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Russian Translation

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Translation from the Russian could be discussed from any one of a number of different points of view, and each phase of the general problem might warrant a separate paper. The following, however, are representative questions asked about the National Science Foundation (NSF) Foreign Science Information Program, and it is these questions which will provide the basis for the present comments: (i) Why is there a national translation program? (ii) Is Russian research really worth the effort? (iii) How is duplication prevented? (iv) Why are other languages not translated? (v) How long will the NSF program last?

NSF grants for support of translation have been made at the request of the professional societies of the United States to improve dissemination of foreign scientific information. Since political considerations play no part in the NSF program, such considerations are not discussed here.

Criteria for NSF Translation Grants

The chief criteria by which a translation proposal is judged at NSF are, first, the value of the information to science and, second, the relative accessibility of the publication in its original form. The consensus has been that many Russian publications report first-class work and are at the same time inaccessible, especially since a measure of accessibility must include scientists' ability to read the original once it is obtained. If the budget for translation were larger, projects in Japanese, Chinese, and other languages would undoubtedly be undertaken. There is a growing feeling that other Eastern European material should be examined more closely, but only one request for support of such work has been received.

Emphasis on translation from the Russian can be explained another way: More of our scientists read German, French, Spanish, and other Western languages than read Russian. If a good, needed German periodical or book and an equally good, needed Russian periodical or book compete for translation funds, the Russian must be chosen simply because it is less accessible to the larger number of scientists.

The NSF Office of Scientific Information does not generate information but is, rather, concerned with all phases of its dissemination. The languages in which information is published are one clear present hindrance to easy flow of research results.

In the United States, we are as provincial as any other nation in ignoring information produced in other countries. Various studies have indicated that emphasizing one's own literature is a national trait (*1*). That this emphasis is not a function solely of the quality or pertinence of the work of one's countrymen is shown by the fact that U.S. writers cite mostly U.S. references, British cite British, French cite French, and so on, not to the exclusion of the work of other countries but certainly to the relegation of "other nation" research to a minor role. It is doubtful that this situation can be explained in terms other than insufficient dissemination of foreign information.

Soviet Dissemination of Foreign Information

Soviet scientists learn English sooner and more thoroughly than we learn Russian (*2*). Consistently, U.S. scientists who have visited Russia have been amazed at the Soviets' knowledge of our literature (*3*). One recent visitor went so far as to state that they probably know our literature better than we do (*4*).

It also appears that the Russians translate on a very large scale (*5*). English and other foreign-language monographs and journals are promptly translated into Russian. Soviet abstracting of foreign literature must be organized and carried on with notable efficiency in order to produce such publications as the huge *Referativnyi Zhurnal* (*Abstract Journal*) and the *Ekspress Informatsiia* (*Express Information*) series, the latter of which is a high-speed method for disseminating information on foreign technologic developments. For example, *Express Information*, issue 19, May 1956, on "Metallurgy and metalworking," a completely random choice as an example, contains illustrated Russian summaries, ranging in length from three short paragraphs to four 7⅞-inch by 11⅝-inch pages, of articles from *Product Engineering* for February, *Aircraft Production* for March, *Metal Industry* for March, *Metal Progress* for January, and *Revue de l'aluminium* for January and February. To accomplish this feat, the Russian All-Union Institute of Scientific and Technical Information received, evaluated, summarized, translated, and reproduced this material within 2 to 3 months of its original publication. *Express Information* also covers general technology, the petroleum industry, radio engineering, agricultural machinery, mining, and some ten other subject areas.

Apart from the authoritarian kind of organization necessary to accomplish such a task the Russians have adopted several other unusual techniques. *Express Information* appears to be photo offset and is on very cheap paper. Most of the illustrations are line drawings, occasionally especially prepared, it would appear, to avoid the halftone, or screened, negative. Abstracts are gathered in loose-leaf fashion in a thin paper wrapper. The *Express Information* series is not attractive, nor is it likely to last very long on a shelf or in a file. But it serves to call to the attention of Russian workers pertinent foreign developments about which they might not otherwise have known.

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Not all Russian publications are produced in this manner or with this speed. Their established research journals had, when last the question was investigated, as long or longer publication delays than ours. Occasionally their papers seem to be overwritten, possibly the result of a less stringent referee system than ours. The quality of their publishing in journals of the quality type does not yet match ours. But the point of issue here is availability of information published in other countries, and here they more than match our efforts.

The description of *Express Information* is not provided for purposes of comparison with a U.S. journal. The Soviet publication is not a journal, and there is no comparable U.S. service. Advocates of rapid abstracting as the best means for disseminating foreign information might do well, however, to study this Soviet effort closely.

It seems clear that much of the Russian information which U.S. scientists are seeking is of the type which the Russians themselves willingly publish and make available to the public. William Locke (*6*) has reported on the discovery of a Russian paper, "The application of Boolean matrix algebra to the analysis and synthesis of relay contact networks," which appeared in an important, readily available Soviet journal; it had simply reposed on a library shelf waiting to be noticed. Locke estimates the cost of tardy discovery of this important contribution to information theory at $250,000.

Translation Projects under Way

Journals. The largest Russian-to-English translation projects for public consumption at present are those of the National Science Foundation, the National Institutes of Health, the U.S. Atomic Energy Commission, and Consultants Bureau, Inc. (*7*), a commercial translating-publishing firm. In terms of sheer bulk, Consultants Bureau, which seems to have pioneered the publication of translated journals in 1949 with a translation of the Soviet *Journal of General Chemistry,* is the largest producer. At the end of December 1956, this firm was publishing 15 translated Soviet journals, some 20,000 pages per year, and planned to issue five more titles in February. These figures do not include the seven journals which they produce as subcontractors to the American Institute of Physics and the American Institute of Biological Sciences.

During December 1956, NSF was supporting, through grants, cover-to-cover translation of four physics journals published by the American Institute of Physics (*8*) and four biology journals published by the American Institute of Biological Sciences (*9*). The Office of Naval Research had contributed a large part of the cost of one of the physics journals. Grants were also supporting three annual volumes, totaling roughly 1000 pages, of selected mathematics papers, published by the American Mathematical Society. Planning for two translated geophysics journals was well advanced, and proposals were being discussed in mechanics, metallurgy, and electronics.

The Atomic Energy Commission is interested in the translation of complete journals applicable to the national atomic energy program and is cooperating with NSF in developing such a program. The National Institutes of Health are supporting two of the Consultants Bureau journals—*Biochemistry* and *Bulletin of Experimental Biology and Medicine*—and have recently awarded contracts for the translation and publication of six additional Soviet journals in medical research (*10*).

Three other commercial publishers were producing translated Soviet journals as this article was written. *Atomic Energy* (*Atomnaia Energiia*) was being offered on subscription by Consultants Bureau and Associated Technical Services (*11*), and Pergamon Press, Ltd., was binding translations of a large part of the Soviet journal with their *Journal of Nuclear Energy.* The Physics Series of the *Bulletin of the Academy of Sciences of the U.S.S.R.* (*Izvestiia Akademii Nauk SSSR: Seriia Fiziki*) was being published by Columbia Technical Translations (*12*). A prospective new entrant into the translated journal field is the Pergamon Institute (*13*), now in process of incorporation in the United Kingdom and the United States, as a nonprofit institution. Although broad plans of the institute are known, specific projects had not yet been initiated at this writing.

Separate articles. An almost-impossible-to-estimate number of translations of separate articles are being made by commercial translating firms. A further sizable quantity of this kind of translation is carried on by many agencies of government in this country and abroad (*14*, p. i; *15*). The Atomic Energy Commission, for example, annually contracts for the translation of articles from Soviet journals not translated heretofore. These translations are announced in *Nuclear Science Abstracts,* available from the Government Printing Office.

Among the agencies of other governments active in translating from Russian to English are the Ministry of Supply and the Department of Scientific and Industrial Research (DSIR) of the United Kingdom, the National Research Council of Canada, the Commonwealth Scientific and Industrial Research Organization of Australia, the Atomic Energy Research Establishment at Harwell, and the Indian National Scientific Documentation Center in New Delhi.

The DSIR publication, *Translated Contents List of Russian Periodicals,* provides a wide variety of useful information. First, it describes the interesting scheme whereby DSIR will share the cost of preparing to order translations requested by at least two citizens of the United Kingdom. Translated tables of contents of a number of current Soviet journals are listed, as are translations available at the Science Museum Library. British Museum accessions of Russian books and serials are also noted.

Translation Monthly, published by the Special Libraries Association, serves a very specific purpose as a catalog of special translations and is described in more detail later. The Library of Congress *Bibliography of Translations from Russian Scientific and Technical Literature* ceased publication with December 1956, but its contents have been absorbed by *Translation Monthly.* However, back copies of the monthly *Bibliography* are useful references.

A Preliminary Guide to Translations, listing a number of sources, will be available momentarily from the Government Printing Office. This U.S. Public Health Service publication, which emphasizes medical translation activity, was compiled by the National Library of Medicine, with assistance from the National Institutes of Health and the National Science Foundation. The *Guide* is an outgrowth of a mimeographed list originally used by the Armed Forces Medical Library to answer inquiries.

Although it does not deal with translations or exclusively with science, the Library of Congress *Monthly List of Russian Accessions* is an excellent guide to current Russian publications, since the translated titles of all accessioned material are included.

Book Translation

Translating books is certainly not a new idea. One of the publishers' criteria usually is that the original text meets an informational need not satisfied by a current book in English. Another criterion is, of course, that the book will sell. The first criterion should always be clearly satisfied; it is with the second that problems begin to arise.

The second criterion is a more difficult one in this day of steadily increasing publication costs (including the tremendous factor of getting the printed book from the presses to a buyer who has been made aware of his need for it) and in-

creasing specialization among researchers. A major publisher has said that he generally cannot accept a book that is likely to sell fewer than 5000 copies in one edition. Smaller, more specialized publishers will contemplate smaller sales. A typical university press may find 2500 copies as the break-even point for a nonsubsidized book if the author is not paid for his manuscript.

Since NSF is concerned by law with the kind of research variously labeled basic, fundamental, or undirected, it seems inevitably to follow that most proposals for translation of books deal with books which have an expected sale of 500 copies during their first 10 years. With the program restricted to Russian books, as it is at present, the problem of sufficient financial support of book translations is still almost insurmountable. The Russians are prolific producers of books (*14*, p. 3; *16*) and the consensus of experts is that the best Russian authors reserve some of their best work for books which often constitute first publication of important research information.

Because of its extremely limited book-translation funds, NFS has been forced to devise a stringent policy for this activity. A book which seems to promise a large sale will simply be called to the attention of a commercial publisher. A book in the "gray area" of probable sales less than 2500 copies might be called to the attention of a university press.

If an apparently worth-while book seems prevented from publication because of the cost of translating the manuscript, NSF will consider lending assistance. If a publisher will assume publication costs, and the book is properly judged by a panel of reviewers to be of significant value to science, NSF can seriously consider supporting the preparation of an edited translation.

This kind of policy does, it is felt, guarantee the expenditure of NSF funds only on eminently worthy books. It is also clear, unhappily, that a great many eminently worthy, but highly specialized, books will probably await support until funds may become more plentiful in another year. It is impossible to avoid adding the personal comment that one of the most difficult aspects of administering the translation program is that of having to participate in the refusal to support translation of a book which is so good that only 300 to 500 scholars can possibly profit from its availability in English.

To date, NSF has awarded grants to translate a very few books. Several interesting proposals are pending. Both the National Institutes of Health and the Atomic Energy Commission also plan to arrange for the translation of significant Russian monographs.

Why Translate Journals?

Translation of complete journals is questioned in some quarters. Is any given journal worth this kind of treatment? The answer seems a rather irrefutable *Yes* when one considers all the factors involved.

Translation of a complete journal is advisable when the consensus of subject specialists is that a reasonable percentage of the articles in the journal will be useful to scientists. No one is surprised if *Comptes rendus* or one of the *Zeitschrifte* prints an occasional mediocre paper, or if *all* the papers do not happen to pertain to a given reader's special interest. The same attitude has been applied to the leading Soviet journals with the additional qualifying consideration that fewer members of the English-speaking community can read the original Russian than can read the French or German (*17*).

The question of cost also points to translation of complete journals in many instances, as the following examples indicate. As a theoretical ideal, it has been suggested, a board of bilingual subject specialists should review the Soviet literature and select the "best" papers. If these are translated and published separately, an individual need obtain only those he really wants. Perfect translations, linguistically and technically, can be obtained by assigning linguists to translate and subject specialists to edit and perfect the translations.

NSF supported such a project at Columbia University. Excellent translations of 230 Soviet physics papers were produced, and they can be purchased for 10¢ each from the Office of Technical Services of the Department of Commerce. There has been little demand for the translations, primarily because their announcement and distribution did not fit into conventional scientific information channels.

A different approach is being tried by the National Institutes of Health. For *Biochemistry* and the *Bulletin of Experimental Biology and Medicine,* NIH has agreed to purchase from Consultants Bureau a certain number of copies of each issue at a reduced price, the total purchase price being calculated to cover most of the translation and production costs for the two journals. This has enabled Consultants Bureau to lower the price to all subscribers to the same figure as that paid by NIH. In support of the NIH research grant activities, the copies purchased by NIH are distributed to a carefully selected list of nonprofit and tax-supported institutions conducting research in the fields covered by the journals, and to appropriate Government agencies. Among the recipients of the free copies from NIH are many institutions which might otherwise not have been able to afford the journals, even though the publications now cost less than one-fourth of their former price.

In order to cover specialized, as well as basic, medical fields, NIH is providing a contract translation service to the editors of professional journals. NIH has sent translated tables of contents of the Russian specialty journals and has invited American editors to select papers for translation and possible republication in accordance with their editorial policies. This program has just been launched.

How an NSF Translation Project Operates

The NSF grant system differs from the NIH scheme in several important aspects. While NIH was instructed by Congress to establish a Russian medical translation service, NSF is expected to serve the physical and natural sciences. The current translation budgets of the two groups are very nearly the same.

The American Institute of Physics translation project may be cited as an illustration of how the NSF support scheme works. First, the institute proposed a survey to obtain the advice of U.S. physicists. NSF supported the institute in such a survey, conducted by Dwight E. Gray, then of the Library of Congress, and Elmer Hutchisson, of Case Institute (*18*).

Respondents to the survey concurred remarkably on the following points: (i) The Russian material is important and should be translated. (ii) Translation is important to science as well as to the national welfare. (iii) Complete journals should be translated because no group is competent to decide upon what is important to everybody. What seems pointless this year may be the key to major achievements next year.

The survey also produced a preference listing of journals, important enough, according to respondents, to justify complete translation. Many respondents viewed the surveyors' cost estimates for a translation project (the estimates later proved surprisingly good) with pleased surprise. "It would be worth it at 2 (5, 10, and so forth) times the cost," was a typical comment.

The leading journal according to the survey was chosen for the first project. This was the *Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki,* known in translation as *Soviet Physics—JETP.* After a little more than 1 year, the journal has acquired more than 750 subscribers and is still growing.

To produce the journal, the institute appointed Robert Beyer, of Brown University, as editor. Beyer is a physicist

who reads Russian. Slowly and painstakingly he compiled a list of willing individuals with competence in Russian, English, and one or more branches of physics. Beyer tears apart the issues of the Soviet journal as he receives them in his office at Brown, and he mails separate articles to translators chosen from his list according to subject specialization. One man may thus be asked to translate three articles from one issue, another may receive only one article in 6 months. The translators are paid.

Beyer edits the translations, and photo-offset copy is prepared on Varitypers in his office. A commercial photo-offset printer prints and binds the journal, and the American Institute of Physics provides business management for the project.

Subscription money is received by the institute and is added to the grant from NSF in a separate account set up for the purpose. If it had not been for a roughly 70-percent increase in the size of the Soviet journal in 1956, subscription income would probably now be paying all translating and publishing costs. As it is, with continued increases in the number of subscriptions, the journal is paying at least its production costs, and there is still the hope that it may become completely self-supporting.

In order to gain additional experience in methods, when the institute requested an NSF grant to add three more titles to its list [*Journal of Technical Physics, Doklady* (Physics Section), and *Journal of Acoustics*], they chose a contractor, Consultants Bureau, to do the entire job except for certain details of administration. It is too early to detect significant differences between the two approaches.

Cost of Journal Translation

It probably requires about 5 years for a new scientific journal to reach a plateau in the number of subscribers, so it is difficult to predict accurately what the cost experience in the journal translation program is likely to be. It is already quite clear, however, that, ignoring subscription income, NSF-supported journals cost roughly 60 percent less to produce than did the separate-article translations mentioned earlier. With subscription income a factor, the cost to the taxpayer becomes less, and for some of the journals it is hoped that this cost will drop virtually to zero. It is recognized, however, that there are journals which, published in the author's original language, do not achieve this happy fiscal state.

While the typical research journal pays its authors little or nothing for manuscripts, or in many cases must resort to levying page charges, the publisher of a translated journal must add to the normal costs of publishing the high cost of translation. The economics of the situation may be clarified by an example which, while hypothetical, is based on experience.

A typical Russian journal will average 500 words per solid text page. For a physical science or engineering journal, allowance for equations, graphs, data tables, and other illustrations will bring the actual average closer to 300 words per page. One thousand pages per year, therefore, equals roughly 300,000 words. If one organization were to contract to have 1 year of this journal translated for its own use, it would pay in the range of $6000 to $9000, and possibly more, especially if the translator has to provide more than 10 or 15 copies or if illustrations are a special problem. With NSF sponsorship, that organization would pay $25 per year (2½¢ per page, on the average) to subscribe, or $375 if it needed 15 copies of each issue.

When 150 to 200 organizations subscribe to this hypothetical, NSF-supported journal at $25 each, they are essentially covering the translation cost. Each gets $6000 to $9000 worth of translation for $25. When the number of subscribers reaches 600, virtually all production costs are being met. As the subscription list swells further, administrative costs are met. In the range of 750 to 1000 subscribers, extra money should begin to come in to support less successful projects or to initiate new ones. The NSF journal-translation budget is thus a revolving fund.

There are numerous other advantages to the complete journal approach to translation besides the economic one. Completely translated journals are covered in the usual way by abstractors and reviewers: they are easy to reference; they are easier to store; in short they have all the advantages of any other journal.

Translation Centers

Although there are many advantages to the translation of complete journals, special translations will always be necessary. To provide an organized approach to this wealth of information, the Special Libraries Association Translation Center has been established at John Crerar Library in Chicago to collect and make available scientific and technologic translations from all languages. This center was established on 1 January 1957 by integrating the SLA Translation Pool and the Library of Congress Scientific Translation Center. It is cooperatively supported by grants from the National Science Foundation and the National Institutes of Health.

Two of the principal services of the Translation Center are provision of inexpensive copies of translations and assistance in preventing duplication of translation effort. The latter aim cannot be achieved with perfection, of course, until all translators provide the Center with copies of their product or with information on what they have done or are about to do. But the present operation is a significant step in the right direction.

It is difficult to state precisely just how much money is saved for whom by the existence of the Center, but a series of crude approximation calculations will serve to emphasize some of the economic aspects.

The average length of the 34 translations of Russian physics papers listed in the November, 1956, issue of the Library of Congress *Bibliography* (No. 38), was 14 pages (*13*). Purchased from the SLA Center where these translations are now on file, an enlargement photostat of this "average" physics translation would cost $3.80, a microfilm $1.70. At typical commercial rates this translation would cost in the order of $60. By extrapolation from these very rough average figures, one finds that the total holdings of the SLA Translation Center (roughly 12,000 translations) could be purchased in photostat for a maximum of $45,600 or in microfilm for a maximum of $20,400. If one were to order the total holdings translated commercially for one's own use, the cost would be in the range of $500,000–$900,000. While the example may be sophomoric, it does indicate the financial virtues of the kind of cooperative effort exemplified by the Center.

The Translation Center does not translate; it collects translations. Most of the translations on file at the center are gifts or loans from government agencies, both U.S. and foreign, industrial firms, universities, and individuals. In some instances, government-made translations are shipped to the center by the donating agency without agency identification. Industrial firms in such highly competitive fields as pharmaceuticals also donate large numbers of excellent translations in exchange simply for the right to remain unidentified.

Several problems remain to be solved to help the SLA Center achieve its goal of becoming a national depository and reference center on scientific and technical translation. There are probably a number of noncommercial producers of translations who do not contribute their material to the center. It is hoped that the continued growth and increased usefulness of the center will help educate these groups to the importance of their

cooperation. One encouraging factor should be the success of both the Library of Congress and the Special Libraries Association in maintaining the anonymity of contributors who wish not to be identified with their translation work. It is a firm policy of the center to withhold the names of its contributors unless the contributors specifically wish to receive published credit.

Translation centers such as the one in Chicago are potentially among the more important services which can be rendered to users of scientific information. These services will improve only as more and more individuals and organizations contribute their efforts, both toward building the holdings of translations and toward using the existing holdings.

Reviews and Abstracts

Translation of complete journals and books is important because it places at hand a complete version of specific research of probable value. Such translations become an integral part of English-language scientific literature. Special translations are complementary, but the combined production of these activities does not solve the whole problem.

Many years have passed since a scientist could remain familiar with the literature by reading a few journals and the current books. Coincident with the growth of this unhappy state of affairs, reviews and journals of abstracts have assumed more and more importance in the general scheme of scientific communications.

The NSF has made one modest grant to Annual Reviews, Inc., to cover the costs of publishing reviews of Russian progress in those areas where the *Reviews'* editorial boards find such progress to be significant. To date, this grant has resulted in Russian progress reports in psychology, physiology, medicine, plant physiology, biochemistry, and microbiology. One is not to infer, however, that Russian progress in other fields has been judged insignificant. One of the problems in supporting reviews is that there does not seem to be a really clear consensus among scientists on what should be reviewed and how.

Improved coverage of Russian literature (and that of other countries as well) through abstracting seems essential, but it is a many-sided problem. In fields where abstracting is well established—chemistry, for example—careful attempts to achieve thorough coverage are being made. A chemist assumes that if a worth-while paper of chemical interest appears, almost anywhere, it will in time be abstracted by *Chemical Abstracts*. Scientists in other fields have different kinds and degrees of literature consciousness.

A pilot project in increased abstracting is now under way supported by a small NSF grant to *Biological Abstracts*. *Biological Abstracts'* editors have identified 31 primary Soviet biology journals as important, and they have contracted with Consultants Bureau to cull from the *Referativnyi Zhurnal, Biologiia* (*Abstract Journal, Biology*) abstracts of articles from the 31 journals. These abstracts are translated verbatim and published in *Biological Abstracts* in the appropriate subject divisions. No attempt is made to separate these as Russian information: they are treated as information first and Russian incidentally.

Thirty-one journals cover much that is important in Russian biology, but this does not constitute exhaustive coverage. *Biological Abstracts* did not assume, in choosing the 31 titles, that they were achieving comprehensive coverage. Whether or not the program is enlarged will depend on the quality of the Russian material and the comments of *Biological Abstracts'* users.

The National Institutes of Health program includes the translation of approximately 4000 medical abstracts annually. These will be published in a quarterly *Abstracts of Soviet Medicine* by *Excerpta Medica*. This journal will be in two parts, the first devoted to basic and the second to clinical medical sciences. The abstracts will be furnished in part by Russian editors appointed to *Excerpta Medica*'s editorial boards by the Academy of Medical Sciences, U.S.S.R., and in part by systematic selection of abstracts from the four-section Soviet medical abstract publication *Meditsinskii Referativnyi Zhurnal*.

Associated Technical Services is also publishing translated summaries of papers from several important Russian chemical journals.

The abstracting board of the International Council of Scientific Unions has for some time been actively promoting greater international cooperation in scientific abstracting, and NSF has supported its work in part with a grant.

Collection of Source Material

Abstracting and reviewing are one side of a coin, the other side of which is availability of the source publications. It seems certain that abstract journals cannot always guarantee the availability in this country of the material they abstract. Some foreign publications are abstracted by scientists overseas, who are permitted to keep the original publication in payment or part payment for providing the abstract. Obtaining, storing, and servicing all of the publications abstracted by any major service would be a tremendous task for the service and usually is not undertaken. *Engineering Index* is an exception, since the Engineering Societies Library holds all material listed in the *Index*.

An abstract is probably better than no information at all, especially when the abstract is well prepared and informative, but there are gaps in the nation's holding of scientific serials. In order to fill this gap the Midwest Inter-Library Center (MILC) in Chicago has begun establishing a center which aims to make available at one point all of the world's journals that publish results of original research. The first step in what is likely to be a lengthy but relatively inexpensive project was taken by the members of MILC with a search of their holdings for titles of publications abstracted by *Chemical Abstracts*. NSF recently made a grant to the group to enable them to seek out and obtain subscriptions to the titles not regularly received by any member. Of the 4733 titles listed by *Chemical Abstracts* in the December 1951 *List of Periodicals Abstracted,* MILC members were already receiving 3942. The new edition of this list, soon to appear, includes a large number of new titles, and MILC has begun checking members' holdings of the newly added titles. Using coverage of *Chemical Abstracts* as the criterion, MILC–NSF aim in time to have available to any researcher a full copy of any significant chemical paper. This facility is expected to supplement, rather than duplicate, the service already rendered by the American Chemical Society Photocopy Service, since the MILC will initially concentrate on certain rare material which experience has indicated is difficult or impossible to obtain in this country.

Following the start in chemistry, holdings of the journal center will gradually be expanded, probably first to biology, and then to other fields as funds and facilities permit. In this age of tremendous expenditures for research, simple availability of source material seems an obvious necessity not to be ignored simply because it is not costly.

Duplication of Translation

Duplication of effort may be justified in situations of great urgency or when careful verification seems vital. The kind of duplication which NSF and others are trying to help prevent is the inadvertent kind which stems from simple lack of knowledge of what others are doing.

Present intragovernment liaison, while it is informal, seems effective. Scientific information representatives of the many

embassies in Washington and of a number of U.S. agencies meet at an occasional, informal luncheon. A larger "persons interested in scientific information" luncheon is also held monthly to serve a similar purpose on a somewhat larger scale.

Through fairly steady communication between NSF and various agencies of the United Kingdom, NSF has been informed in detail of the current Department of Scientific and Industrial Research program to translate and analyze a sample copy of each section of the huge Russian abstract journal, *Referativnyi Zhurnal*. The Ministry of Supply has provided copies of a significant but limited-by-funds translation project which it is conducting. The *Preliminary Guide to Translations,* mentioned previously, is an interagency voluntary effort and, in itself, is an invitation for the increased cooperation of other agencies as well as commercial translators and publishers.

Problems in Documentation

Soviet literature, in the original Russian or in translation, presents problems in documentation which are beyond the scope of the present discussion. However, several aspects of identification and cataloging are especially pertinent to translation.

One problem will be solved by having new translated journals carry the same volume-number identifications as their Russian counterparts. Existing translated journals which may have started with their own numbering systems will shortly begin to identify themselves more carefully with the Russian original. Contributors to the Translation Center are being asked to provide complete citations with their translations. The expanded *Translation Monthly* features an improved subject index and, probably in the near future, will add a monthly author index. These details seriously affect the accessibility of the translated material. Translations are evolving from the status of occasional pieces to that of full-grown information tools which present new problems to solve, hopefully, as they arise.

As the volume of translated Russian material grows, one stumbles with increasing frequency over the need for better agreement in such matters as transliteration and the rendering into English of key words in Soviet journal titles. Different transliteration schemes are used or advocated by the Library of Congress, the International Organization for Standardization (*19*), and the Royal Society. One occasionally sees other, perhaps intuitive, systems.

Although the systems are similar, they can produce a given Russian author's name as, variously, Jakob, Iakob, Yacob, or some other permutation derived by equating *J, I,* and *Y*; *c* and *k*; or *a* and *o*. This causes problems in identification as well as cataloging, especially in dealing with large quantities of material, such as at the Translation Center. The same author may show up in a half-dozen places in the catalog because he has initials as well as a last name. The not-so-hypothetical six places increase with frightening rapidity when one notes that the key words from Soviet serial titles, such as *Doklady, Trudy, Vestnik, Izvestiia, Sbornik, Uspekhi, Voprosy,* and others, can be and are translated in different ways.

The problem is more a matter of semantics than of translation, however. While *Doklady* may literally mean *Reports,* some translators feel that *Proceedings* more accurately conveys the nature of the journal to an English reader. Thus far, the trend for completely translated journals has been to use an identifying English title, acceptable in terms of current usage, plus the original Cyrillic title. Possibly the best solution would be to add a transliterated title and then simply to absorb the Russian words into English usage, just as *Zeitschrift* has been absorbed. An excellent example of where this situation becomes a problem is in the retranslation into English of Russian translations of English references.

Machine Translation

Machine translation can receive here only the briefest attention; therefore, several references are suggested for those interested in more details (*8, 20*). This relatively new field is being followed very closely at NSF, and several grants have been made for research on various approaches to the problem. It is hoped, of course, that machine translation will become the means of the ultimate fast, accurate, low-cost translation which could have such an important effect on dissemination of foreign-language research reports. Until such time, "conventional" translating techniques must be employed.

Learning Russian

The emphasis in this discussion has been on mass translation of important, inaccessible scientific information. Published translation is, of course, duplicating publication. The problem of publishing all research results once is still a gigantic problem, and it is not simplified by duplicate publication.

There seem to be three alternatives. NSF expects to continue its translation program as long as scientists want it and as long as the international situation permits access to the source material. The second alternative is an unlikely return to the custom of publication in a commonly accepted international scientific language, such as the Arabic, Greek, or Latin of earlier centuries. Proceedings of international meetings have been reported in Interlingua (*21*). Since human beings are as they are, however, a universal scientific language seems, to say the very least, a long way off.

The third alternative is more difficult than large-scale translation, simpler than promulgation of a universal language, possible to achieve, and has the added virtue of appealing to one's sense of the fitness of things. More emphasis can be placed on teaching scientific Russian to science students.

Research-oriented graduates have traditionally learned French and German, not solely as a doctorate requirement but because in many instances they knew they would have to depend on these languages to keep abreast of their professions, for example, organic chemistry and the German literature.

We may be long in accepting it because it has come upon us with surprising speed, but the fact of the matter is that Russian is now definitely a language which research-oriented graduates should know. This is said not to depreciate the importance of French, German, or other languages but to emphasize the new, radical aspects of the situation.

An interesting symptom of increasing interest in this problem is the proposal announced by the Pergamon Institute at the recent AAAS New York meetings. Described as in the planning stage was a symposium on the teaching of scientific Russian to be held in London in July 1957. Representatives of Columbia, Harvard, Cambridge, London, and Oxford universities were said to have agreed to participate.

Summation

This discussion has described the status of the large United States program for translation from the Russian. A partial description of what is being done or planned, and by whom, has been provided as a guide for those who wish to follow the subject further. The urge to pass on useful information has necessarily restricted the space which might also have been profitably devoted to the philosophic aspects of the problem.

Although it is not said with any sense of pride in achievement—because much more remains to be done than has been done—it would seem fair to describe the current national translation activity, in-

cluding all contributions to it, as a phenomenon. Phenomena in scientific communication are not common: a full appreciation of their significance requires more analysis than results from a simple listing of their outward characteristics. But a few observations might be made in conclusion.

Most United States scientists probably feel that, as a nation, we are and should be world leaders in science, even though this feeling is neither nurtured nor expressed in a spirit of violent competition. If this assumption is allowed, the point which seems to remain is that the United States will not retain its position casually. Our scientists expect to maintain an awareness of the scientific achievements and failures of the other nations of the world. But we must especially become more aware of the advances of Soviet science, both qualitatively and quantitatively. The evidence points toward this last conclusion, regardless of whether one is concerned with the production of ideas or things, increase in man's knowledge of himself and his environment, conflict between idealisms, or simply the national security.

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Penalty of Isolationism

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The identicalness of two antibiotic preparations, one isolated in 1946 and designated as "grisein" (*1*) and the other isolated 5 years later and designated as "albomycin" (*2*), leads once more to a sad reflection of the penalty that must be paid for scientific isolationism, which may even be colored by scientific nationalism.

If ever isolationism has been dangerous in any field of science, if ever rapid development in such a field has required close international collaboration among different scientific groups, it has been particularly true of the study of antibiotics. The study of the formation, isolation, chemical identity, and biological activities of these microbial products requires rather specialized procedures in biology and biochemistry. Our knowledge of antibiotics and their extensive applications is of only very recent origin. It involves a knowledge of the antibiotic-producing organisms, which may vary greatly in nature, of the chemical substances produced by these organisms, of the antimicrobial activities of these substances, their pharmacological properties, and their practical potentialities as therapeutic agents.

One of the most striking illustrations of the need for close collaboration in this field was recently presented by the isolation in four different laboratories in the United States and in Western Europe of preparations which, on careful comparison, proved to represent the same chemical and biological entity. This could be established, not only by a comparison of the physical and chemical properties of the preparations, but even more simply by the use of organisms of known sensitivity to different antibiotics. Developments in the case of grisein and albomycin would seem to provide an equally striking illustration.

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Isolation of Grisein

Following the isolation in our laboratory, from cultures of actinomycetes, of actinomycin in 1940, streptothricin in 1942, and streptomycin in 1943, the search for organisms capable of producing antibiotics that were active upon bacteria resistant to streptomycin was continued. This search resulted in the isolation in 1946, from the Huleh peat of Israel, of a strain of *Streptomyces griseus* that produced an antibiotic different from streptomycin. It was designated *grisein.* This antibiotic inhibited in very high dilutions the growth of certain Gram-positive bacteria, such as *Micrococcus pyogenes* var. *aureus* (*Staphylococcus aureus*) and *Bacillus subtilis,* and of Gram-negative bacteria, such as *Escherichia coli* and *Serratia marcescens.* The activity of the antibiotic produced by this culture was much greater against staphylococci than against *Escherichia coli.* Unlike streptomycin, it had no activity against *Bacillus mycoides, Proteus vulgaris,* and *Salmonella typhosa,* and only limited activity against mycobacteria. Sensitive bacteria rapidly developed resistance to grisein, so much so