in the area of the mechanics of instantaneous outbursts of coal and applied hydrodynamics.

S. A. Khristianovich was one of the initiators and organizers of the Siberian Division of the USSR Academy of Sciences.

The scientific achievements of S. A. Khristianovich have been highly regarded. He has received three USSR State Prizes.

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The Presidium of the USSR Academy of Sciences has wished Sergey Alekseyevich many years of life, good health and the completion of all his creative plans.

Academician B. B. Kadomtsev

The 50th birthday has been marked for Academician Boris Borisovich Kadomtsev, one of the leading scientists in the area of plasma physics and magnetic hydrodynamics.

B. B. Kadomtsev is responsible for fundamental research in elaborating the theory of many mechanisms of plasma instability in concrete systems, the theory of turbulent plasma in magnetic traps and the theory of the behavior of matter in superstrong magnetic fields. The theoretical work of B. B. Kadomtsev excels not only in the importance and newness of the approach, but is also closely tied to the needs of experimental research. This work has largely determined the overall direction of research on high temperature plasma physics and has helped to bring Soviet thermonuclear research to leading positions.

In heading a large scientific collective working on the problem of controlled thermonuclear synthesis, B. B. Kadomtsev takes a direct part in organizing and carrying out the entire thermonuclear program of the USSR.

Along with research on plasma physics, B. B. Kadomtsev has also carried out a number of interesting projects in other areas of physics. He has examined the problem of fluctuation in a gas from the viewpoint of random collisions, the instability of a two-flow state in a magnetron, and the behavior of a heavy atom in a superstrong magnetic field. The ideas developed by him of collective processes in plasma are beginning to be more and more widely used in astrophysics.

In being the head of the Plasma Physics Chair at the Moscow Physics Engineering Institute, B. B. Kadomtsev gives great attention to the training of scientific personnel.

B. B. Kadomtsev carries out extensive scientific organizational work. He is the chairman of the Scientific Council of the USSR Academy of Sciences on the Interdisciplinary Problem "Plasma Physics," the editor-in-chief of the journal USPEKHI FIZICHESKIKH NAUK [Advances in Physical Sciences], and the physics department of the All-Union Institute for Scientific and Technical Information.

The scientific activities of B. B. Kadomtsev have been given high international recognition. He has been elected a foreign member of the Swedish Academy of Sciences.

The Soviet government has highly regarded the achievements of B. B. Kadomtsev in the development of Soviet science, having awarded him the USSR State Prize and the Order of the Red Banner.

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In the congratulatory address sent to the hero, the Presidium of the USSR Academy of Sciences wished Boris Borisovich Kadomtsev good health, happiness and new success in his fruitful activity.

Corresponding Member of the USSR Academy of Sciences P. P. Timofeyev

For contributions to the development of geological science and on the occasion of his 60th birthday, Corresponding Member of the USSR Academy of Sciences Petr Petrovich Timofeyev, by an Ukase of the Presidium of the USSR Supreme Soviet, of 14 November 1978, was awarded the Order of the October Revolution.

For more than 35 years, the scientific activities of P. P. Timofeyev have been devoted to developing the genetic direction in lithology and coal geology, of which he is one of the leaders. He has worked out a method for an integrated detailed lithological-facies study of sedimentary formations, and has formulated the principles of formation analysis as a method of their historical geological understanding.

A genetic approach to studying the sedimentary formations of continental blocks in the earth's crust and oceans made it possible for P. P. Timofeyev to disclose the existence of internal relations in many processes of sedimentogenesis and lithogenesis. He developed the teachings on the genesis of coals and dispersed organic matter, and established the role of the latter in the processes of the making of sediments into rock. On this basis he worked out the principles and for the first time in the world constructed a geological genetic classification of humus coals, and this is the basis for determining their quality and the ways of rational use in industry. P. P. Timofeyev has shown the guiding and determining role of the facies medium in the processes of mineralization and the role of organic matter as the accelerator of these processes, particularly in diagenesis. He has solved specific regional problems of lithology and coal geology, and has elucidated the patterns of coal bearing in the deposits of many regions of the USSR.

P. P. Timofeyev is the chairman of the Interdepartmental Lithological Committee of the USSR Academy of Sciences.

The name of P. P. Timofeyev is widely known abroad. He is vice president of the International Committee on Coal Petrology, a member of the Bureau of the International Association of Sedimentologists, a member of the working group of the International Deep Water Drilling Project "Sedimentary Petrology and Physical Properties of Rocks," and the chairman of the UNESCO International Project "Correlation of Coal-Bearing Formations."

P. P. Timofeyev gives great attention to the training of highly skilled scientific personnel.

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The Presidium of the USSR Academy of Sciences in the congratulatory address sent to the hero wished him good health and new creative successes in studying the natural riches of our nation.

Corresponding Member of the USSR Academy of Sciences M. T. Iovchuk

For many years of scientific and sociopolitical activity and on the occasion of his 70th birthday, Corresponding Member of the USSR Academy of Sciences Mikhail Trifonovich Iovchuk by the Ukase of the Presidium of the USSR Supreme Soviet of 20 November 1978, has been awarded the Order of Friendship of Peoples.

M. T. Iovchuk is a prominent philosopher. The central place in his scientific activities is held by the methodological problems of the historical philosophical process, the history of Marxist-Leninist philosophy and the scientific materialistic ideology, the history of the philosophical and social thought of the Russian people and the other peoples of the USSR, the theory of culture, sociological and other theoretical problems. Many works by M. T. Iovchuk including the monographs "Leninizm, Filosofskiyeh Traditsii i Sovremennost'" [Leninism, Philosophical Traditions and The Contemporary World] and "G. V. Plekhanov i Yego Trudy po Istorii Filosofii" [G. V. Plekhanov and His Works on the History of Philosophy] (awarded the Prize of the USSR Academy of Sciences imeni G. V. Plekhanov), are devoted to examining the historical process of the development of Marxist philosophy in the struggle against various bourgeois and revisionistic currents. Being one of the first Soviet researchers of the history of philosophical and social thought in the peoples of our country, M. T. Iovchuk has profoundly analyzed the ideological and philosophical heritage of A. N. Radishchev, V. G. Belinskiy, A. I. Gertsen, N. P. Ogarev, N. G. Chernyshevskiy, N. A. Dobrolyubov and other pioneers of Russian thought in his works. M. T. Iovchuk has made a significant contribution to studying the essence and patterns of the cultural revolution in the USSR and the decisive role of Marxist-Leninist theory in the process of spiritual culture and the development of the communist ideology of the Soviet people. With the direct involvement of the scientists, such fundamental works were prepared as "Istoriya Filosofii" [The History of Philosophy] in six volumes (translated into many foreign languages), "Ocherki po Istorii Filosofskoy i Obschestvenno-Politicheskoy Mysli Narodov SSSR" [Essays on the History of the Philosophical and Sociopolitical Thought of the Peoples of the USSR], "Istoriya Filosofii v SSSR" [The History of Philosophy in the USSR], "Filosofskaya Entsiklopediya" [Philosophical Encyclopedia] in five volumes, and books on urgent problems such as "Razvitiye Sotsialisticheskogo Obschestva na Sovremennom Etape" [The Development of Socialist Society at the Present Stage], "Dukhovnyy Mir Sovetskogo Rabochego" [The Spiritual World of the Soviet Worker], "Sotsialisticheskiy Rabochiy i Kollektiv" [The Socialist Worker and the Collective], "Filosofskiy Problemy Ideologicheskoy Bor'by" [Philosophical Problems of the Ideological Struggle], and many others.

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M. T. Iovchuk is the chairman of the Scientific Council of the USSR Academy of Sciences on the History of Social Thought, a member of the Bureau of the Department of Philosophy and Law of the USSR Academy of Sciences, and a member of the editorial board of the journal VOPROSY FILOSOFII. In working at the Academy of Social Sciences under the CPSU Central Committee, at Moscow State University imeni M. V. Lomonosov, and in other institutions of learning, M. T. Iovchuk takes an active part in the training of highly skilled theoretical personnel.

The fruitful scientific activity of M. T. Iovchuk has been widely recognized abroad. He has been elected a foreign member of the Bulgarian Academy of Sciences and the European Cultural Society, and is the co-chairman of the USSR--GDR Commission of Philosophers.

In the congratulatory address, the Presidium of the USSR Academy of Sciences wished the hero good health and new creative successes for the good of Soviet science.

Nobel Prize Winner, Academician P. L. Kapitsa

[The sketch was written by Academician A. S. Borovik-Romanov]

Academician Petr Leonidovich Kapitsa was awarded the Nobel Prize for Physics in 1978.

The scientific activities of P. L. Kapitsa over many years are marked by extraordinary creativeness.

After completing the Petrograd Polytechnical Institute in 1918, Petr Leonidovich remained on the chair of Abram Fedorovich Ioffe. In 1921, he was sent for scientific work to England, where for a long period of time he worked in Cavendish's Laboratory at Cambridge University, the director of which was E. Rutherford.

In his work carried out at Cambridge, Petr Leonidovich turned to the problem of developing superstrong magnetic fields. He proposed a pulse method for obtaining such fields, and this is presently used in many laboratories. The use of this method eliminated the basic difficulty of creating powerful magnetic fields, that is, the very great overheating of the coils in the passing of currents of thousands of amps through them. P. L. Kapitsa worked out several variations of energy storage devices for powering the pulse coils, and solved a large group of technical problems related to the designing of mechanically strong coils and developing equipment for metering physical parameters under pulse conditions. In an original device, Petr Leonidovich succeeded in obtaining a magnetic field with an intensity of 320 kE with a pulse duration on the order of a hundredth of a second. In his first work with pulse fields, he placed a Wilson chamber in a magnetic field and observed the bending of the flight trajectories of the alpha particles (1923). After this he turned to a study of the galvanomagnetic properties of metals in strong fields. One of the important

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results obtained by P. L. Kapitsa in the course of this research was his discovery in 1928 of a linear law for the increase in the electrical resistance of certain metals. This law found a theoretical explanation only 30 years later, when physicists studied the energy spectra of electrons in metals.

It must be pointed out that Petr Leonidovich Kapitsa who combines the talent of a researcher with the inventiveness of an engineer was one of the first physicists to use large modern technical devices in a laboratory, and at the same time shifted the last achievements of physics into the practical area.

In 1934, P. L. Kapitsa returned to Moscow and organized the Institute for Physical Problems in which he continued research started in England on the creation of strong magnetic fields, as well as in the area of low temperature physics and equipment.

The work in the area of low temperature physics and equipment for which P. L. Kapitsa received the Nobel Prize was carried out in the 1930's and the first half of the 1940's. The new designs of equipment for obtaining liquid helium and liquid air as proposed by Petr Leonidovich were fundamental inventions which opened up new opportunities in low temperature equipment.

A particular feature of the design of the helium liquifier of P. L. Kapitsa is that cooling occurs by the adiabatic expansion of the gas in a piston gas expander. Such a gas expander was developed using the gaseous helium itself as a lubricating material. This was possible due to the selection of the design of the gas expander and the action of the piston. In contrast to the old liquifiers operating on the Joule-Thomson effect and requiring preliminary cooling of the helium with liquid hydrogen, in the helium gas expansion liquifier it was possible to avoid preliminary cooling or to limit oneself to cooling with liquid nitrogen. All modern helium liquifiers which are presently produced by many industrial firms are built along the lines proposed by P. L. Kapitsa.

P. L. Kapitsa developed a new air liquifying cycle when industry was confronted with a need for a large amount of oxygen. In considering that high power in equipment was achieved by shifting from piston-operated machines to turbines, P. L. Kapitsa developed a special highly-efficient radial turboexpander which predetermined the worldwide development of the modern large air-separating units for producing oxygen. In 1941, P. L. Kapitsa was awarded the State Prize for the development of a new air liquification method using a low pressure cycle and a highly efficient turboexpander.

P. L. Kapitsa studied the anomalous properties of liquid helium. He developed an original design for a viscosimeter for measuring the viscosity of liquid helium in passing it through a narrow slot, and he discovered that under these conditions helium viscosity virtually equals zero. Petr Leonidovich called this phenomenon superfluidity. The first article on the

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discovery of superfluidity was published by P. L. Kapitsa in 1938. After this he organized an entire series of original experiments to study heat transfer in superfluid helium. Here he discovered the amazing behavior of liquid helium which could be explained only by a supposition that with heat transfer through narrow channels, there is a countermovement of two components of the fluid. One of these components has normal properties, while the other possesses superfluidity and does not transfer heat. The movement of the "cold" superfluid component provides the seeming heat superconductivity of liquid helium. For this work published in 1941, Petr Leonidovich was awarded the State Prize in 1943.

The discovery of the superfluidity of helium not only disclosed one of the surprising properties of matter. This discovery lay at the basis of a new area of physics, the physics of quantum fluids, as an explanation of superfluidity required the introduction of a concept of elementary excitations which lies at the basis of a quantum mechanics description of the energy spectra of macroscopic solids.

In studying the processes of heat transfer in liquid helium, Petr Leonidovich discovered an important fact. In the transfer of heat from the solid state to liquid helium, on the boundary line a temperature shift arises, and the amount of this shift grows strongly with a reduction in temperature, the so-called Kapitsa shift. This thermal resistance plays a particularly important role in carrying out modern research with temperatures of several thousands of degrees.

At the end of the 1940's, Kapitsa turned to a completely different group of physical problems related to the development of powerful continuous-action SHF oscillators. Petr Leonidovich succeeded in solving a difficult mathematical problem of the motion of electrons in the magnetron type of SHF oscillators. On the basis of the calculations carried out, he developed original continuous-action SHF oscillators, the planetron and nigotron with a power up to 175 kilowatts. Using such oscillators, P. L. Kapitsa began research on the heating of plasma with a high frequency field. He discovered that if a SHF resonator which is connected to an oscillator is filled with gas to a pressure of several atmospheres, then at the center of the resonator (where the intensity of the SHF oscillations is maximal), a cord discharge occurs in the gas. This research discovered a new way to solve the problem of developing a thermonuclear reactor.

Petr Leonidovich Kapitsa is not only an outstanding scientist but also a major organizer of science. He is the director of the Institute for Physical Problems of the USSR Academy of Sciences, a member of the Presidium of the USSR Academy of Sciences, and the editor-in-chief of the journal ZHURNAL EKSPERIMENTAL'NOY I TEORETICHESKOY FIZIKI, a leading physics journal of the nation. He gives great attention to the selection and training of youth capable of creative scientific work. Petr Leonidovich is a prominent social figure who is concerned with all aspects of the development of human society.

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The activities of P. L. Kapitsa have been highly regarded by the Soviet government. He was twice awarded (in 1945 and 1974) the title of Hero of Socialist Labor, he has received six Orders of Lenin, the Order of the Red Banner and medals.

Petr Leonidovich has been elected a member and honorary member of academies and scientific societies in many countries.

The awarding of the Nobel Prize to Petr Leonidovich Kapitsa is still another proof of the international recognition of the services of this outstanding scientist.

S. V. Zonn Receives Gold Medal imeni V. V. Dokuchayev

The Presidium of the USSR Academy of Sciences has awarded the Gold Medal imeni V. V. Dokuchayev in 1978 to Doctor of Agricultural Sciences Sergey Vladimirovich Zonn (Institute of Geography of the USSR Academy of Sciences) for an aggregate of scientific works on the genesis and geography of forest soils.

One of the leading soil geographers of our country, S. V. Zonn has made a contribution widely recognized both in the USSR and abroad to studying forest soils and their role in the life of the biogeocenoses. A majority of his scientific works, including a monograph, is devoted to the forest soils of the Caucasus, the Far East, the Baltic and Bulgaria, as well as to the soils of the subtropical and tropical countries such as Cuba, Algeria, India, Columbia and elsewhere.

The monograph of S. V. Zonn on the alpine forest soils of Eastern Tibet where his studies are undoubtedly of a pioneer nature, disclosed patterns which determine the uniqueness and multiplicity of soil formation types and spectra of the vertical belt alternation of soils. The work characterizes the soils under individual vegetation formations and shows the influence of individual tree varieties and the surface vegetation cover. The book provides a classification of soils in this unique region and proposes basic measures for their improvement and preservation.

The monograph "Pochvoobrazovaniye i Pochvy Subtropikov i Tropikov" [Soil Formation and Soils of the Subtropics and Tropics] generalizes the vast material collected by the author on the problems of subtropical and tropical pedology. This made it possible for him to disclose the soil formation factors, the particular features of the soil processes, to trace the genesis and geography of the soils and examine various questions of their agricultural use and the protection of the subtropical and tropical zones of the earth.

The work of S. V. Zonn has introduced much that is new and original in developing the teachings of V. V. Dokuchayev on the genesis and geography of soils.

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S. V. Zonn has done a great deal on the questions of soil amendment, and on studying the land reserves of the Russian plain. In recent years he has successfully developed the new aerospace direction in studying natural resources, particularly soil resources.

V. V. Kafarov and I. N. Dorokhov Receive Prize imeni D. I. Mendeleev

The Presidium of the USSR Academy of Sciences has awarded the Prize imeni D. I. Mendeleev in 1978, amounting to 2,000 rubles, to Corresponding Member of the USSR Academy of Sciences Viktor Vyacheslavovich Kafarov and Candidate of Technical Sciences Igor Nikolayevich Dorokhov (Moscow Chemical Engineering Institute imeni D. I. Mendeleev) for a series of works and for the monograph "Sistemnyy Analiz Protssessov Khimicheskoy Tekhnologii" [Systems Analysis of Chemical Engineering Processes].

These works which represent an exposition of the theory of chemical engineering processes on the basis of the recent achievements in chemistry, physics, cybernetics and applied mathematics is the result of many years of work by the authors on the problems of the cybernetics of chemical engineering processes. They have examined the bases of a new systems approach to the analysis, calculation and modeling of processes in the chemical, petrochemical and microbiological industry, they introduce the general concept of a physicochemical system, they define the strategy for the analysis and synthesis of such systems, and formulate the principles for a mathematical description of a chemical production process as a complex cybernetic system.

This new direction for the first time has made it possible to have a scientifically sound approach to examining the hydrodynamic, thermal and diffusion phenomena in the processes of absorption, distillation, extraction and crystallization in superimposing the effects of the chemical action in multiphase and multicomponent systems. As a result it has been possible to provide a quantitative description for such involved processes as suspension and emulsion polymerization of vinyl chloride, copolymerization of styrene with acrylonitrile, the synthesis of ion exchange resins, drying in suspended and flowing beds, and mass crystallization from solutions in equipment of varying design.

The theoretical studies of V. V. Kafarov and I. N. Dorokhov have made it possible to reorganize production processes for various chemical products, and this has provided a great economic effect.

V. P. Mikhaylov Receives Prize imeni P. L. Chebyshev

The Presidium of the USSR Academy of Sciences has awarded the Prize imeni P. L. Chebyshev of 2,000 rubles in 1978 to Doctor of Physical and Mathematical Sciences Valentin Petrovich Mikhaylov (Mathematics Institute imeni V. A. Steklov of the USSR Academy of Sciences) on the series of studies "On the First Boundary Value Problem for Differential Equations in Partial

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Derivatives." The series of works of V. P. Mikhaylov represents fundamental research devoted to studying the first boundary problem for differential equations in partial derivatives of the elliptical and parabolic types.

The first three works of the series study parabolic equations of the general type. Conditions have been obtained on the boundary of the area guaranteeing correct solvability of a mixed problem. The next two works are devoted to the study of quasielliptical and quasiparabolic equations. A detailed analysis has been made of polynomials of many variables, and a method has been shown for isolating the main part of complete nondegenerate polynomials. This has made it possible to study the first boundary problem for the quasielliptical and quasiparabolic equations, and to prove the theorems of normal solvability. In the last two works of the series, a study has been made of the question of the existence of a general solution to the Dirichlet's problem for an elliptical equation in the instance when the boundary function is summable with the square. In the terms for the properties of the surface integrals, necessary and sufficient conditions have been obtained for the existence and even the uniqueness of a solution which accepts average boundary solutions.

The series of works of V. P. Mikhaylov which has received the prize represents a substantial contribution to the theory of differential equations in partial derivatives.

A. B. Yablokov Receives Prize imeni A. N. Severtsov

The Presidium of the USSR Academy of Sciences has awarded the Prize imeni A. N. Severtsov of 2,000 rubles in 1978 to Doctor of Biological Sciences Aleksey Vladimirovich Yablokov (Institute of Developmental Biology imeni N. K. Kol'tsov of the USSR Academy of Sciences) for a series of studies on population morphology of animals.

In his works of 1966-1976, A. B. Yablokov discovered and formulated specific population morphological principles (comparative variability of organs and structures and currents of variability), he developed the classification of intrapopulation phenotypic variability, and noted new directions for studying animal populations. The patterns discovered by him are based on a study of different groups of mammals (cetaceans, pinnipeds, rodents and Chiroptera), birds, reptiles, insects and mollusks. On the basis of an extensive and diverse study of the material, A. B. Yablokov has formulated certain theses of population morphology as an independent area in evolutionary biology, and has outlined the range of problems which can be solved by population morphology methods.

The works of A. B. Yablokov for which the prize has been given are a major contribution to studying the problems of population biology and microevolution. They develop the areas of evolutionary morphology which at one time were elaborated by Academicians A. N. Severtsov and I. I. Shmal'gauzen.

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A. I. Tugarinov Receives Prize imeni A. P. Vinogradov

The Presidium of the USSR Academy of Sciences has awarded the Prize imeni A. P. Vinogradov of 2,000 rubles in 1978 to the Corresponding Member of the USSR Academy of Sciences Aleksey Ivanovich Tugarinov (posthumously) for his series of works on geochemistry.

A. I. Tugarinov was responsible for fundamental works on the Precambrian geochronology of all the continents of our planet, on the geochemistry of alkali metasomatism, on the geochemistry, petrology and mineralogy of alkali rock, on the physicochemical problems of hydrothermal and magmatic processes, and on elucidating the geochronological patterns in the manifestations of Precambrian metallogeny.

The research carried out by A. I. Tugarinov and his co-workers made it possible to clarify, and in a number of instances recreate the schemes for the articulation of the Precambrian into a series of ancient geological formations of the earth. The result of this research was a geological scale of the Precambrian which he developed and which was accepted by a majority of the specialists concerned with studying the Precambrian regions.

The works of A. I. Tugarinov devoted to elucidating the physicochemical and isotope-geochemical features of endogenic ore formation are of great significance for understanding the patterns of the ore process in the history of the earth. Due to this work it has been possible to determine the temperature and pressure conditions in the formation of the hydrothermal deposits of certain rare elements, to determine the sources of ore matter in a number of rare metal and polymetallic deposits, and to establish the most important ages of ore formation in the history of the earth.

The geochemical evolution of lead from the Early Precambrian up to modern times, the distribution patterns of thorium, lead and uranium in the earth's crust and the elucidation of the sources of ore matter are a far from complete list of the most important problems of isotope geochemistry for which A. I. Tugarinov made a very significant contribution to their solution.

A. I. Tugarinov wrote a course of general geochemistry which represents the fullest systematic compendium on one of the most important areas of earth sciences. This work used enormous Soviet and foreign literature which was critically reviewed and generalized in light of the many years of research carried out by the author himself.

V. R. Kabo Receives Prize imeni N. N. Mikhlukho-Maklay

The Presidium of the USSR Academy of Sciences has awarded the Prize imeni N. N. Mikhlukho-Maklay of 1,000 rubles in 1978 to Doctor of Historical Sciences Vladimir Rafailovich Kabo for his works "Proiskhozhdeniye i Rannyyaya Istoriya Aborigenov Avstralii" [The Origin and Early History of the Australian Aborigines] (Moscow, 1965) and "Tasmaniytsy i Tasmaniyskaya Problema" [The Tasmanians and the Tasmanian Problem] (Moscow, 1975).

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The monograph of V. R. Kabo "Proiskhozhdeniye i Rannyaya Istoriya Aborigenov Avstralii" is the first comprehensive study in Soviet and world historiography on the ethnogenesis of the indigenous population of the fifth continent. For analyzing this complicated process, the author has drawn widely on the data of anthropology, geology, paleogeography, archeology, ethnography, linguistics and other sciences. Inherent to the book of V. R. Kabo is a newness of exposition, as well as consistency and soundness of the scientific theses and hypotheses. It provides a clear concept of the origin and history of the Australian aborigines and the development of their culture. The importance of the research of V. R. Kabo goes far beyond the limits of Australian studies; it introduces much that is new into the elucidation of the processes of ethnogenesis and the development of the peoples in the Pacific Basin, South and Southeastern Asia, and the formation of their cultures.

The second work of V. R. Kabo "Tasmaniytsy i Tasmaniyskaya Problema" is an unique continuation of the preceding book. Prior to its appearance, in world historiography there was no work which with such completeness and on the basis of a creative analysis of the materials of anthropology, archeology, geomorphology, ethnography, linguistics and other sciences, examine the origin and history of the indigenous population of Tasmania and the rise and development of its culture. The author profoundly analyzes the economy, social system, material and spiritual culture of the Tasmanians. He convincingly proves that the Tasmanians are one of the branches of the ancient population of Australia. The particular features of the anthropological type and the culture of the Tasmanians are explained by their millenium-long isolation from the outside world. Relying on enormous factual material describing the socioeconomic organization, the culture and religion of the Tasmanians, V. R. Kabo shows their place in the social and cultural development of mankind. Both monographs by V. R. Kabo have made a significant contribution to studying the history of the population in a vast region.

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SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

PROCEDURAL ACTIONS OF USSR ACADEMY OF SCIENCES DESCRIBED

Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 4, 1979 p 58

[Unattributed procedural actions of the Presidium of the USSR Academy of Sciences]

[Text] The Presidium of the USSR Academy of Sciences has agreed with the proposal of the USSR Gosstandart [State Standards Committee] for entrusting the USSR Academy of Sciences with scientific and procedural leadership of the All-Union Scientific Research Institute of the Metrological Service of the USSR Gosstandart (VNIIMS).

Scientific procedural leadership over the work of the VNIIMS in the area of the physical bases of metrology has been entrusted to the Department of General Physics and Astronomy, while work in the area of chemical and physicochemical measurements and their metrological support is to be under the Department of Physical Chemistry and the Technology of Inorganic Materials.

Because of the importance of the problems carried out by the Commission of the USSR Academy of Sciences on the Chemistry of Photographic Processes and in relation to the development of a series of new scientific directions in the area of photographic science, it has been decided to transform the Commission into the Scientific Council of the USSR Academy of Sciences on the Problem "Photographic Processes of Recording Information."

The Corresponding Member of the USSR Academy of Sciences K. V. Chibisov has been approved as the chairman of the Scientific Council of the USSR Academy of Sciences on the Problem "Photographic Processes of Recording Information."

The request of Doctor of Economic Sciences G. N. Cherkasov to release him from the duties of the director of the Institute for Socioeconomic Problems of the USSR Academy of Sciences has been granted.

Doctor of Economic Sciences I. I. Sigov has been appointed director of the Institute for Socioeconomic Problems of the USSR Academy of Sciences.

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Corresponding Member of the USSR Academy of Sciences K. F. Sergeyev has been appointed director of the Sakhalin Interdisciplinary Scientific Research Institute of the Far Eastern Scientific Center of the USSR Academy of Sciences. He has also been approved as a member of the Presidium of the Far Eastern Center of the USSR Academy of Sciences.

Doctor of Chemical Sciences B. V. Lazarev has been approved as the chairman of the Scientific Council of the USSR Academy of Sciences on Thermal Analysis.

Academician N. V. Ageyev has been released from the duties of the editor-in-chief of the journal IZVESTIYA AN SSSR, SERIYA "METALLY" [Proceedings of the USSR Academy of Sciences, Metals Series], at his personal request. Thanks have been voiced to N. V. Ageyev for many years of fruitful work in the position of editor-in-chief of this journal.

Academician A. F. Belov has been appointed editor-in-chief of the journal IZVESTIYA AN SSSR, SERIYA "METALLY".

Candidate of Historical Sciences V. M. Berezhkov has been released from the duties of editor-in-chief of the journal SSHA--EKONOMIKA, POLITIKA, IDEOLOGIYA [The United States--Economics, Politics and Ideology] because of an extended mission overseas. Thanks have been voiced to V. M. Berezhkov for many years of work in the position of editor-in-chief of this journal.

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