MECHANICAL TRANSLATION WITH A PRE-EDITOR
AND WRITING FOR MECHANICAL TRANSLATION

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One of the most important factors in all translation is the state
of semantic explicitness of the material form of the message to be
translated. There is, however, this fundamental difference between
human and mechanical translation: the human translator has at his
disposal situational criteria of degrees varying according to the
accessibility of specialized knowledge to make up for the lack of
explicitness of the lexical, grammatical and contextual semantic
criteria of the material form of the message. MT, on the other hand,
can make use of only the criteria supplied by the material form itself
of the message.

If the state of semantic explicitness of this material form were
always 100%, MT would be an easy task indeed. But this is rarely the
case. The absolute impossibility of including in the mechanization
process all situational criteria — that is, also those semantic
criteria at the disposal of the human translator, which are not
supplied by the conventional material form of the message —presents
the most serious problem for MT. Many of these situational criteria
are, however, inferable from the narrower and wider context. Now we
may be able to abstract at least the grammatical and lexical criteria,
and, perhaps, also the contextual criteria of a language which enable
a native in most cases to determine all incident, grammatical and non-
grammatical, meanings in a semantically not completely explicit
conventional material form of a message. And it has also to be
admitted that it is at least theoretically possible to build
translating machines on the basis of such criteria. It is, however,
well to realize that these criteria, especially those relating to the
context, are quite numerous, that the number of their possible co-
occurrences is exceedingly large and that the variability of different
states of semantic explicitness of the conventional material form not
only of different messages of one language, but also of different
sections of one and the same message, is practically infinite.

Therefore, if it is our ambition to create machines which
translate messages from one language into another without any
intervention of a human agent, then the realization of MT may either
never come about, or prove impractical.

No doubt, the ideal of MT would be a mechanization of the
translation process in which the maximum requirement in the human
sphere is a monoglot on each side of the assembly line — that is, a
mechanical system which on the feeding side swallows foreign messages
of a MT period in their conventional material form, and which on the
delivery side spews out these messages in one of the possible
conventional forms allowed by the target language for which the system
is built. Such a mechanical translation system, since it would not
require any change in the conventional graphic form of the foreign
message, of course does not need a pre-editor. The monoglot on the
feeding side consequently does not need to know the language of the
foreign text. He only needs to know the graphic symbols in which it is
written. He is only concerned with the dialling of these symbols into
the translation mechanism. This ideal is, however, for the reasons
stated above, not attainable. Nor is it necessary to aim so high. In

MT, as different from human translation, our ambitions need not go further than, for instance, a target language form of the coded message which, though not conventional, is, nevertheless, quite intelligible. Nor need we, on either the feeding or the delivery side, exclude completely the intervention of the human brain in the MT process. The problem which faces us here is the minimum human intervention necessary to make MT both possible and practical.

There is, in fact, one possible approach to the problems of MT which, with comparatively little interference with the conventional material forms of both the code and target languages, comes very near to the ideal of complete mechanization, or which, under conditions man is able to create, may even result in not only a virtually complete but also a very practical mechanization of the translation process. But before I can outline this approach, I first have to specify a few points. These points concern the conventional phonic and graphic forms of messages, the question of a pre- and post-editor, and, at last, the question of Writing for MT.

Theoretically speaking, MT could be based on either the phonic, or on the graphic form of language. It is, for instance, at least theoretically possible to think in terms of a translation mechanism set into motion by speaking into an apparatus similar to a telephone receiver. Or we may start a mechanical translation process by dialling written forms of a message into a dialling apparatus similar to that of a modern desk telephone. In our approach we have excluded a consideration of the "cryptophone", the phonic symbolization, and have been content with a study of the "cryptogram", the graphic symbolization of semantic content to be mechanically "decoded", to use Dr. Warren Weaver's very descriptive terminology.[1] The reason is that many languages with MT value, that is languages important for MT, have a historic script which represents an older stage of the language concerned, and this historic script is often semantically more distinctive than the modern phonic form. Our main problem is, therefore, the graphic distinctiveness with regards to meaning. Give us graphio-semantically completely explicit texts, and the engineers will do the rest! Our difficulty lies, therefore, not in homophones — that is, words with different meanings but of identical pronunciation — but in homographs — that is, words with different meanings but of identical graphic form. This difficulty brings us immediately face to face with the problem of editing in MT.

In order to deal with the difficulty of homography some sort and degree of editorial work is unavoidable in MT, This editorial work can be done either by a pro-editor who makes the graphio-semantically inexplicit form of the foreign message completely explicit, that is digestible for the machine before it is fed into it, or it may be done by a post-editor who, dealing only with the product of MT — that is, the target language form supplied by the machine — selects from the several alternative translations offered those which best suit the context. Dr. Bar-Hillel has in a number of lectures ably demonstrated that, if we limit ourselves to certain Western languages more closely related to English, i.e. German, and to scientific publications, and if we, furthermore, limit the mechanical dictionary to semantically non-overlapping synonyms, then multiple non-grammatical meaning can be

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[1] Manuscript on MT dated July 15, 1949 (hereafter WWMT), No 7, TRANSLATION AND CRYPTOGRAPHY: "it is very tempting to say that a book written in Chinese is simply a book written in English which was coded into the 'Chinese code'".

satisfactorily dealt with by a post-editor.[2] You will hear more about
<u>MT with a Post-Editor</u> from Dr. Bar-Hillel himself. Here I should like
to say only so much: if we are unable to develop a MT that does not
limit itself to closely related languages and scientific publications,
and if we are unable to develop a simple pre-editorial solution which
makes possible the mechanical determination of both the grammatical
and non-grammatical incident meanings, then the post-editorial
approach is the answer. In any case, if we are not satisfied merely
with a decoding of the semantic content of a foreign message, but also
desire the product of translation to be in a conventional form of the
target language, ready for publication, then MT, like all
translations, will require a post-editor. In this respect we may even
speak in terms of MECHANICAL TRANSLATION WITH A PRE- <u>AND</u> POST-EDITOR.

It is, however, quite clear that a MT which requires a post-
editor to determine all incident meaning in the translation product is
very far indeed from the ideal of MT defined above. It leaves the
final step in the decoding process, the determination of incident
meaning, to a human agent. Let us now see whether we can not get
closer to that ideal with a pre-editor. I shall have to deal with the
problems of TARGET LANGUAGE IN THE LIGHT OF CODE LANGUAGE in my second
paper.[3] Here we are only concerned with the first half of our
definition of the ideal of MT, namely that of a mechanical translation
system which on the feeding side of the assembly line swallows foreign
messages in their <u>conventional</u> material form. This means a mechanical
system able to digest and translate foreign texts in the grammatical
and lexical form characteristic of or allowed for, the language period
for which the translation mechanism has been designed, without the
necessity of <u>any</u> pre-editorial work. This ideal, we have already said,
is unattainable, at least for a considerable time to come. The task
before us is, therefore, to solve somehow the problem of the graphio-
semantic inexplicitness of the foreign language text. Such a solution,
as far as MT With A Pre-editor is concerned, can only lie in the
direction of a graphic supplementation of the conventional form of the
foreign message which raises its graphio-semantic explicitness to the
level necessary for a mechanical translation. The simplest form is a
kind of pre-editing in which the pre-editor indicates all incident
meanings by special graphic symbols which he adds to the conventional
written form in all instances involving multiple meanings. The
important point in this pre-editorial work is, however, that the
determination of incident meaning does not only depend on the semantic
peculiarities of the <u>foreign</u> language, but has to be made also in
consideration of the semantic peculiarities of the <u>target</u> language
concerned. Our problem is multiple meaning in the light of <u>code-target
semantics.</u> If we, for instance, want to translate the English sentence
"he is an ass" into Chinese, we have to find out whether the Chinese
word for "ass" can also be used as a contemptuous expression denoting
a stupid human being. If it can, then the Chinese equivalent for the
animal called "ass" can be used as a translation of the word "ass" in
the English sentence above. But if it cannot be so used, then another
Chinese word denoting something like "stupid" or "foolish" has to be
used, or the semantic content of the English sentence has to be
expressed in a completely different way according to the idiomatics of

[2] Cf.   Dr. Y. Bar-Hillel,   THE PRESENT STATE OF RESEARCH ON MECHANICAL
TRANSLATION (hereafter PRMT), American Documentation, Vol. II, No 4, pp. 6-8
of reprinted copy.
[3] GENERAL MT AND UNIVERSAL GRAMMAR.

the Chinese language,

There are at least two possible approaches to deal with this problem of code semantics versus target semantics, one of which contents itself with a mechanization of the translation process in the narrower sense, whereas the other aims at a mechanization of the translation process in the wider sense. We may,for instance, decide that the scope of MT embraces only the translation process proper and does not include the semantic interpretation of the code language text. This is actually the theoretical basis of the post-editorial approach. We could do this also in a "MT with a pre-editor". We could namely put the burden of the semantic interpretation on the buyers of MT, that is all those who want foreign works mechanically translated. This approach is closely bound up with the problem of Writing For Mechanical Translation.

Expressed in most general terms, "writing for MT" means that people desirous of a MT of foreign language material are required to submit these to the MT center in a specified form, namely a form whose language and/or script is better suited for MT than their original form. This specified form may either be entirely different from the original form, or it may be merely a modification. We may stipulate that, whatever is not submitted in a specified form, will not be accepted for MT. Such a procedure could appreciably simplify the engineering problem and even result in a complete mechanization of the translation process proper.

People desirous of a MT may for instance be required to write their manuscripts in, or to transcribe their publications into, an artificial language, or to submit them in a completely regularized form of the foreign language on the lines of Professor Stuart C. Dodd's Model English.[4] You will hear more about Model English from Professor Dodd himself in his paper on Model Target Languages. In my second paper I shall also have to touch upon Model English in connection with the problems the target language poses when viewed in the light of the code language. Code language texts in a regularized language could greatly simplify the mechanical correlation of the grammatical forms of the code and target languages.

Or we could request the buyers of MT to submit foreign texts whose linguistically and graphically conventional form they have previously made graphio-semantically completely explicit by the insertion of distinctive supplementary symbols. We could namely develop monoglot dictionaries — that is dictionaries entirely in one of the foreign languages with MT value - which, in the light of the semantic peculiarities of each of the target languages, explain every one of the multiple meanings carried by the meaningful constituents of foreign language texts and which indicate each incident meaning by a distinctive symbol. Such dictionaries could, of course, also be mechanized. The buyers of MT would then use these dictionaries and select from them the supplementary symbol indicated by the incident meaning concerned. This procedure would give us a graphio-semantically completely distinctive foreign text which, together with certain adjustments on the target language side which I shall discuss in my second paper, would allow a complete mechanization of the translation process in the narrower sense. But it is well to stress that we can here speak of a complete mechanization only because we have

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[4] General Semantics Bulletin, Nos. 8 & 9, Institute For General Semantics, Lakeville, Conn.

excluded from the scope of MT the mechanization of the determination of incident meaning.

But if we aim at a mechanization of the translation process in the wider sense, if we think that the determination of incident meaning should be included in the scope of MT, we can pursue another approach which includes a pre-editor knowing the code language concerned, and a mechanized monoglot dictionary of the type outlined above. When the pre-editor dials the conventional graphic form of the foreign message into the translation mechanism, it would first pass through the mechanical dictionary. Whenever in terms of the target language no multiple meanings are involved, the dictionary mechanism would not intervene and the dialled material would move on to the next stage in the translation process. Otherwise a device would call the attention of the pre-editor to the fact that multiple meanings are involved and the dictionary entry concerned would appear on a screen. The pre-editor would then select the meaning required by the context and dial the distinctive graphic symbol representative of this meaning and supplied by the dictionary entry. The dialling of the supplementary graphic symbol would then release the section concerned of the foreign text for the next stage in the translation process. This solution I have discussed in greater detail in two previous papers.[5]

All the solutions I have mentioned are feasible. But, I believe, they will remain academic. They will not lead to a materialization of MT because they are not practical at all. The burden on the supply side is too great, the extent of human intervention too large, the essential and most complicated aspect of MT, that of multiple grammatical and non-grammatical meaning, remains unmechanized. It is true that the ideal of a monoglot on the feeding side who does not know the target language would be realized, but not the ideal of a monoglot who does not need to know the code language. On the contrary, he has to know it. These solutions furthermore, do not fulfill the ideal of a MT based entirely on the conventional. material form of the foreign message. On the contrary, this conventional form has to be either replaced, modified or supplemented. These solutions cannot help still being too slow. They are, in short, still very far from the ideal of complete mechanization.

There is, in fact, one possible approach which, I believe, will ultimately bring us much closer to thin ideal. Dr. Warren Weaver suggested that "it does seem likely that some reasonable way could be found of using the micro-context to settle the difficult cases of ambiguity".[6] My approach — a radical departure from that suggested in my previous papers[7] — is an attempt in that direction. I shall now, in the short time still at my disposal attempt to outline this approach. But before I can do so, I have first to clarify a few points,

If we speak of the mechanical determination of incident meaning, we do not think of a mechanical system which actually compares the multiple meanings of a code word with the multiple meanings of its possible target equivalents and then selects the appropriate target equivalent. Our anthropomorphisms in such statements are, of course,

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[5] Studies in Mechanical Translation, No.1: MT, and No.2: SOME PROBLEMS OF THE MECHANICAL TRANSLATION OF LANGUAGES (both mimeographed), Department of Far Eastern and Slavic Languages and Literature, University of Washington, Seattle.
[6] WWMT, No.5
[7] See footnote 5.

not to be taken literally. Such a mechanical system is impossible. What we have to look for is a way to somehow link the abstract problem of code-target semantics to something concrete, something material, in the context which may serve as a stimulus for a mechanical system so designed that its purely mechanical reaction to that stimulus results in the supply of an appropriate target equivalent. We may either find such stimuli in the code text or, if not, we may be able to create them. In either case we shall, however, have to be guided by considerations of practicality, that is considerations of the following limitations concerning the code and target texts:

The solution should not necessitate the consideration of incident non-grammatical meaning, of any dictionary, or a knowledge of the target language by a human agent, nor should it require any change in the language of the code texts. And even the traditional spelling should remain virtually unchanged. In order to make this last point completely clear, I have to add the following:

We have already indicated earlier that we are for the time being thinking only in terms of a MT based on the cryptogram, the graphic symbolization of the semantic content of foreign messages. I have to add here that at this initial stage I am considering only those graphic symbolizations which are alphabetic. In the case of languages with non-alphabetic scripts we shall make use of their customary romanization. Where this is lacking, we shall choose their semantically most distinctive romanized form.

This approach will, apart from the specified utilization of certain conventional non-alphabetic symbols found on the average American typewriter, ultimately operate with diacritic marks placed under certain letters. But in order to understand fully the significance of this approach, it is better to describe it in terms of a distinction between capital and small letters, though, if we would really make use of this distinction, we would have to limit ourselves to those alphabetizations which make such a distinction.

The next point concerns the meanings in which we shall use the terms "spelling" and "orthography". For us "spelling" will not mean "conventional alphabetization", but "conventional alphabetization less the distinction of the form of letters, for example capital and small letters". The term "orthography" we shall not use in the sense of "correct spelling", but in the sense of "the form of the letters, for example capital and small letters".

Another point is to what extent we can and should interfere with the conventional form of the code language and its conventional graphic form. I believe that all approaches to MT which are based on an interference with the language and the "spelling" of foreign messages are doomed to failure. This is, as I shall point out in my second paper,[8] quite different on the target language side. The problems of MT have to be solved in such a way that the semantic content of foreign messages can be mechanically decoded without any previous change in both their language and their conventional "spelling". In this respect I have come to realize that the terms "pre-editor" and "pre-editing" I have used hitherto are liable to create wrong impressions. No pre-editing will be necessary if no change in the grammar, vocabulary and "spelling" of the code language is involved. There is, however, one thing with which we may interfere on the code

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[8] See footnote 3

language side without affecting its language and "spelling". This is its "orthography" in the sense defined above. Let us now see whether we can make use of "orthography" for the mechanical determination of incident meaning.

The human reader or translator determines incident meaning by context. As far as the narrower context of the conventional graphic form of messages is concerned, it is the meanings of co-occurrent meaningful constituents of the text which helps him in his determination. Of great relevance - at least as far as one particular language is concerned - are Abraham Kaplan's conclusions that "A context consisting of one or two words on each side of the key word has an effectiveness not markedly different from that of the whole sentence"[9] and that "The most practical context is therefore one word on each side, increased to two if the other word is a particle".[10] What we, consequently, would need for our purposes is a simple arrangement enabling the machine, in a purely mechanical way, to differentiate between certain types of meaningful constituents of the code text so that it can lift out of the narrow context any combination of such constituents and thus obtain them in an uninterrupted sequence. In order to obtain appropriate target equivalents we would then only have to fix the order in which different combinations of such constituents are lifted out and, furthermore, have to include in the translation system a mechanized dictionary containing the relevant word combinations. Double entry in the dictionary because of the possible post- or precedence of a co—occurrent word can be avoided by superimposing the mechanical dictionary entries of co-occurrences as well as the mechanical registration of word combinations lifted out of the code context.[11]

We would, therefore, have to make two decisions. First we would have to decide what meaning aspects of the code texts we want to have mechanically determined and what meaning aspects are best indicated by our supplementary "orthography" in order to make the mechanical determination of the remaining meaning types possible. What we want the machine to do is to give us intelligible target equivalents in an intelligible word order — that is, we expect the machine to reshuffle the code word order into the target word order and to determine the non-grammatical incident meaning in terms of code-target semantics. Machines will, however, for some considerable time to come, not be able, on the basis of only the conventional graphic form of code texts, to determine what grammatical functions in the construction of phrases and sentences code words have, whether they are nouns, verbs, adjectives, adverbs, etc., or whether they denote the actor, the action, the goal, etc. These aspects of the code text are, on the other hand, essential for the mechanical reshuffling of word order and for the mechanical determination of incident non-grammatical meaning. An MT based on their graphio-semantic distinctiveness has, moreover, the important additional advantage of reducing the access time of the storage organ! For since the machine would be able to distinguish different categories among the meaningful constituents of the code text, it would check each meaningful constituent not against its

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[9] AN EXPERIMENTAL STUDY OF AMBIGUITY AND CONTEXT, Nov. 30, 1950, The Rand Corporation, p.13, conclusion No.6.
[10] Ib., p. 14, conclusion No.7.
[11] Compare the use of superimposed code patterns in Zatocoding (Calvin N. Mooers, ZATOCODING APPLIED TO MECHANICAL ORGANIZATION OF KNOWLEDGE, Zator Technical Bulletin No. 62, Zator Company, Boston, 1951, p.4)

entire memory, but only against the memory department concerned: a noun against its store of nouns, a verb against its store of verbs, actors, goals of the action, etc., against its store of actors, goals, etc. etc. Our MT "orthography" will, therefore, where necessary, have to supplement the information of the conventional graphic form of the code language with regard to such grammatical meanings.

Secondly we have to decide what sort of symbolization our supplementary "orthography" is to use. In both decisions we shall have to consider practicality from the point of view of both the "MT orthographers" — that is, people who apply the supplementary "orthography" — and the engineers.

As a consequence of all these considerations I suggest a kind of "Universal MT Orthography" in which all alphabetized texts destined for MT should be written and which would supply the wherewithal necessary for the mechanical determination of target equivalents and word order. I shall now try to exemplify this approach with a very simple example.

German "er hegt die fromme Hoffnung" means "he entertains the pious hope". In terms of the semantic peculiarities of English, "hegt" may be rendered "festers, preserves, feels, nurtures, cherishes, entertains, etc.". Also "fromme" and "Hoffnung" have multiple meanings in terms of the English target language. Now, although "hegt" by itself has different English equivalents according to the context, yet, if followed by "Hoffnung" as its direct object, it has only one meaning. The same is the case with "Hoffnung" if preceded by "hegt" or "fromme", and with "fromme" if followed by "Hoffnung". Let us now assume that in the Universal MT Orthography all nouns have to be written with a capital first letter as in German, all principle verbs with a capital second letter and all attributive adjectives with a capital third letter and, therefore, give the German sentence the graphic form: "er hEgt die frOmme Hoffnung". Then the MT mechanism could be so designed that it lifts out "hegt" and "Hoffnung" and thus obtains these words in an <u>uninterrupted</u> sequence which it would then check against its mechanized dictionary store. Foreign words which in terms of English have no multiple non-grammatical meanings (i.e. German "essen", to eat) present, of course, a much simpler problem. They permit an immediate mechanical correlation not dependent on co-occurrent words. The supplementary symbolization of meanings such as "actor, action, goal, noun qualifier, verb qualifier, etc. etc." can, as pointed out in a previous paper[12], simultaneously supply the stimuli for the mechanical reshuffling of word order. An important point is, of course, the sequence in which the machine has to act on the different impulses caused by the conventional and the MT symbolization. Studies on the lines of Professors Victor A. Oswald and Stuart L. Fletcher's PROPOSALS FOR THE MECHANICAL RESOLUTION OF GERMAN SYNTAX PATTERNS[13] and of Dr. Y. Bar-Hillel's "operational syntax"[14] will be of great relevance here.

There is a large variety of possibilities in which the form of letters can be made to serve for the mechanical determination of incident meaning. The problem is, of course, much more complicated than the simple example given above may indicate, I am, at present, working on the problem of the minimum graphic modification of code texts necessary for our purposes. An important point is the fact that

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[12] SOME PROBLEMS OF THE MECHANICAL TRANSLATION OF LANGUAGES (see footnote 5).
[13] Modern Language Forum, Vol. XXXVI, Nos. 3-4.
[14] PRMT pp.10-13, and 21, point 4, of reprinted copy.

the Universal MT Orthography we may finally devise will in the case of each code language have to be modified in the sense that one or the other form of supplementary symbolization will be found unnecessary because of the complete graphio-semantic explicitness of the conventional form. For instance in the case of Japanese "kinashita", "came" or "has or have come", no supplementary symbolization of the past tense is necessary because the conventional form is in this respect always perfectly distinctive. I should, however, like to stress that in this approach only the distinction of the form of the letters such as capital and small letters is involved and that this will simultaneously serve for the mechanical determination of both word order and non-grammatical meaning. Authors or their secretaries will need to know no other language than that in which the foreign material is written. But what is more important, this Universal MT Orthography can be developed on such lines that its application by authors or their secretaries will not be dependent on the consideration of any incident non-grammatical meaning, whether in terms of the semantics of code language versus target language *or* in terms of the code language alone. Thus, as far as "Writing for Mechanical Translation" is concerned, they will not need to use any dictionaries.At most they would have to look up the list containing the principles of Universal MT Orthography if their memory fails them. And this list will hardly cover one page.

In his report on THE PRESENT STATE OF RESEARCH ON MECHANICAL TRANSLATION[15] Dr. Bar-Hillel has said that "It would seem natural to have the pre-editor deal with the elimination of morphological and syntactical ambiguities and with the rearrangement of the FL text[16] in accordance with a standard order in the TL[17] following a set of instructions available to him. The main business of the post-editor", he concluded, "would be elimination of semantical ambiguities, in addition, of course, to stylistic smoothing". But if the elimination of morphological and syntactical ambiguities by a human agent results in a code text form containing the wherewithal not only for the mechanical reshuffling of word order, but also for the mechanical determination of incident non-grammatical meaning, no post-editorial semantic determination would be necessary. Thus our approach as outlined above, in conjunction with certain arrangements on the target language side[18] will either restrict post-editorial interpretation to a minimum, or it may even make it completely superfluous,

But also all pre-editorial work may, under conditions man is able to create, become superfluous. It is clear that a "MT Orthography" can universally signalize only grammatical universals. In my second paper[19] I shall show how the territory of language universals may be artificially extended. Now if a supplementary universal MT orthography is applied to an alphabetized language text, then anybody who has acquired a knowledge of this orthography as applied to his mother tongue and who knows the alphabetization involved would, even before he has actually begun to learn the foreign language concerned, from the very outset recognize most of its grammatical meanings. He would at once be able to locate its nouns, verbs, qualifiers, actors,

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[15]P.5 of the reprinted copy.
[16]i.e., code text.
[17]Target language.
[18]See my paper mentioned in footnote 3.
[19]Ib.

predicates, goals, etc. etc. For example, without knowing Japanese, he would in "mUKashii Jiji to Baba ga aRimashta" (formerly an old man and an old woman there-were) at once recognize that "mUKashii" is an adverb (capital second and third letter), that "Jiji" and "Baba" are not only nouns in the singular, but the subject (capital initial and no other supplementary signalization), and that "aRimashta" is not only a verb, but the predicate in the active voice (capital second letter and no other supplementary signalization).[20]

    With such a supplementary orthography — assisted where necessary by an operational syntax on the lines of Dr. Bar-Hillel's suggestions[21] — the student would very quickly come to an understanding of foreign texts, since his actual language work could limit itself to a mastery of the vocabulary and those residual grammatical problems not signalized by supplementary orthography. Thus national governments may find it advisable to have supplementary MT orthography as applied to the mother tongue taught in the last year of grade school in order to make the future learning of foreign languages easier. They may even, in the national interest of making easier the learning of their respective languages by foreigners and — if the MT age materializes — in order to simplify and speed up and make cheaper mechanical translation, decide on an exclusive application of supplementary MT orthography to their conventional Latin, Greek, Russian or Gothic script form of their languages.

    In the latter case — which, I admit, may remain a fond dream — the need for a pre-editor in MT would, of course, disappear completely and the ideal of MT, complete mechanization, would be almost fully realized.

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[20]The universal supplementary signalization of the past tense would in this case not be necessary since the conventional graphic form (i.e., the ending "-ta" or "-mashita") is in this respect perfectly distinctive.
[21] That is in cases of grammatical meaning not signalized by the universal supplementary orthography. Cf. footnote 20.