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LINGUISTIC ASPECTS OF TRANSLATION

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In discussing the linguistic aspects of translation I shall address myself to the following six questions:

1. What has been contributed by machine translation to the general theory of translation?
2. What constitutes an invariant in the process of translation?
3. What are the methods of confronting the elements of different languages?
4. What are the ways of transition from input structures to output structures?
5. What is the algorithmic linguo-typology, relative to the field of languages?
6. What is the future of translation?

1. The fundamental conclusion, which must be extracted from comparison between human and machine translation, consists in the following statement: Man translates, applying his understanding of the input and the output text; i.e., by correlating the given text and the formed one with his past and present *conscious and subconscious perception of reality.* The Machine on the other hand translates by passing from the input to the output text without any understanding of either; that is, merely by correlating the given text with a stored bi-codal vocabulary and with a prescribed routine of transitions from one code structure to another. This means that if we call *translation* the ensemble of operations executed by a translating machine, then a translating man does *more* than simply re-coding the input text into the output one, and this extra work, however much importance it has for human communication, is not necessary for the act of translation properly defined. Moreover, using such a definition we must conclude that actually Man *does not translate* at all, for he does not correlate the structures in two different codes. In practice a good "translator" first understands the heard (or read) message acting as a speaker of the input language, then he repeats the understood message now acting as a speaker of the output language. We may say that Man uses the input language and the output language on succession, whereas the Machine uses the two languages simultaneously. Surely, Man has the ability to translate in the same manner as the Machine (but not vice versa). A beginning student is compelled to act like the Machine because the inadequacy of his knowledge prevents him from understanding the foreign text directly; to him the

routinized correlation of the two languages is a forced substitute for direct comprehension. Understanding arises only after the correlation is done, and must be considered as a post-effect of translation itself. Even here we can see some difference between a student like a machine and a translating machine: in the latter we have no comprehension post-effect. From now on we shall speak of machine translation, of human translation (the beginner's case), and of human heterolingual rendering (the expert's case).

2. The creation of a numerical intermediary language (IL) for machine translation (MT) gives a new basis for treatment of various aspects of both translation and rendering. Even in binary systems of MT an input word is supplied with a number indicating the place where the corresponding output word is stored; those numbers constitute a kind of implicit *ad hoc* IL. From a theoretical point of view an explicit and universal IL, having the properties of autonomous functioning, is the only interesting case. Such an autonomous IL permits us to reveal one more distinction between MT and human heterolingual rendering (HHR): their invariants differ entirely. In HHR a set of thoughts and images serves as an invariant of a message rendered in two (or more) languages. Three messages: the French (F) - *les signaux de Mars sont dechiffrés,* the English (E) - *the signals from Mars are deciphered,* the Russian (R) - *signalys Marsa rasšifrovany,* have the same invariant, the same thought induced in HHR, whatever direction of rendering we choose – FE, FR, EF, ER, RF, or RE. Turning to MT we find that the role of invariant sense is played by the *invariant text in IL:* let us go from the F message to some chain of numerical symbols in the IL, then further to the E message; during the RE translation we pass through the same intermittent chain of IL symbols. The paralanguage (input or output) text being compared with the corresponding IL text, one is obliged to expect that they will not be structurally identical (for instance, Russian genders are not represented in the kind of IL used by the Leningrad school of MT). This means that some elements of a paralanguage (PL) are *incongruent* when correlated to the IL. When elements of PL are congruent, translation is easiest: it reduces to simply replacing each PL element with the corresponding IL one, and vice versa. Serious problems arise when we have an incongruence to overcome. The same relation is evident when the IL or MT is compared with the logical language of information retrieval, which may be included in the field of paralanguages. To summarize the situation, let us say that a theory of translation must be essentially a theory of incongruences between PL's and the IL, and of a theory of algorithms for overcoming these incongruences.

3. Assuming a language space of two axes (syntagmatical, paradigmatical) and three levels (morphological, syntactical, semantical) we can develop a classification of incongruences. Because every paralanguage has those axes and levels, they must be represented in the Intermediary Language, too. The semantical units of the IL are *semoglyphs* (in the Leningrad MT they are five-digital octal numbers), denoting each a

ring of translational substitutes (R. *zajac* = E. *hare* = F. *lièvre* = D. *Hase* = I. *lepre* = ...). There is no necessity to link semoglyphs directly with notions. When two notions, e.g., a radical in chemistry and a radical in politics, are expressed with a single word in all European idioms as well as in Indonesian, Turkish, Swahili, and many other non-European languages, it will be quite preferable to use a single semoglyph for both notions. By establishing two semoglyphs, we would be forced to make a choice each time we meet the word in any of PL's. By establishing only one semoglyph this task is eliminated without giving rise to errors since the probability of the two notions occurring in the same text is practically equal to zero.

The syntactical relations between semoglyphs are marked explicitly with *tectoglyphs,* the latter consisting of the phrase number of the governing node and adjoining to the governed one. The relations are provided with additional information b*y formoglyphs,* which also adjoin the semoglyphs and indicate the role of the words in the sentence (subject, direct object, attribute, etc.). The other morphological characteristics, expressed by formoglyphs too, are those which exist in the majority of languages (the formoglyph of the plural, the formoglyph of the future tense, and so on). In our IL of MT there are twenty two entities included in the list of formoglyphs.

The incongruences between a PL and the IL, existing at the semantical level, are classified as various *semies.* On the syntagmatical axis we have *aposemy,* the case when the number of words in a PL term exceeds the number of semoglyphs in the corresponding IL chain; *macrosemy,* when vice versa; *metasemy,* the case when the numbers are equal, but a word-by-word translation of a PL term does not lead to the right IL chain, and at least one of the semoglyphs of the combination, obtained during "word-by-semoglyph" transition, must be replaced by another one. On the paradigmatical axis we have *polysemy* (embracing homonymy), when one and the same PL word under different circumstances is translated with different semoglyphs; and *synsemy* (formalized synonymy), when different PL words are translated with one and the same semoglyph. Each of these five semies needs its peculiar method of overcoming the incongruence, the routines being substantially dissimilar and depending also on the direction of the translation: synonyms give no trouble if we move to the IL, but choosing one of them is a difficult task if we move FROM the IL.

On the morphological level we find analogously various morphies: two on the paradigmatical axis and three on the syntagmatical one. Polymorphy is illustrated by the English ending *-s* (he fights, the fights), which splits into two different formoglyphs: the present tense and the plural; symmorphy – by the Russian nominal endings *-y, -a* (atom*y*, dom*a*), both converging into a single dormoglyph of the plural; *apomorphy, macromorphy,* and *metamorphy* are the morphological parallels of their semantical namesakes. On the syntactical level one meets as an independent case mainly metatecty, for the other four types of tecties usually result from semies as their corollary.

Thus, the matrix of elementary incongruences consists of fifteen items. Of course, in many cases the incongruence between a PL and the IL group of elements belongs to more than one level and one axis simultaneously. Here the procedure of overcoming the incongruences divides into two phases: first, resolving the complex incongruency into semies, morphies, and tecties, and then combining the standard routines prescribed for the corresponding elementary incongruences.

Complex incongruences produce relative wholes. In the input language they are produced with regard to the IL; in the IL, with regard to the output language. Taking as an example the English *in order to,* we see that each of the three words when used independently has its own semoglyph, but when they are dependently placed one after another they constitute a situative unit translated into the IL with a single semoglyph. This clear case of aposemy (combined with apotecty) well represents the dependent *valencies,* i.e., the possibilities of special links which exist inside the relative whole induced by an incongruence. We may say that a valency is potentially present in a word and is actualized as a link when the work is placed beside another word with the corresponding symmetrical valency. The preposition *in* possesses the right valency for the noun *order,* which in turn has the left valency for *in* and at the same time has the right valency for *to,* the latter possessing the appropriate left valency for *order.* All the valencies in the example become links creating the relative whole, incongruent to the IL (three words through four valencies into one semoglyph).

The system of dependent valencies is the most important result of projecting a paralanguage onto the Intermediary Language, and vice versa.

4. Translation via the IL consists of two principal stages: *analysis,* i.e. transition from the input language to the IL, and *synthesis,* i.e. transition from the IL to the output language. In both stages a symbolic sign system, called the *metalanguage* (ML,) is used for the description of a message in the paralanguage. The difference between a PL and its ML lies in the cardinal fact that the majority of syntactical relations and many morphological categories are given in the PL indirectly, implicitly, while in the ML all of them are expressed directly and explicitly. A symbolic element of the ML used in the description of morphology or *formeme* denotes one and only one grammatical characteristic of the PL word. For the morphological image of the French métaux we shall use three formemes: One for the substantive (symbol *S),* a second for the masculine (symbol *m)* and a third for the plural (symbol *p).* Only the last of the formemes will be converted into a formoglyph during passage to the IL, the first two formemes having no correspondents in the IL grammar. In the ML *tectemes* are used for the description of syntactical relations, whereas sememes are used for the description of word-building (to the German *Treibstoffsatz* three sememes correspond in the ML symbolization).

Because every PL has its own grammar and its own word-building which does not coincide with systems of other PL's we have to conclude that each PL requires its special ML. The IL on the contrary is one and the same for all the PL's of the translational field; this means that the IL is not identical with any of the ML's. Given the message in a PL, its description of it in its special ML must be totally isomorphic with the described: all the PL categories of the message are to be symbolized faithfully, *including those which do not exist in the IL.* Here lies the obvious reason for the dissimilarity between the ML's and the IL: the same message in the IL will be normally non-isomorphic with the PL message.

The analysis contains two groups of operations: 1) the *descriptive group,* where we replace the chain of morphemes of the input PL and the implicitly given relations between them, with the set of the explicitly written formemes, tectemes, sememes of the corresponding ML; 2) the *forward-normalization group,* where we delete those symbols, which do not exist in the IL, add the lacking ones, and change those elements which are incongruent with regard to the PL. Symmetrically, the synthesis contains two groups of operations too: 1) the *backward-normalization group,* which transfers the IL set of elements into the output ML set of symbols; 2) the e*nscriptive group* which replaces the set of the ML symbols with the chain of morphemes of the output PL.

Operations for overcoming incongruences belong naturally to one of the normalization groups. Having found among a cluster of ML formemes a symbol of valency, the analyzing machine (case of MT) or man (HT) has to check, whether the next cluster of the ML formemes includes the symbol of the pair valency. If not, nothing is to be done; if it does include the symbol, however, the sememes to which the valencies are attached must be searched for in the special list of sememe pairs, and after the positive result of the searching, the prescribed change of the semoglyphs must be performed. Once this subroutine has been finished, we do not keep the ML set of symbols intact; the isomorphism between the PL message and its ML description is lost at the very moment of the semoglyph change. Consequently since at that point of the algorithmic time the message is in a transitional state, it has already ceased to be a purely ML chain, but it has not yet become a purely IL chain. A similar thing can be said about the descriptive (enscriptive) group of operations: during the most part of its algorithmic time the message is in a transitional state which no longer represents a pure PL chain of morphemes and has not yet been converted into a pure ML chain of symbols. In practice those pure forms exist only before and after the analysis (the same with the synthesis). Usually it is much more convenient for the creator of the algorithm to interweave the two groups of operations within each stage combining some descriptive operations with certain forward-normalization ones, and some backward-normalization with certain enscriptive operations as well. It is self-evident, that the mixing up of the operations does not affect their theoretical status which in any conceivable combination and admixture remains absolutely unchangeable.

The analysis begins on a single-word level by splitting any word into a stem and a residue (in those languages that permit such treatment, of course); when necessary we make their grammatical description more precise by consulting the formemes of neighbouring words. Asemic (i.e. without corresponding semoglyphs) words, which are mostly the auxiliaries of various kinds, transfer their information to semic ones and get a special mark for future deletion; the valencies are utilized for indicated changes. After these operations the initial text becomes a kind of sieve with pendants: its sections must be shifted in such a manner that all traces of deletions and of insertions are eliminated, and the text becomes compact and linear once more. Here the pre-syntactical phase of the analysis ends.

The main purpose of the syntactical part of the analysis is to establish throughout the text the pair configurations with a governing node and a governed one. This is made by using the hierarchy of syntax: first the immediate neighbours are tried for pair configuration, then the checking is spread to some fixed distance (plus-minus 2, 3, 4 words) and only later the whole sentence is investigated without restriction for possible pair links. At each stage those words which have already got the governing node are excluded from further consideration; the only word that has not found its governor is fixed as the summit of the sentence tree. In the final phase of the analysis some post-syntactical rearrangement is executed with the aim of adjusting the received IL chain to its standardized form.

For synthesis we have much richer information than for analysis; that explains why the synthesis is essentially simpler and shorter than its counterpart. The main difficulty in the synthesis is the necessity to work out a good word order. And the best solution of the task lies not in the highest stylistic beauty of the output text, but in the minimum complexity of operations used to get it.

5. The best basis for constructing an algorithm of translation is provided by statistico-combinatorial methods which reveal the most important properties of a language. Two methods of the kind have already been developed: approximational analysis and the algorithmic statistico-combinatorial modelling.

Approximational analysis is the simpler and rougher procedure of the two. As its point of departure we take the functional classes. A part of speech in its function as a part of a sentence forms a separate functional class. All dubious groups of words are treated as temporary autonomous classes. Each class obtains its own symbol; then all the words in a given set of sentences are indexed with the symbols, thus filling five matrices. The first matrix shows the spectrum of indices which can be right and left neighbours of a given class. The second matrix pictures the spectrum of governor and dependent indices which can be linked with the given class in tree structures of the sentences. The third matrix reflects the cases of coinciding neighbourhood and syntactic link. The fourth is devoted to syntactic links existing without neighbourhood; and the fifth to neighbourhoods existing without syntactic link. Each matrix has two entries, thereby giving to the classes ten characteristic spectra. The spectra are compared according to a strictly determined routine. From the results of the comparison it is possible to judge whether a dubious group is a really independent class, or whether it must be united with another class having the similar set of spectra. Furthermore, one obtains a paradigmatic lattice of relations between parts of a sentence and parts of speech, the lattice being based on probabilistic spectra for each class. The results are considered as the first level of approximation. It can be used immediately for constructing an algorithm of translation or be accepted as a stopping point for the second step of approximation, now based on a more subtle system of functional classes and relations between the latter. The results can be considered in turn as the second level of approximation and so on, until the n + i-th step yields the results identical to those of the n-th one.

The data obtained by approximational analysis permit one to distinguish the *core* of syntactic relations which includes the relations between those functional classes whose summary probability (among highest probabilities) amounts to 0.5. The pair configurations belonging to the core are established directly, their functional classes being represented in the standard subroutines of the translation algorithm. The more frequent of non-core pair con-figurations are established indirectly, through the use of special *valencies of the second* type; because they bear no relation to the IL, they are called independent valencies. They may be considered as incongruent with regard to the PL syntactical core. This fact produces additional evidence for the close connection between valencies and incongruences.

The algorithm for statistico-combinatorial modelling works *without any use of word and phrase meanings and without any kind of preliminary-grammatical information.* Only texts (divided into phrases, words and phonemes, or graphemes) are given and investigated within a frame of strictly determined programs which can be fully executed by computers. The statistical operations of the algorithm consist mainly in correlating conditional probabilities with unconditional ones, the set-theoretic operations mainly in grouping linguistic units according to their combinatorial properties with regard to the key point revealed by correlation of probabilities. The statistical and set-theoretic operations work in the algorithm alternately; transfer of control from one routine to another depends on the results obtained in the last executed subroutine.

The algorithm includes routines for investigating morphology, syntax, word-derivation, and semantics; it is fully described in N. D. Andreyev's paper published in *Materialy po matematičeskoj lingvistike i mašinnomu perevodu,* tom 2 (Leningrad, 1963), pp. 3-44.

When the statistico-combinatorial modelling of morphology is started, we must first of all establish the probabilities of the paralanguage elements. Conditional probabilities of phonemes (graphemes) correlated with unconditional ones permit one to find out the first affix of a morphological paradigm. A set of bases combining with the affix is compared with another set of bases combining with the second affix, and a subset belonging to the two sets is formed. A recurrent routine reveals all the affixes constituting the paradigm and the type of bases for which the paradigm is characteristic. When all the types existing in the language are established, the next routine investigates the co-occurrence of types. The results make it possible to group types into divisions analogous to parts of speech. Binary indices connecting affixes with the divisions are formed; neighbourhood of the indices in word-strings is used for splitting polysemic affixes into primary ones. A new routine is utilized for functional grouping of primary affixes which leads to obtaining formal categories analogous to grammatical ones. Each elementary functional group of affixes is connected with several formal categories, thus yielding a formal image for words whose affixes belong to the elementary group. When a language possesses no inflexions (type of Vietnamese) the algorithm, having discovered the fact, turns to treating functional words, chosen again on a statistico-combinatorial basis, as separately written "affixes".

Procedures used for investigating syntax and word-building are based on very similar principles. Probabilistic modelling of semantics partly differs from them: it is founded on *semantic distances.* The latter are calculated according to formulas that require numbers for co-occurrences. The similarity between two words is measured in six different ways, and the weighted mean square of these is used as an overall estimate of semantic distance. The first component measures the mean separation of two words in the word sequence of each sentence. The second component is derived from the tree structures of the sentences, distance being measured by the number of links between words. The third component measures the tendency of words to occur together in one compound. The fourth measures the extent to which words tend to share common neighbours to the right and left; the fifth, the extent to which they share common governors and common dependents. Finally the sixth component measures their tendency to combine with common partners in forming compounds. The first three components are of a syntagmatic nature, the last three ones are of a paradigmatic type. Problems of synonymy, homonymy, polysemy, semantic groups, semantic regions, are approached by an *a posteriori* method, that involves taking some sets of words which, all would agree, constitute a semantic class of the given kind, discovering what properties these sets have in terms of semantic distance, and accepting all sets which show the same properties as representatives of the class.

Both the particular ways along which the universal algorithm for statistico-combinatorial modelling proceeds, and the resulting grammar, depend on the internal structure of the investigated PL. Comparing and classifying those different ways will inevitably lead us to the independent algorithmic typology of languages. Projecting PL grammars onto the IL grammar and evaluating the resulting systems of incongruences leads us not less inevitably to the dependent algorithmic typology. Here the IL serves as the origin of the typological space.

Both algorithmic typologies (AT) are necessary for the better solution of machine translation problems: the descriptive (enscriptive) operations are connected with the independent AT, the forward (backward) normalization operations – with the dependent AT. The theory of human heterolingual rendering differs from the two AT's functionally: a man repeating the understood message in another language needs the theory neither before the rendering nor during it – but after it, in order to evaluate the results obtained. This means that the theory of HHR is essentially a scheme for comparison of two messages, the input and the output one, with regard to their thought-and-image contents; it may therefore be named the *comparative psychoinvariant textology.* Only after the properties of psychoinvariants have been adequately studied will one be able to venture to construct a typology of languages correlated with thoughts and images.

6. To minimize the volume of normalization operations we must have the IL as close to the PL's as possible. It is, however, impossible to move the IL in the direction of the Chinese language, for example, without at the same time moving it away from the structure of Russian, and vice versa. We are, therefore, obliged to seek a middle course; i.e., to minimize the average quantity of incongruences for the translational field of the PL's taken as a whole. By appropriately weighting each language of the field, we are able literally to *calculate* the properties of the IL (the calculation has just been performed in Leningrad).

Not only the general properties but also the concrete elements of the IL – simple and complex ones – may be calculated with the help of the weighted means. Looking at a term through the entire PL field, we shall usually see that in the majority of its languages the term is represented in a similar cluster of sememes, and only a minority gives several deviating representations. Let us take as an example a subfield of 9 paralanguages and a term in it: Russian *obratnyj tok elektroda* = English *inverse electrode current* = French *courant inverse d'electrode* = Spanish *corriente inverse de electrode* = Italian *corrente inversa d'elettrodo* = Dutch *omgekerede electrodestroom* = Polish *prad elektrody wsteczny;* all seven are congruent with each other, and form the clear majority. Two remaining languages give incongruent equivalents: German *Kathodenstrom,* and Swedish *backström*; both need the dependent valencies for the case to be converted to the IL. Those three sememes of the case, found in the majority of the subfield, with the meanings *(current), (inverse), (elctrode),* and their corresponding semoglyphs 00065, 14230 and 00665 - taken from the real IL dictionary – form a *basic* representation (BR) of the term in the IL. The procedure of getting the BR's is not always so simple and easy, and sometimes one must use a rather complicated routine of calculating the BR; nevertheless the routine is subordinated to the same law of minimizing the sum total of incongruences throughout the PL field. The BR's constitute the system of the IL units of the second order, called *koinoglyphs.* The koinoglyph system must be considered as an outcome in the sphere of retrieval language, that is of the sign code for information retrieval.

The retrieval language (RL) is not required to minimize the average level of incongruence: it is a logico-pragmatical code serving as an instrument for accumulating information. Its structure is fully determined by the classification of scientific facts, and cannot depend on any field of paralanguages and is therefore not identical with the structure of the IL. In spite of their dissimilarity, the very existence of the IL as a passdoor to the RL evidently facilitates creating a truly international network of information retrieval. Instead of translating from so many PL's into the RL and back, with the IL it is sufficient to have only two algorithms of translations: the IL-RL analysis and the RL-IL synthesis. Thus, machine translations (MT) becomes the first stage of information retrieval (IR).

The most advantageous scheme of MT will be that of establishing 200 national MT computers with only two algorithms of translation in each: analysis from the national PL to the IL, and synthesis from the IL to the national PL. Every important piece of scientific, technological and public information will be fed into the computers, translated into the IL, 200 copies of the translations being spread among all the national centers and duly translated back into the output PL's. The most advantageous scheme of IR will be that of establishing two IR computers for every branch of science and technology, duplicating each other and situated in opposite hemispheres. The materials in the IL, produced by the national MT computers, will be incessantly put into the branch IR computers, according to their contents; the two international systems of computers (MT and IR) will be indissolubly interwoven with each other by means of the Intermediary Language of Machine Translation.

Mankind has had numerous languages for communication of class I, "humans-to-humans"; now we elaborate codes for communication of classes II, "machines-to-machines", III, "humans-to-machines", IV, "machines-to-humans". With this new development the linguistic aspects of translation are focussed around that unique language which serves the communication classes II, III, and IV simultaneously, that is around the Intermediary Language of MT. One may foresee a not very remote period of time when the IL, common to men and machines, will expand the sphere of its application to communication class I too. Men, getting accustomed to meeting one and the same language circulating between all the computers, may take that lead and begin to use the IL as a means of direct access to the electronic "brains", therewith saving the extra time and money which are spent for the MT, preceding and following the IL. To facilitate the process of direct communication with information machines, a phonetic form of the IL will be developed, because of the millennia old custom of men to utter and comprehend sounds easier than figures.

But even such development will not kill the theory of translation: we can press upon the terrestrial machines our Intermediary Language, but we shall not be able to do the same with regard to extraterrestrial civilizations. Being involved into a group of those cultures, each with their own IL, we shall be compelled to construct in cooperation with them the Intermediary Language of the Second Order, which will mean a new life to the theory of translation and make it a Science of Highest Rank and Importance.

Till now we, linguists, dared only *explain* languages. The time has come, when our chief occupation must be *creating* them.

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DISCUSSION

WINTER:

I would like to make two brief comments:

1. The basic assumption about the essential difference between human and mechanical translation is only partly justified. It is not true that all human translation implies comprehension of content except in the case of a beginning language student. Rather does it seem to be a very common experience in practical translation work that

the content one is asked to render in the target language is comprehended only in part; still, the human translator can exact the transfer. To give an example; there is no obstacle to my translating a text in nuclear physics or in advanced mathematics without my understanding it, provided that I know the linguistic structures involved and that I have been furnished with the appropriate vocabulary information.

2. One consideration which seems to let us favor the introduction of an artificial interlanguage is the resulting economy in the number of translation programs needed for the handling of a large quantity of natural languages. Obviously, if texts in ten source languages were to be translated individually into ten different target languages, we would need one hundred individual programs. If we used an artificial interlanguage, only twenty such programs would be needed. However, if one decided against an artificial interlanguage, but instead chose to select a natural language belonging to the twenty referred to, clearly only nineteen transfer programs would be called for. Thus, an artificial interlanguage does not constitute a source for maximum economy; moreover, and this is more decisive, reliance on an artificial interlanguage implies reliance on an entity which one cannot help considering ill-conceived in strictly linguistic terms.

HAUGEN:

I have had no experience whatever with machine translation. However, I have been translating all my life, both informally as a bilingual speaker, and formally as a teacher and writer. Not until reading Andreyev's paper, however, did I discover that what I have been doing is not translation at all, but "human heterolingual rendering". I wish to say right from the start that I protest strongly against this redefinition of the term "translation". It would be a melancholy step towards the dominance of machines over men if the word "translation" should come to be synonymous with machine translation. Andreyev has given us an instructive analogy by comparing the work of the machine with that of our schoolboy cribs. In my lexicon this is not translation at all; it is just what I have called it, a crib. At its most successful it carries over from one language to another that fraction of the message which is conveyed by the most obvious lexical equivalents and the least subtle morphemic features. Even the high redundancy of natural languages cannot save the message from a disastrous loss of information when it is filtered through this kind of distortion. If we must include mechanical translation within the range of our definition of translation, let us at least keep the modifier "mechanical", abbreviated MT, and contrasted with "human translation", abbreviated HT. Let us not use the latter term for that subhuman kind of work produced by our less gifted students, whose brains are still vastly superior to those of the computers. Perhaps their work could be called "mechanical human translation", or MHT.

Except for this purely terminological comment, I commend Andreyev's description of HT. He assumes "a set of thought and images" between the translator's input and output. This corresponds rather exactly to my own intuitive experience in translating from Norwegian to English and back. The input in the SL does not trigger the output in the TL directly, except in routine messages for which direct associations have been established by previous experience. To put it crudely: the input forces me to recreate in my mind the social context of the utterance and to search my memory for the closest equivalent in the output language. Instead of the single S-R box which receives the input and generates the output, I have to have two such boxes, one for each language. The channel between them is not a mechanism which matches words and structures, though it can also do this, but one which matches the message contents. Permit me to clarify by an example: in older Norwegian plays one often finds cultivated ladies exclaiming “Gud!”, which any mechanical human translator would unhesitatingly render “God!” This can be avoided only if the translator stops to recall the kind of person involved and matches the exclamation with one which similar English speakers might use, e.g. “Good heavens!” or even “Dear me!” I once translated a physics exam from Norwegian to English. When I submitted it to a physicist, he laughed and found it necessary to make a number of corrections in order to make it a correct message. Ideally translation should convey the whole message, without loss of information. This can only be approximated by a process of re-creation, in which a new utterance in stimulated by an imaginary analogue of the situational and linguistic context of the original utterance. The term information here includes not only the referents of the message, but also everything that a message can and does tell us about the speaker himself and his attitudes. It might be possible to set up a scale for measuring this kind of information, and in this case it is clear that the gap between any kind of HT and the best possible MT is not only vast now, but is likely to remain so in the foreseeable future.

FRANCESCATO:

The phrasing, “time has come when [the] chief occupation [of us linguists] must be creating languages”, is inaccurate insofar as language has always been created by human beings.

GARVIN:

1. Prof. Andreyev’s theoretical position is reminiscent of Hjelmslev’s conception of the “purport of content”. In Hjelmslev’s terms, the construction of an interlingua would have to be based on an independent analysis of the purport of content.

2. The desirability of an interlingua for reducing the number of algorithms required for multiple translation has been asserted for several years now and can, in principle, not be disputed. The a priori construction of an interlingua, on the other hand, must be considered extremely unrealistic. It would require the comparison of a multiplicity of languages of diverse genetic origin in a degree of detail comparable to, and exceeding, that needed for historical reconstruction.

3. A more realistic view of the possibility of reducing the number of algorithms for multiple translation can be based on the separation of recognition routines (analysis)

from command routines (synthesis), which is already being followed by a number of machine translation groups. Instead of designing an interlingua a priori, separate recognition and command routines can be written for various languages. The information obtained by the recognition routine for a given source language can then be used by a number of different command routines for various target languages, and conversely. A master control program can be imagined that would act as a "switchboard" into which the different recognition and command routines could be connected as required. The advantages of such an empirical approach are that the various recognition and command routines can be written and checked out separately in the process of designing practical systems for individual language pairs, and the ambitious objective of a more general translating system is deferred until it can be based on tested experience.

HAHN :

Since no two languages make precisely the same distinctions, any translation, especially that provided by a machine, must be hopelessly inadequate. For instance, how can English represent the nuance denoting a change in human relationships presented in French or German by a shift from *vous* to *tu* or from *Sie* to *du,* or by the reverse shift? – It seems to me that a mechanical translation from any given language can be adequately interpreted only by one who knows the language which is being translated – and in that case he does not need the machine!

P. IVIĆ:

Every translation, human or mechanical, brings upon a certain loss of information (distortion of the message). This loss increases if we translate from one language to another, and then from this one to a third one. Would the use of the intermediate language in mechanical translation not also cause an augmented loss of information?