Scientific and Technical Translation
and the All-Union Translation Centre

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Scientific and technological progress, the growth of scientific, technical, commercial, cultural and other relations, the desire of nations and governments to develop cooperation and coordinate their efforts in promoting civilisation are all factors resulting in the steadily increasing demand for scientific and technical translation. Such translation is the most effective way of overcoming language barriers. Heads of information services around the world are for the most part sceptical about the idea of a universal language for science and technology, and therefore more and more attention is being given to the problems of translation and, in particular, scientific and technical translation.

Translation is a philological problem, and contemporary philology is also undergoing changes in the changing world. Whereas earlier philology was mainly concerned with interpretation of religious and literary texts, today professional philologists are turning their attention increasingly to mass media texts—information, business affairs, legal matters, politics, science and technology. It goes without saying that this material, both in written and oral form, is of interest to a far larger audience than, for example, poetry and drama, and therefore this reorientation on the part of philology is perfectly justified. In his book "An Introduction to General Philology"[1] Professor Yu. V. ROZHDESTVENSKY of the Moscow State University looks at a number of interesting philological questions, including the state of philological sciences today, the status of information sciences and the growing influence of the mass media on the linguistic consciousness of modern society. Scientific and technical texts and, consequently, scientific and technical translation, which objectively finds itself at the frontiers of scientific and technological progress which drives society forward, are moving from the periphery to occupy a central position in philological research. The present article on the work of the All-Union Translation Centre will, we hope, help to illustrate the social and scientific necessity of such a shift in philology.

In the USSR, hundreds of thousands of 'author's sheets'[2] of scientific and technical literature and documentation are translated every year from dozens of foreign languages into Russian and from Russian into numerous foreign languages. The structure of translation work in each country and throughout the world is quite varied. The number of scientific and technical texts as a percentage of the total number of texts meant for translation is growing: in 1956–1961 they accounted for 12.7%, by 1974–1977 this had increased to 15.5%. In Japan the figure was 20.5%, in the USSR—19.2%, in Latin America—more than 17%, in the FRG—11.2%, and in Burma around 0.5%. This and other statistical data collected by A. Yu. SHAIKEVICH[3] of the All-Union Translation Centre provides the basis for a thematic analysis of translated materials. Such an analysis would be a long and complex process, but it may be of interest for information science, the science of science and cultural sociology. For example, within the total output of

[1] YU. V. ROZHDESTVENSKY: *An Introduction to General Philology*. Moscow "Vysshaya Shkola", 1979. p. 223. (In Russian).
[2] An author's sheet equals 40,000 characters.
[3] A. YU. SHAIKEVICH: *Scientific and Technical Translation in the Modern World: A Statistical Analysis*. Proceedings of the All-Union Conference on Improving the Translation of Scientific and Technical Literature and Documentation. Moscow, 1982, pp. 23–5 (In Russian).

translated scientific and technical materials, the propotion of "pure" science is steadily increasing: in 1956–1961 it accounted for 36% as compared to 45% in 1974–7. This increase was particularly dramatic in the USSR (from 29% to 65%), in Romania (from 21% to 51%), and in Turkey (from 6% to 29%). However, there are countries (the Netherlands, Denmark, Yugoslavia and Latin America) where the shift has been towards the applied sciences.

Over the last few years, in terms of volume of material translated, the All-Union Translation Centre has overtaken the All-Union Chamber of Commerce and is now first in the USSR. It should be added that no competition is involved here. The translation services offered by the two organisations are clearly set apart as far as their subject matter is concerned. For the most part the All-Union Chamber of Commerce translates technical documentation, while the All-Union Translation Centre focuses on varied scientific and technical literature—newspaper articles, patents, books specifications, reports, etc. The annual output of the Centre is thousands of author's sheets. The Centre has a branch in Rostov-on-Don which provides translation services for the North Caucasian industrial region, an editorial office in Kiev which serves almost all the Ukraine with its huge scientific, technological and industrial potential; an editorial office in Gorky, opened to meet the needs of the Volga-Vyatsky economic region, and an editorial office in Tbilisi serving Transcaucasia. The expansion of the All-Union Translation Centre to different parts of the USSR has been brought about by the growing demand of science, education and industry, and is as yet far from complete.

It would, however, be untrue to say that in the USSR translation work is localised and linked to specific regions. On the contrary, there exists an effective coordination system based on a centralised archive of unpublished translations in the State Public Library for Science and Technology. Its translation archives are administered by the Translation Centre. An organisation requiring a translation of scientific and technical literature first sends an application to the Translation Centre, which then checks to see whether there is already a translation of this material in the archives. If there is, the applying organisation is provided with a copy, which is considerably cheaper and quicker than making a new translation. A large number of organisations are involved in the coordination system, and in 1982 alone the economic saving achieved by preventing duplication amounted to more than one million roubles.

The Translation Centre does not have a single translator on its staff, and all translation work is done by free-lance translators. In the overwhelming majority of cases these translators are highly-qualified specialists in the appropriate branches of science and technology. Among several thousand translators who work for the Centre, many have a doctor's or a master's degree, many are engineers or scientists, and many know the foreign language almost as well as their native tongue. If necessary, the scientific editors ensure that the translation is of a high standard, but most of the translations do not require such editing.

The All-Union Translation Centre is the major organisation dealing with scientific and technical translation in the USSR, and therefore it conducts considerable organisational and methodological work. Seminars on work quotas and the improvement of translation work are held regularly for translators and the heads of translation organisations. Quotas have been introduced for the first time for translation work and for the concomitant processing of scientific and technical literature and documentation; an experimental translators' workplace has been designed, and state standards have been established for

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the presentation of scientific and technical translations. The Centre regularly puts out "Lists of New Terms" covering various fields of science and technology for which there is much demand. These lists, compiled by specialists who are paid an author's fee for their collaboration, contain the latest technical terms which have not yet found their way into the dictionaries. As the publication of new or up-to-date dictionaries is a lengthy process the speed with which the lists are issued is highly appreciated by both translators and all those involved in the translation of scientific and technical literature. Recently the Centre has expanded its work in this area and now collaborates with similar organisations abroad. Publications to date include a Bulgarian–Russian list of Computer Terms[4] and a Bulgarian–English–Russian list of Terms in Electrochemistry and Corrosion[5]. The former was prepared by the All-Union Translation Centre and the Central Institute for Scientific and Technical Information of the People's Republic of Bulgaria. It contains 1000 terms and abbreviations used in the computer field and an index of terms with corresponding references. Information on this publication can be obtained from the "Soyuzpechat" catalogue (for distribution within the USSR) and from the v/o Mezhdunarodnaya Kniga catalogue (for distribution abroad). The latter was prepared jointly by the Translation Centre and the Bulgarian Translators' Association on the basis of two issues of English–Russian Terms in Electrochemistry, Corrosion and Electrochemical Metal Processing published by the Translation Centre. At present it is being edited at the Centre and is published in 1983. A Hungarian–Russian list of Computer Terms[6], prepared jointly by the Translation Centre and the Hungarian State Bureau for Translation and Certification, was published in 1982. It contains 1350 terms and abbreviations used in computer technology. A Finnish–Russian list of Terms in Machine Parts is among other publications planned for the future.

The Translation Centre collaborates with foreign organisations within the framework of the International Information Service for Scientific and Technical Translation (Interinformperevod), of which it is the central organ. Over recent years, Interinformperevod has also conducted research and done considerable work in the field of lexicography and the construction of analysis and synthesis algorithms for machine translation.

The efficiency of human translators and editors cannot be substantially increased, and therefore the question of automating translation is now attracting considerable attention throughout the world. The Centre has been working on this problem for several years, with a view to creating and introducing commercially feasible systems of machine translation (MT) from the most widely used foreign languages into Russian.

The problem of machine translation is one of the most interesting problems connected with the modelling of human verbal activity. There is no need here to describe the diversity and complexity of the translator's work. Suffice it to say that it is even more difficult to transfer this activity, or even part of it, to a computer. Detailed programmes and algorithms are required that would make it possible to simulate the actions, or the results of the actions, that a translator performs with the units of two natural languages in order to make two texts in different languages equivalent in meaning. This equivalence is

[4] *Bulgarian–Russian Computer Terms.* Compiled by B. M. ILIEVA, I. G. GAZDOV, V. S. POKROVSKY. (Eds) B. K. KHRISTOVA, G. I. PENCHEVA, V. A. SHAROV. Editors-in-chief: I. P. SMIRNOV (Translation Centre) and I. G. GAZDOV (TsinTI). Moscow–Sofia, 1980. 128 pp.
[5] *Bulgarian–English–Russian Terms in Electrochemistry and Corrosion.* Compiled by M. M. MEL'NIKOVA, I. P. SMIRNOV, S. P. DAVYDOV (USSR), R. V. MOSCHCHEV (Bulgaria) (Ed.), K. S. LOSEV (USSR), T. B. DONCHEV (Bulgaria). Moscow–Sofia, 1983.
[6] *Hungarian–Russian Computer Terms.* Compiled by B. V. KLIMOV (USSR) L. ILLÉS (Hungary). (Ed.) N. D. KHAN (USSR). Editors-in-chief I. P. SMIRNOV (Translation Centre) and G. SZAPPANOS (Hungarian State Bureau). Moscow–Budapest, 1982. 174 p.

necessary not just in terms of content, but also in terms of the linguistic means of expression. Translation is more complex than abstracting, annotating, indexing and other procedures for which there already exist satisfactory "machine" solutions and operative programmes. Equivalence in terms of the means of linguistic expression is not achieved by literal translation. For example, if the translation is to be reasonably coherent, it is essential not only to solve grammatical problems, but also to select one of a number of possible lexical meanings in those fairly numerous instances in any language when a word is polysemantical. Hence special dictionaries—contextological, for example—are compiled for machine translation which, within certain limits and not with absolute accuracy, make it possible to solve the problem of lexical ambiguity. Thus, for example, an English noun having several meanings is translated using a special algorithm which analyses the immediate context according to special rules. The word "derogation", which in Russian may be translated as "podryv" (injury, detriment) or as "umalenie" (belittling, depreciation) is translated as "podryv" if it is followed by the word "sovereignty", which, moreover, may be preceded by the preposition "of". The special contextological dictionary[7] contains a set of such algorithms for ambiguous words in all parts of speech. This is undoubtedly a complex procedure for resolving the problem of machine translation, but as yet there is no easier way. The translator also often adopts a far from simple and direct route to solve translation problems, and, moreover, by no means all the problems of ambiguous words can be resolved by reference to the context.

In addition to purely lexical algorithms, machine translation also makes use of a number of algorithms of grammatical analysis and synthesis. At present the machine is able to perform grammatical analysis at the same level as a school-child. However, like a poor scholar, it often makes mistakes. The following is a machine translation from English into Russian produced by the AMPAR system used at the Centre. The sentence "Registration for the training seminar is being handled by the ISO central secretariat alone" was translated as «Регистрация для обученного семинара осуществляется ИСО центральный секретариат только» whereas it should have been translated: «Регистрация участников семинара осуществляется только центральным секретариатом ИСО».

Clearly, some of the 'mistakes' in a machine translation can only be corrected after considerable preparatory work. It is difficult to translate the expression 'training seminar' correctly until it is known what seminar is referred to. The same is true of the abbreviation 'ISO'. In addition, the word 'uchastnikov' (participants) has to be introduced into the Russian translation. Such factors already involve questions of style in broad extralinguistic connotations. Some errors in machine translation can be explained by the difficulty of providing for a machine analysis of corresponding linguistic phenomena. The 'ing' form of the English verb, for example, is extremely difficult to analyse using purely machine algorithms; it should be remembered that within the framework of traditional 'human' linguistics the grammatical classification of these forms is also rather complicated, and different grammarians classify them differently. Such examples are sufficient to illustrate the difficulty of machine translation even in cases where the text appears at first glance to be simple.

[7] *Contextological English–Russian Dictionary for Machine Translation of Polysemantic Words.* Compiled by Yu. N. Marchuk. Moscow. Translation Centre, 1976. Part 1, 264 p. p. Part 2–256 p.

It does not follow, however, from what has been said above that machine translation has no future. There are various types of text which are perfectly suited to machine translation. Speaking generally, machine translation becomes a possibility if the material is differentiated according to the type of translation needed. The typology of translation reveals that different types of text make different demands of the translator. A literary translation requires that the translator penetrate into the image and that he employ those linguistic means which are designed primarily to convey the emotional aspect of the original, its overall artistic effect upon the listener (reader). Machine translation is not suited to this kind of work. In contrast, the translation of technical specifications and inventory lists deliberately excludes any creative work on the part of the translator, and such an approach is prohibited by the nature of the material.

Scientific and technical translation as such is relatively varied. It is well known that a newspaper article can be written in such a way that, in terms of the creative effort required to translate it, it may be compared to a literary text. Again, the new information which is nearly always contained in scientific or technical translation material may not have any linguistic equivalent in the target language. The professional translator often finds himself at the frontiers of scientific and technological progress, and one of his tasks is to give lexical form to new concepts. Thus the typology of scientific and technical translation is an extremely important practical factor determining the possibility of machine translation and, indeed, of any means of automating translation as, for example, machine dictionaries.

Present-day machine translation, which is used only for scientific and technical texts, always requires a human editor. The theoretical models upon which the existing systems are based rely first and foremost on translation equivalence at the level of surface structures, using the simplest and most frequent instances of correspondence between two specific languages. The creation of improved systems that would ensure a higher quality of machine translation, and consequently a lesser demand for human editors, depends on developing models capable of reproducing the actions of human translators with greater accuracy, that is capable of formulating and applying syntactical and semantic method of analysis and synthesis and of producing an equivalent transformation of the content within the limits permissible if the translation is still to remain a translation and not become a synopsis.

Progress in this direction is extremely difficult. The process of creating machine translation systems is inductive, moving gradually from the demand of practice via the formation of easily accessible linguistic phenomena to increasingly complex combinations[8].

The Translation Centre attaches importance to the compilation of automatic dictionaries to assist translators, editors and specialists engaged in translation. The automatic dictionary should include the maximum number of new words and expressions in order to reduce the time that the translator now spends searching through dictionaries and consulting with specialists. Experience has shown that the standard and efficiency of translation increase significantly with the use of automatic dictionaries but they also bring with them various scientific and technical problems.[9]

[8] Yu. N. MARCHUK: *Problems of Machine Translation.* Moscow, Nauka, 1983, 232 pp. (in Russian).
[9] I. I. OUBINE: Text-Computer-Dictionary. In: *'Level of text and methods of linguistic analysis'.* Moscow, AN SSSR. Institute of Linguistics-Translation Centre, 1982, pp. 52–62. (In Russian).

New methods of translation can only be introduced if there is an integrated approach to the problem of information services. As information, the machine translation should fit organically into the existing system of current awareness information services, otherwise it will not be used. Given the varied quality of machine translation, post-editing can only be avoided within a system in which there are differentiated flows of translation information. Technical and economic factors also require that input facilities should be taken into account. Input of information on magnetic carriers would be quite effective in a system in which the recipient is able to make repeated use of a specially created collection of edited and unedited machine translations. These and many other questions pertaining to the organisation, technical justification and promotion of translation activities are dealt with at the All-Union Translation Centre—the largest translation organisation in the USSR.