Studies in Mechanical Translation

No. 1.

MT

by

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The Meaning of Signal

Signals in the sense of MT are coded messages to the computer ordering distinctive mechanical processes (FL signals) and their decoded form (TL signals). For the different kinds of MT signals we refer to §§ 54 - 58.
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Our Approach to the Problem of Mechanical Translation of Foreign Language Material.

(By Erwin Reifler, Associate Professor of Chinese, University of Washington, Seattle)

Abbreviations:

- MT: Mechanical Translation
- SL: Selected Languages
- FL: Foreign Language
- TL: Target Language

Quotations:

1. Leonard Bloomfield, Language:
   a) "A task for linguists of the future will be to compare the categories of different languages and see what features are universal or at least widespread."
      (p. 270)
   b) "... a form-class comparable to our substantive expressions, with a class-meaning something like 'object', seems to exist everywhere."
      (pp. 270, 272)
   c) "As to denotation, whatever can be said in one language can doubtless be said in any other...
      (p. 278)
   d) "... the difference will concern only the structure of the forms, and their connotation."
      (p. 278)

2. Joseph Vendryes, La Comparaison En Linguistique, Bulletin de la Société de Linguistique de Paris, 1925:
   a) "... à certains égard l'anglais... pourrait adjoindre une (classification), où il figureait par exemple à côté du Chinois; puisque, abstraction faite de toute parenté, évidemment hors de question, l'anglais et le chinois présentent, dit-on, certaines ressemblances de structure."
      (p. 5)
   b) "Cela entraîne le linguiste à appliquer la comparaison aux traits semblables qu'il observe entre diverses langues, sans souci d'en tirer la preuve, ni même la recherche, d'une parenté. C'est une étude riche d'enseignements (p. 5...). Ce n'est plus une tâche généalogique ou strictement historique, comme celle à laquelle depuis cent cinquante ans s'applique la grammaire comparée. C'est une tâche psychologique qui consiste à grouper des faits communs aux langues les plus diverses pour atteindre, derrière la réalité linguistique, l'esprit dont elle est sortie. Cette tâche est d'une étendue immense et d'une portée incalculable. En multipliant les enquêtes... on opérera une véritable révolution dans la pratique de la méthode comparative et pour tout dire, dans la linguistique. Le linguiste n'aura plus pour objet d'établir par la comparaison un rapport de parenté entre des états de langue séparés dans l'espace et dans le temps; il tirera de la comparaison des états de langues une connaissance précise..."
des besoins universels de l'esprit humain et des lois générales qui en régissent l'activité. Ses conclusions seront d'autant plus sûres que la comparaison portera sur des langues plus nombreuses, n'ayant entre elles aucun lien de parenté.

On en revient ainsi aux études de linguistique générale, si en faveur au temps jadis, mais par une voie où elles ont toute chance de se rénoverer avec plein succès (p. 6) ... à côté de la grammaire comparée traditionnelle, il y a place pour une linguistique comparative largement humaine, qui prendrait avec des moyens d'information améliorés, accrus et des données plus nombreuses et mieux classées, le travail qui avait été seulement soupirné par les philosophes de la fin du XVIIIème siècle." (p. 7)

c) "Assurément cette recherche d'une doctrine générale n'est pas nouvelle. Il y a une partie de la linguistique où elle est pratiquée depuis plusieurs décades et où elle a obtenu des résultats décisifs. C'est la phonétique... " (p. 7)

d) "Le travail du cerveau reste enveloppé de mystère; seul le résultat emprisonné dans les langues est accessible à l'étude. Pour constituer une grammaire générale dont les lois sont conformes à la réalité, la première tâche parait donc être de dresser un répertoire de tous les faits de grammaire observés dans toutes les langues. Seule une enquête complète pourraire méthodiquement faire connaître le caractère propre, l'étendue, la fréquence de chacune des catégories possibles de l'entendement humain. Un système à priori, bâti par raisonnement abstrait sans base solide dans le réel, devient rapidement caduque. L'intuition est dangereuse quand elle se substitue aux enseignements de l'expérience." (p. 9)

e) "... Une enquête générale sur les langues du monde sera complète les lacunes et des manques dans l'usage des catégories grammaticales. Mais elle montrera aussi quelles sont les plus répandues, celles qui paraissent nécessaires et qui répondent à un besoin de l'esprit humain. Cette recherche sera d'une importance capitale pour la psychologie tout court, à laquelle le langage offre un champ d'observation si vaste et si varié." (p. 12) ... Il faut constituer un tableau aussi complet que possible des catégories grammaticales et des procédés qu'ont employés les langues pour les exprimer." (p. 15)

f) "... L'enquête qu'il y aurait lieu de faire sur l'évolution des faits grammaticaux pourrait naturellement être étendue aux faits de vocabulaire. On peut imaginer la comparaison sur le plan des noms, dont les noms sont donnés aux choses et dont les noms une fois créés évoluent. La sémantique est une science qui doit aussi faire appel à la méthode comparative en l'appliquant à toutes les langues ... Il s'en dégage
assurément quelques idées justes: c'est d'abord que les créations de mots répondant souvent à des lois générales suivant lesquelles certains sens sont naturellement associés à certains sens. C'est aussi que les mots qui désignent les opérations de l'esprit et en général l'activité psychique sont le plus souvent empruntés à des notions matérielles; la vie morale n'est que peu à peu dégagée de l'animalité et le fonds le plus ancien du vocabulaire témoigne d'un état social qui nous remonte aux premières âges de l'humanité.

Il est particulièrement intéressant de suivre l'évolution des mots... Le façon dont se sont constitués les vocabulaires techniques, ceux de la religion et du droit, mérite d'être étudiée dans l'ensemble des langues. Une sémantique générale est aujourd'hui aisément concevable après certaines études très poussées qui ont été faites sur la constitution de telle ou telle famille de mots dans les langues classiques. Le comparatif devra seulement établir les conclusions. L'examen de l'origine des mots et des causes qui en modifient la signification fournit de bons indices des tendances générales de l'esprit humain... On s'étonne parfois de rencontrer les mêmes formules populaires, les mêmes proverbes, les mêmes fables, les mêmes thèmes de folklore dans des pays différents fort éloignés les uns des autres. On est alors tenté de croire à des transmissions effectuées au cours des âges et qui auraient provoqué des emprunts. L'emprunt est vraisemblable, on même assuré, dans certains cas; mais il y en a d'autres où il faut admettre une rencontre accidentelle. L'idée d'une même proverbe a pu venir indépendamment à l'esprit de deux êtres humains sans qu'ils se soient concertés. Peu de rencontres sont admisables aussi dans l'invention où le choix des métaphores dont les poètes ornent leurs vers...

... Il y aurait en tout cas une enquête générale à faire qui porterait sur les métaphores poétiques aussi bien que sur les dictionnaires l'expérience des relations sociales et sur les proverbes par lesquels s'exprime la sagesse des nations.

On peut croire que les mêmes sentiments produisent à peu près les mêmes effets chez tous les peuples. Ces effets doivent se refléter dans le langage. Il y a dans la nature même les uns une conscience qui subsiste partout identique malgré la variété des mœurs et des croyances, des institutions et des modes voisins. Ce fonds est alimenté par les passions qui sont le ressort de la vie et par les besoins qui en sont la raison... Une étude de ce fonds commun aboutirait à une sorte de 'dictionnaire des idées reçues' qui ne serait pas limité au monde bourgeois d'un temps, mais qui aurait une valeur universelle... Ce dictionnaire serait fort utile pour la connaissance de l'histoire des mots.1 (pp. 16-17)
Our Approach:

1. This approach is based on our work in semantic universals in different languages* and on our experience gained in classwork in translation problems. The most important ideas underlying this approach are:

A. Conditions for the Possibility of MT

2. MT is only possible if different languages can somehow be mechanically correlated. A mechanical correlation is only possible if:
   a) they have something in common and if
   b) what they have in common is expressed or expressible in distinctive signals.

3. A large number of linguistic features are known to be either universals, widespread (quotations 1a, b; 2b) or shared by at least two languages (quot. 2a).

4. Certain common or comparable features concern the phonetic aspect of language (quot. 2c).

5. Those, however, which concern the logical aspect of language are especially numerous. They are found in the grammar (quot. 1a, b; 2d, e) as well as also in the lexicon (quot. 1c, d; 2f).

6. The crucial problem, however, for the success of MT is the problem of distinctiveness of PL signals (cf. #2 b).

B. The Concerns of MT

7. The primary concern of all translation is meaning. Therefore, while the universal features of the logical aspect of language will be of primary importance for MT, universals in phonetics have no bearing on it.


See also my forthcoming article "The Importance of Comparative Semantics for General, Comparative and Historical Linguistics", ETC, A Review of General Semantics;
9. Of the conventional signals of language only the phonetic and graphic signals fall within the sphere of interest of MT as chief means for a mechanical correlation.

9. However, MT is at least in its beginning stage, less interested in the spoken than in the written form of languages. Moreover, the conventional phonetic signals are in a number of important languages often far less distinctive than their corresponding conventional graphic signals (so, for instance, in Chinese and Japanese, but also in languages like French and English, that is in languages with a "historical" form of writing. Consider also the extremely interesting case of certain Semitic languages mentioned in §§ 26, 27, 28, 30, 32).

10. MT will, therefore, in the first place make use of the conventional graphic forms of linguistic forms as signals for MT correlation. It is, for instance, not concerned with homophones, but with homographs (See sections 23, 24, 26, 27, 52, 53).

C. The Practical Aspect of MT

11. The importance for MT of descriptive and historical linguistics and especially of the linguistic analysis of languages as far as grammar and lexicon are concerned is emphasised. It has, however, to be pointed out that the aim of MT is entirely practical. It need, therefore, not strictly adhere to the results of scientific research. Wherever these serve its purpose, it will consider them. It will ignore them in those cases where an arbitrary treatment of the language material serves better the purposes of MT (cf. "attributable universals" in §§ 11, 69c, 77). We have, moreover, already pointed out that MT is primarily concerned with meaning, a feature of language often treated as a poor relation by many linguists and referred to psychology or philosophy. On the other hand MT is concerned only with the "what" of meaning and not at all with the "how" and "why". Thus also psychology and philosophy will probably be able to contribute only their
factual knowledge and experience to the solution of the language problems involved in MT. Linguistic, psychological and philosophical theories are not likely to have any bearing on it.

D. The Mechanisation Aspect of MT

MT is a mechanical problem only insofar as it has to adjust its language material to the limited capabilities of a computer. The solution on the language side must be one which does not require a computer with infinite variability, or with a variability too astronomical to be practical. In order to cut down the quantity of necessary mechanical processes to that minimum which makes the production of an MT computer-feasible we have to reduce the lack of explicitness of the FL text to the lowest possible degree. This we can do by:

a) establishing all those features that are common (or attributable, cf. Sections 56, 74) to all languages or, at least, to all SL, and have distinctive conventional graphic signals,

b) establishing all those features that are common (or attributable) to all languages, or at least, to all SL, and have in certain languages no distinctive conventional graphic signals,

c) establishing those features of b which admit of a logical arrangement in groups. (cf. Section 75)

d) arbitrarily creating additional distinctive graphic signals for the features indicated under c,

e) removing the inexplicitness of the FL text concerning the features mentioned under c by inserting the signals mentioned under d.
#13. We fully realize that this means the exclusion of a very important aspect of translation from the process of mechanization, namely that of interpretation (see Section 63). We contend, however, that:

a) whatever the native reader has to do by way of interpretation in the case of non-distinctive features of the FL text, can at least at the present stage of computer development, not be mechanized. Therefore, all that an FL text leaves to the FL reader to determine concerning lexical meaning, connotations, grammatical meaning, and word order, has to be added to the FL text before it is fed into the computer. And it has to be added in a form the computer can "digest";

b) the preparation of the FL text suggested above is the only possible, or at least the only satisfactory solution to our problem of dealing with a very large section of non-distinctive features in many languages (all zero representations of grammatical meaning, differences in word order and certain kinds of multiple meaning).

#14. To use "wider context" as a means to make non-distinctive signals distinctive and thus make them "digestible" for the computer is ruled out by the fact that the possible contextual co-occurrences of each FL signal are practically infinite, whereas the actual number of its possible grammatical or multiple lexical meanings is very limited (see Mr. W. Weaver's Memorandum on LT, p. 8, #5). Only those cases of contextual co-occurrences can be made accessible to mechanization which can be treated as "idiomatic signal units" (cf. §56d and e, §87).

#15. We believe that the machine cannot, at least at the present stage of computer development, be interposed between an FL text and a TL reader, but
only between the interpreting brain of the native reading the FL text and the ultimate reader of the TL text. The native has to read the FL text and, in the cases of inexplicitness of the text, record in it by additional (universal) graphic signals the result of his mental processes re grammatical meaning, word order and certain types of multiple meaning (cf. §§ 51, 52, 53, 55, 56, and 85-94). This means that the FL text has to be edited. (See Section 63)

§16. What the computer can do is only:

a) to take the place of a polyglot whose FL knowledge is limited to the extent that concerning all questions of grammar and lexicon not graphically explicit in the FL text he is dependent on the assistance of a native, another polyglot, or on reference books.

b) speed up all other processes of general (into all SL) or specific (into one TL) translation (including the use of dictionaries).

§17. The maximum requirement of MT in the human sphere — as far as the language side of the MT problem is concerned — is, on both sides of the assembly line, a monoglot.

§18. The final form of the interpreted FL text must be such that anybody ignorant of the meaning of the FL text, but familiar with the conventional written form of FL (for instance Chinese, Arabic, Greek), with the universal additional graphic signals and with the controls of the computer, can "dial" it into the computer.

E. The Language Aspect of MT

§19. Thus MT has primarily to be solved on the language side.
#20. What we need on the language side is distinctive graphic signals. These are lacking in the case of:

a) multiple meanings,
b) in zero representation of grammatical meaning (for instance "sheep", indicative of singular as well as of plural),
c) in non-distinctive graphic signals of grammatical meaning, that is graphically non-distinctive grammatical forms (as, for instance, "-d" in "decided", indicative of past tense as well as of past participle) and graphically non-distinctive word order (as, for instance, where 風, though following the verb 傷, is not its direct object. This case will, however, be treated as an "idiomatic graphic signal unit".)

#21. We have, therefore, a twofold task:

a) On the FL side: to supply, as far as possible, additional distinctive graphic signal for all meanings lacking them.
b) On the TL side: to select, as far as there are, by means of a comparative semantic research TL words which share all, most, the most important, or at least two of the multiple meanings of the FL signal concerned. ("shared transferred meanings", see #71b, 72, 73.)

F. The Signal Aspect of MT.

#22. As we have already indicated above (#9 and 10), MT is not concerned with linguistic forms, but only with their conventional written forms and their meaning. Moreover these conventional written forms (conventional graphic signals as different from the arbitrary graphic signals especially created for
the purposes of MT) are for us not of linguistic interest, but concern us only as more or less distinctive drawings or sequences of symbols that can be fed into a computer and can release a more or less distinctive mechanical reaction.

#23. MT is, therefore, not interested, for instance, in homophones, but in "homographs" of words of different origin (homophones or allophones represented by the same conventional graphic signal, for instance, English "pole", a long stick, and "pole" in "North Pole"). Homophones represented by allographs (cf. English "two", "too", and "to") are, of course, no problem to MT since they are represented by distinctive conventional graphic signals.

#24. A homograph of words of different origin is, for the purposes of MT, considered as one graphic signal with multiple meanings.

(Secondary Graphic Signals)

#25. But how about all non-distinctive conventional graphic signals of the FL text (cf. # 6)? Can these be made distinctive? We have already previously indicated in which cases distinctive signals are lacking (# 20) and outlined the double task (that is on the FL and TL side) which thus confronts MT (# 21). With respect to the use of additional graphic signals (# 21 a) we should like to point out:

(Conventional Supplementary Graphic Signals)

#26. There actually are a number of languages, important for MT, which use (sometimes optionally) additional graphic signals: Chinese, Japanese, Arabic, Hebrew (and to a limited degree also in French and Greek), for instance, have two conventional forms of a written representation, one less explicit, the other explicit to an often very high degree. Moreover, some of these languages are characterised by an extraordinary number of homographs, so, for instance, Chinese in the case of characters associated with multiple pronunciations and meanings,
Japanese when written either without kana or only in kana, Arabic and Hebrew if entirely written in consonants, as, for example, Hebrew יְדֵי versus יְדֵי, meaning "he ruled", יְדֵי meaning "king", and יְדֵי, meaning "Moloch". This is also, though to a much lesser degree, the case in French and Greek, as seen, for instance in French là, meaning "her ", versus là, meaning "there"; ou meaning "ox", versus où, meaning "where"; a meaning "has", versus à meaning "to"; du meaning "of the", versus d' meaning "due"; sur meaning "upon" or "sour", versus sur meaning "sure"; fut meaning "he was", versus fut, meaning "shaft", etc., and in Greek ἔφυ, meaning "to", versus ἔμφυ, meaning "one"; τούτο, meaning "where", versus τοῦτο, meaning "anywhere"; ΠΟΤΕ, meaning "when?", versus ΠΟΤΕ meaning "at any time, once", etc.

#27. As already indicated by some of these examples (יְדֵי versus יְדֵי, יְדֵי, יְדֵי; ἔφυ versus ἔμφυ and ἔμφυ), homographs are often used not only for homophones, but also for allophones (cf. # 23). This is especially frequently the case in Japanese where often the same characters are used for synonyms and even for allophonic allomorphs, namely when the same Chinese character is in one case used for its semantic, in another case for its phonetic value. This is also often the case in Chinese, namely when one and the same character is used either for words of the same origin but characterised by certain phonetic variations (often associated with different lexical or grammatical semantic aspects of the same fundamental semantic theme), or when one and the same character is used for words of different origin but similar (though different) pronunciations (in the case of certain phonetic loans).

#28. In these cases the use of the more explicit graphic form, consisting of the unaugmented conventional graphic signals plus a small number of supplementary graphic signals, often serves to make homographs distinctive (as, for
instance, the opt onal kana in Japanese). Let us illustrate this with examples from Chinese which, though possessing such supplementary graphic signals, uses them much less than the other languages mentioned:

#29. In the spoken forms of Chinese different tones often distinguish multiple lexical and grammatical meanings which in the written form mostly are in zero representation. Chinese has, however, the conventional supplementary graphic signals for the graphic indication of tones. These supplementary signals often appear in classical Chinese texts added to certain characters in order to indicate different pronunciations and/or meanings (for instance 卐 in the opening passages of the 《易经》). The following examples will show how such supplementary graphic signals also serve to distinguish multiple meanings:

a) lexical meaning: 卍 in the first tone means "crooked", in the third tone "song"; 擓 in the first means "to lean to", in the second "to suffer"; 棚 in the second means "to stumble", in the third "to kick"; in the fourth "to excite" (note in the latter case also the difference in the romanized forms: "chüeh" versus "kuei").

b) grammatical meaning: 種 in the third means "seed", in the fourth "to sow"; 王 in the second means "king", in the fourth "to rule" (cf. Hebrew י over versus יָהוּ, "king" and יִיהוּ, "he ruled"); 卷 in the fourth means "a roll or scroll", in the third "to roll up"; の in the third means "good", in the fourth "to love"; 重 in the fourth means "heavy, etc.", in the second "to repeat", etc. (note in the latter case also the difference in the romanized lexical forms: "chung" versus "ch'ung").
(The Educated Native Knows The Form And Value Of The Conventional Supplementary Graphic Signals Of His Language)

#30. We should like to emphasize that in the cases of languages mentioned for their use of conventional optional graphic signals the educated native is well aware of the existence of the distinguishing peculiarity concerned in the spoken form of his language (for instance, the tones in Chinese, different pronunciations of one and the same character in Chinese and Japanese, or of the consonantal form in Hebrew, Arabic, etc.) and is well acquainted with the use and value of the supplementary graphic signals concerned. Thus the use for the purposes of LT of these conventional supplementary signals in the case of the FL concerned would be an easy task and extremely valuable.

#31. In the cases of languages possessing such supplementary signals LT is, therefore, confronted with two possible FL texts, a less explicit one and a much more explicit one. Which one is LT going to use? The answer can only be in favor of the latter.

(The FL Text Has To Be Edited)

#32. But if we, in these cases, decide in favor of an augmented FL text, we shall, mostly, have to do some editing. Since, however, the educated native is well acquainted with the use and value of the conventional secondary graphic signals of his language (#30), this will not be difficult for the FL reader concerned. But here several new problems arise which have first to be decided:

With the exception of, for instance, French and Greek, all the languages mentioned for their conventional use of supplementary optional signals admit of different degrees in an editing process aiming at increasing the explicitness of their texts. For instance, in Hebrew texts intended for adult or educated readers — with the exception of scientific texts of linguistic import, the Bible and prayer
books — the conventional vowel signs and diacritic marks (for instance the dagesh) are added only in the case of certain words, namely wherever an omission of these optional signals would even in the case of adult or educated readers make the selection of the incident meaning (the incident reading) difficult. On the other hand, wherever mental processes of the adult or educated reader result in a correct interpretation of lexical or grammatical meaning in zero representation in the consonantal text, the supplementary signals are customarily omitted. Mutatis mutandis we have the same situation in Japanese and, to a lesser degree, in Chinese. Furthermore, the use of supplementary signals in these languages shows varying degrees of extensity according to the educational level of the reading public for whom the texts are intended or according to the different aims of the writers. The question which confronts NT here is the following:

\[ \text{13}. \text{ Shall we in these languages decide on any particular educational level or shall we, in the editing of the NT text concerned, use the conventional supplementary signals to their fullest possible extent? Since distinctiveness of the signals of NT is the crucial problem of NT, and since the native NT reader will often be unable to decide which conventional primary signal or signals (the NT signal less its supplementary signal or signals) are explicit enough, and since, anyway such decisions, if left to the NT reader, would enormously increase the time of editing, the answer will in most cases be in favor of the second alternative. We shall probably have to make an exception in the case of the Chinese language where the number of multiple meanings representable by conventional supplementary signals indicative of tones is corporately small and thus may not warrant their indiscriminate use. Here it may be more advisable to insert the tone signals only in cases where multiple meanings are involved and where they can be thus distinguished, but not in those where they do not} \]
indicate differences in meaning. Since the educated Chinese is always conscious of such semantically conditioned differences in tone, his insertion of the supplementary signals will not require much time. A further restriction of the use of the tonal signals in the FL text may be recommendable: multiple lexical meanings characteristic of one form class (§§ 39 b, 53 Ba/ga, 79) and all possible grammatical meanings are, in general MT, anyway made distinctive by universal arbitrary signals (§ 53 Bb and c). Therefore, a special study will have to be undertaken in order to determine whether and how a double graphic indication of these meanings can be avoided in tonal languages like the Chinese and whether it is desirable to avoid it (cf. § 59). In specific MT conventional supplementary signals indicative of grammatical meaning will sometimes probably be preferable to the universal arbitrary signals indicative of the same meanings (cf. §§ 54 b, 55 b).

§34. Another problem peculiar to the Chinese (and perhaps to other tonal languages) is that presented by the differences in the number and distribution of tones in the traditional literary system and the different modern dialects. The literary system has four, Standard Mandarin has also four, lacks however, the fourth of the literary system and has split the first tone of the literary system into two tones. Cantonese has nine tones. A special study has to be undertaken in order to determine whether the choice of any particular tonal system affects the graphic explicitness of the literary form of the Chinese language. If, for instance, arbitrary graphic signals based on the nine tones of Cantonese give greater graphic distinctiveness than those based on the four tones of Standard Mandarin or than the conventional supplementary signals (based on the traditional literary tones), MT will, of course, decide in favor on the first. The Chinese FL reader would then have to be Cantonese,
35. Thus MT will in the case of certain languages use supplementary graphic signals in order to increase their MT value (their graphic explicitness) to the fullest possible degree, namely in those languages which already have conventional supplementary signals. The obvious question which arises here for MT is whether or not this method can be extended to languages lacking such conventional supplementary graphic signals? Before we can answer this question, we have first to find out what made the use of conventional supplementary graphic signals desirable and possible in the languages possessing them:

36. In these languages such supplementary graphic signals were desirable and possible because of:

a) the existence of certain variant features of their spoken form not represented in their conventional primary written form (written form less supplementary signals) and

b) because of the fact that the educated native speakers concerned were and are well aware of these distinguishing features of the spoken form.

37. An analogous treatment is, therefore, desirable and possible wherever this double phenomenon occurs. Thus it is desirable and possible wherever in a language:

a) the spoken form distinguishes differences of multiple meanings not represented in the written form, and wherever

b) the educated speakers are well aware of these differences.

(Universal Arbitrary Graphic Signals)

38. The conditions for a treatment analogous to that accorded languages characterized by the possession of conventional supplementary graphic signals (§36-35) are common to all SL in the case of those graphically non-distinctive multiple meanings which are:
a) absolute or attributable universals (Sections 11, 69c, 77) and which

b) can be made distinctive by their grammatical meaning or by the department of knowledge in which they occur.

§39. This holds true for:

a) all cases of multiple grammatical meaning in graphic zero-representation,

b) those cases of graphically zero-represented multiple lexical meanings that are characteristic of one form class (Sections 53 Ba/aa, 79)

c) those cases of graphically zero-represented multiple lexical meanings which can be made distinctive by their grammatical meaning (Sections 53 Bc, 80)

d) those cases of graphically zero-represented multiple lexical meanings, other than those described in b and c, which can be made distinctive by subject labels indicative of the department of knowledge in which the meaning occurs (for instance German "Schiff" fend, meaning "ship"; "Schiff" fend, meaning "boiler"; "Schiff" fend, meaning "nave". (Cf. the symbols used in Hare-Sanders, Enzyklopädisches Deutsch-Englisches Wörterbuch, 16th edition, p. XVII. In the case of the most common meaning — in our example that of "ship" — of an FL word the distinctive symbol may, of course, always be omitted. (Cf. Sections 53 Ba/bb)

§40. We have, however, here to distinguish between General MT (translation from one FL into all selected TL) and Specific MT (translation from one FL into one TL). It is clear that in Specific MT the supplementary signalization will
be worked out in consideration of the agreements or disagreements peculiar to each set of two languages (cf. Sections 69, 61). But in General MT an adjustment is necessary for the following reasons:

§41. Many cases of §39 a) will, in spite of their graphic zero-representation, be semantically quite distinctive in their TL form as well as also in all of their MT-ed TL forms on account of the universality or attributability of grammatical concepts, namely by grammatical context. In Chinese, for instance, the occurrence of a subject or of certain adverbs of time in a sentence make person and tense of the predicate quite explicit. Thus 日 in 王 曰 可 only refer to the third person and to the past on account of the co-occurrence of 王 and 曰. Moreover, the cases of grammatical zero-representation vary from language to language. On the other hand many cases of §39 b) are in many SL graphically (and phonically) non-distinctive, and furthermore, the phenomenon of "shared transferred meanings" (71 b, 72; 73) varies for every set of two SL. The question which confronts MT here is how to deal on a universal scale with these cases?

§42. The answer can only be an approach analogous to that used in the case of conventional supplementary graphic signals (see §§ 32 and 33), that is the use of the universal arbitrary MT signals throughout, in those cases as well in which the lexical and grammatical meanings concerned are not in zero-representation as also in the cases where they are "shared transferred meanings" of two SL. In other words, we have, for the purposes of General MT to treat all SL as if they were in the cases of these meanings on the same graphic zero level (see §§ 42, 46, 47, 48, 49, 53 Ba/as; b; 79, 83, 84, 86, 88-90). In this way General MT is able to make all SL, in the cases of the meanings concerned, equally explicit.
43. Thus also in the case of languages not possessing conventional supplementary graphic signals MT can, by the use of arbitrary signals, reduce the difficulty of multiple meaning to a very large extent, namely with respect to all grammatical meanings, all lexical meanings characteristic of one form class, and all those lexical meanings which can be made distinctive by their grammatical meaning — that is with respect to meanings concerning whose grammatical distinctiveness the educated and trained FL reader is fully aware on account of his intimate knowledge of his language — and, at last, with respect to all those lexical meanings which can be made distinctive by subject labels.

44. But how about multiple meanings not falling into these categories, that is the large majority of multiple lexical meanings? How can we here reduce the problem of non-distinctive conventional signals to its lowest possible minimum?

45. In these cases a different approach is necessary which will be discussed in the chapter dealing with "The Meaning Aspect of MT" (Sections 81, 82, 92). Here we should only like to indicate that in these cases we believe the answer to be:

a) on the FL and TL side:
   a1) a semantic research aiming at detecting "shared transferred meanings",
   b1) consecutive reference numbers accompanying every FL signal or unit of signals,

b) on the FL side:
   a mechanised "MT-dictionary".
(Cases in which MT is not interested in the Distinctiveness of Conventional Graphic Signals)

#46. In spite of the paramount importance for MT of the graphic distinctiveness of conventional graphic signals (#6, 9, 20, 22) this distinctiveness is in General MT, for the reasons given in #41 and #42, ignored in the following cases:

a) on the side of the FL text

   a1) all possible graphic transformations of any contextual word indicative of grammatical meaning (including all cases of suppletion) are considered as signals only for its lexical meanings (but see #43; cf. Sections 83, 84, 86);

   b1) all homographs representing multiple lexical meanings characteristic of one form class are considered as signals only for the grammatical meaning common to all members of the form class concerned. (79).

b) on the side of the TL text

   The equivalents of a1) appear in all cases only in the form of the headwords of their paradigms.

#47. These conventional graphic signals are, in General MT, made-distinctive by universal MT-signals identical for the FL and TL side (Section 57).

(Modification of Section 46 a1)

#48. With respect to #46 a/1) we have to mention certain exceptional cases in which different grammatical forms of one FL word are associated with different lexical meanings. This is the case, for instance, with Hebrew נָבָט.
which in its Qal form יְתַתָּ לְךָ means "he threw", in its Hiph'il or causative form יְתַתָ לְךָ means "he thanked", and in its Hithpael or reflexive form יְתַתָ לְךָ means "he confessed". Such cases are, for the purposes of MT, not considered different grammatical forms of one PL word, but as isolated grammatical forms of different (defective) PL words. Their conventional graphic signal is considered as a signal only for the lexical meaning or meanings associated with them, and not as a signal for the lexical meanings associated with the headword of their paradigm.

These exceptional cases could be merged with the overwhelming majority intended in #46 (א), that is those in which all possible graphic transformations indicative of grammatical meaning of an PL word have the same lexical meaning or meanings as the headword of its paradigm. MT theory would then have to (arbitrarily) lump them together with those in which universal MT signals can simultaneously make graphically distinctive zero-represented multiple grammatical and non-distinctive lexical meanings (cf. נְכָר noun equals "light", עָנָן adjective equals "shining", glistening, polished, etc.", מֶנֶסֶס adverb equals "only", etc. See # 39 c and 56 Bb). That is the lexical meanings exclusively associated with certain of their grammatical forms could very well be "attributed" to the headword of their paradigm as additional transferred meanings and then be considered as made distinctive by the universal MT signal for grammatical meaning.

However from the point of view of mechanical correlation the effect would be the same whereas from the point of view of general MT theory it may be advisable to keep those exceptional cases separate from those whose grammatical meanings are, in the conventional written form, in zero-representation (as exemplified above by עָנָן).
(exception to #46)

#49. For the purposes of Specific MT the rule laid down in #46 has to be invalidated in those cases in which a grammatical form of an FL word has an exact equivalent in TL. In these cases a graphic transformation of a contextual FL word indicative of grammatical meaning (including all forms of suppletion) is to be considered a distinctive signal for both lexical and grammatical meanings (cf. Sections 40, 61).

#50. The rules laid down in #46-49 solve for MT the problem of differences in the structure of forms in different languages (quotation d). These are no obstacle to MT because MT, though considering the structure of forms of FL in the process of selecting the appropriate MT signals for grammatical meanings, ignores it in the process of mechanization, except in the cases indicated in #48 and 49.

(The Concept of "Labelling" in MT)

#51. The concept of labelling will, perhaps, best characterize our approach. We believe that MT can only be successful if we succeed in "labelling" graphically non-distinctive meanings of conventional graphic signals of FL by additional (universal) graphic signals indicative of a distinguishing feature known to the educated FL speaker, but unrepresented in the conventional written form. Such distinguishing features are, for instance, differentiating situations or actions (see Bloomfield, Language, p. 39, 1st paragraph: "facial expression, mimicry, tone of voice, ... insignificant handling of objects, ... and, above all, gesture."). But only those which are "prescribed by the conventions of language" (cf. Bloomfield, ibid.) can be used for "labelling" by MT because the distinguishing features must be those which are conventionally associated with particular
phonic signals. Thus graphically non-distinctive meanings of conventional graphic signals can be "labelled" by additional graphic signals indicative of:

A. Semantic differences associated with phonic differences,

B. Semantic differences not associated with phonic differences.

Let us demonstrate this with some examples:

<table>
<thead>
<tr>
<th>#52. I.</th>
<th>In the case of languages possessing conventional supplementary signals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>The &quot;labelling&quot; of conventional primary graphic signals by conventional supplementary graphic signals indicative of semantic differences associated with phonic differences:</td>
</tr>
<tr>
<td>a)</td>
<td>multiple lexical meanings:</td>
</tr>
<tr>
<td>German</td>
<td>(dis) Sage (legend) : (dis) Sæge (the saw)</td>
</tr>
<tr>
<td>Greek</td>
<td>ἢδναι (to go) : ἢδνα (to send)</td>
</tr>
<tr>
<td>Hebrew</td>
<td>מַלָּכָה (king) : מַלְכָּה (Melch)</td>
</tr>
<tr>
<td>Chinese</td>
<td>踏 (to stumble): 踏 (to kick) : 踏 (to excite)</td>
</tr>
<tr>
<td>Japanese</td>
<td>行 (to go) : 行 (to behave, etc)</td>
</tr>
<tr>
<td></td>
<td>里 (native, place) : 里 (Japanese mile)</td>
</tr>
<tr>
<td>b)</td>
<td>multiple grammatical meanings:</td>
</tr>
<tr>
<td>German</td>
<td>Vater (father) : Väter (fathers)</td>
</tr>
<tr>
<td>Greek</td>
<td>πού (where) : πού (anywhere)</td>
</tr>
<tr>
<td>Hebrew</td>
<td>מַלָּכָה (king) : מַלְכָּה (he ruled)</td>
</tr>
<tr>
<td>Chinese</td>
<td>種 (seed) : 種 (to sow)</td>
</tr>
<tr>
<td>Japanese</td>
<td>乱 (disorder) : 乱 (to throw into disorder)</td>
</tr>
</tbody>
</table>
c) multiple lexical and grammatical meanings

<table>
<thead>
<tr>
<th>Language</th>
<th>Word</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>Stünde (hour)</td>
<td>Stünde (he would stand, with capital initial after a period)</td>
</tr>
<tr>
<td>Greek</td>
<td>ἐλπὶ (I shall go)</td>
<td>ἐλπὶ (I am)</td>
</tr>
<tr>
<td>Hebrew</td>
<td>ἠλπὶ (oak); ἤλπὶ (he cursed); ἤλπὶ (these)</td>
<td></td>
</tr>
<tr>
<td>Chinese</td>
<td>惡 (to dislike)</td>
<td>惡 (where? how?)</td>
</tr>
<tr>
<td>Japanese</td>
<td>生 (to beget); 生 (raw)</td>
<td>生 (life)</td>
</tr>
</tbody>
</table>

B. The "labelling" of conventional primary graphic signals by conventional supplementary graphic signals indicative of semantic differences not associated with phonetic differences:

a) multiple lexical meanings (of し and す):

<table>
<thead>
<tr>
<th>Language</th>
<th>Word</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese</td>
<td>日 (sun)</td>
<td>火 (fire)</td>
</tr>
<tr>
<td></td>
<td>熟 (to ripen)</td>
<td>生 (to beget)</td>
</tr>
</tbody>
</table>

b) multiple grammatical meanings (of から, また and まで):

<table>
<thead>
<tr>
<th>Language</th>
<th>Word</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese</td>
<td>自 (since, postposition)</td>
<td>故 (since, conjunction)</td>
</tr>
<tr>
<td></td>
<td>あと (ago, before)</td>
<td>前 (a precedent, etc.)</td>
</tr>
<tr>
<td>German</td>
<td>band (he bound)</td>
<td>Band (ribbon, volume)</td>
</tr>
</tbody>
</table>

- c) multiple lexical and grammatical meanings (of 木 and 木 etc.):

<table>
<thead>
<tr>
<th>Language</th>
<th>Word</th>
<th>Translation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japanese</td>
<td>木 (tree); 黄 (yellow)</td>
<td>来 (the coming)</td>
</tr>
<tr>
<td></td>
<td>に (in, into); 二 (two)</td>
<td>荷 (a burden)</td>
</tr>
<tr>
<td>French</td>
<td>la (her)</td>
<td>là (there)</td>
</tr>
<tr>
<td></td>
<td>ou (or)</td>
<td>où (where)</td>
</tr>
<tr>
<td></td>
<td>a (has)</td>
<td>à (to)</td>
</tr>
</tbody>
</table>
II. In the case of languages not possessing conventional supplementary signals:

A. The "labelling" of homographs by arbitrary supplementary graphic signals indicative of semantic differences associated with phonic differences:

a) multiple lexical meanings:

<table>
<thead>
<tr>
<th>Russian</th>
<th>Bolma  (wool)</th>
<th>Bolma  (wave)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latin</td>
<td>palus (swamp)</td>
<td>palus (a pole)</td>
</tr>
</tbody>
</table>

b) multiple grammatical meanings:

<table>
<thead>
<tr>
<th>Latin</th>
<th>spiritus (nominative)</th>
<th>spiritus (genitive)</th>
</tr>
</thead>
</table>

C. multiple lexical and grammatical meanings:

<table>
<thead>
<tr>
<th>Latin</th>
<th>manus (hand)</th>
<th>manus (good)</th>
</tr>
</thead>
</table>

B. The "labelling" of homographs by arbitrary supplementary graphic signals indicative of semantic differences not associated with phonic differences:

(For the following demonstration we assume as universal MT signals: 

- at the side of;  - passive voice;  - physical ability;  - possibility;
  - permission;  - from;  - desire;  - religion;  - engineering;
  - navy;  - link;  - writing;  - accusative;  - past tense;
  - plural;  - verb;  - adverb;  - adjective;  - noun;  - noun-meaning carried by the adjective);
a) multiple **lexical** meanings:

Here we have to distinguish two subgroups:

- **aa** meanings characteristic of one form class
- **bb** meanings not characteristic of one form class

Group **bb** we subdivide further into:

- **aaa** meanings peculiar to scientific terms
- **bbb** meanings not peculiar to scientific terms

Examples:

**aa** multiple lexical meanings characteristic of one form class:

- **English**
  - by \( \overline{\overline{\text{x}}}_x \) (I sat by him)
  - by \( \overline{\overline{\text{x}}}_x \) (I was beaten by him)

- **German**
  - von \( \overline{\overline{\text{x}}}_x \) (from)
  - von \( \overline{\overline{\text{x}}}_x \) (I was beaten by him)

- **können** (ability), **können** (possibility), **können** (permission)

- **möglen** (possibility), **möglen** (permission), **möglen** (desire)

- **Chinese**
  - \( \overline{\overline{\text{x}}}_x \) (from)
  - \( \overline{\overline{\text{x}}}_x \) (I was beaten by him)

  - \( \overline{\overline{\text{x}}}_x \) (permission)
  - \( \overline{\overline{\text{x}}}_x \) (possibility)

**bb** multiple lexical meanings not characteristic of one form class:

- **aaa** multiple lexical meanings peculiar to scientific terms (cf. # 39 d):

  - **English**
    - nave \( \overline{\overline{\text{x}}}_x \) (of a church)
    - nave \( \overline{\overline{\text{x}}}_x \) (of a wheel)

  - **German**
    - Schiff \( \overline{\overline{\text{x}}}_x \) (boat)
    - Schiff \( \overline{\overline{\text{x}}}_x \) (nave of a church)

  - **Chinese**
    - 道 \( \overline{\overline{\text{x}}}_x \) (road)
    - 道 \( \overline{\overline{\text{x}}}_x \) (Tao in Taoism)
multiple lexical meanings not peculiar to scientific terms:

<table>
<thead>
<tr>
<th>German</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>Band O (ribbon)</td>
<td>本0 (root)</td>
</tr>
<tr>
<td>Band _DD (tie)</td>
<td>本田 (volume)</td>
</tr>
</tbody>
</table>

b) multiple grammatical meanings:

<table>
<thead>
<tr>
<th>English</th>
<th>German</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>it 0 (nominative)</td>
<td>sie 0 (she)</td>
<td>取 0 (take)</td>
</tr>
<tr>
<td>it4 (accusative)</td>
<td>sie4 (they, them)</td>
<td>取4 took 取 (passive)</td>
</tr>
<tr>
<td>beat 0 (present tense)</td>
<td>sheep 0 (singular)</td>
<td>取 0 (take)</td>
</tr>
<tr>
<td>beat4 (past tense)</td>
<td>sheep4 (plural)</td>
<td>取4 took 取 (passive)</td>
</tr>
</tbody>
</table>

C) multiple lexical and grammatical meanings:

<table>
<thead>
<tr>
<th>English</th>
<th>German</th>
<th>Chinese</th>
</tr>
</thead>
<tbody>
<tr>
<td>fast ' (to fast)</td>
<td>blossom (naked)</td>
<td>光 n (light) 光 (shining, etc.)</td>
</tr>
<tr>
<td>fast' (quickly, firmly fixed, see Section 61)</td>
<td>blossom (only)</td>
<td>光 (bald, naked): 光 (only).</td>
</tr>
</tbody>
</table>

(The Different Kinds of MT Signals)

#54. We distinguish the following main groups of MT signals:

a) conventional signals, that is the conventional graphic form of contextual words.

b) arbitrary signals, that is those created or adopted (for instance, conventional supplementary signals adopted by MT, (See §§ 25-35) for the purposes of MT in order to make distinctive those meanings which in the FL text are either in zero-representation or represented by non-distinctive signals (§§ 35 – 43). In specific MT conventional supplementary signals indicative of grammatical meaning may sometimes be found preferable to universal arbitrary signals indicative of the same meanings (See § 33).
55. Among the conventional signals we distinguish:

a) **primary signals**, that is those which constitute the minimum requirements of an FL text intelligible to an educated native reader, for instance, in certain cases of homophony the use of Chinese characters in a Japanese text (cf. § 52 B); the "consonantal" elements in a Hebrew, Arabic, etc. text, a French or Greek text without all accents and diacritic marks and spiritus (cf. § 52 A and Bo), a Chinese text without the (Chinese or Western) conventional punctuation marks.

b) **supplementary signals**, that is those conventionally used to make the FL text more explicit, for instance the Kana in Japanese; the vowel signs and other conventional diacritic marks in Hebrew, Arabic, etc.; the accents and other conventional symbols like the tréma in French, the accenté and spiritus in Greek, the (Chinese or Western) punctuation marks in Chinese. As for the preference of conventional supplementary signals to arbitrary signals in certain cases of specific MT see § 54 b.

56. Among the (universal) arbitrary signals we distinguish:

A. From the point of view of the occurrence or lack of different phonetic features of FL:

a) signals based on phonetic differences of FL (cf. § 52 A; § 52 A).

b) signals not based on phonetic differences of FL (cf. § 52 B; § 53 B).

B. From the point of view of different semantic features of FL:
a) signals indicative of multiple lexical meanings which again fall into the following subgroups:

   a) signals "labeling" meanings characteristic of one form class (see § 79 and §53 B aa).

   b) signals "labeling" meanings peculiar to scientific terms (cf. § 53 B a/bb/aaa).

   c) signals "labeling" meanings not peculiar to scientific terms (cf. § 53 B a/bb/bbb)). To these belong also the signals mentioned under b and c when they simultaneously "label" multiple lexical meanings (cf. Sections 80, 88-90).

   d) signals "labeling" meanings which cannot be "labeled" by the signals mentioned in aa, bb, and cc. They are supplied by the mechanised PL dictionary (cf. § b5 b and Sections 81, 82, 82) and have a fixed sequence in which they accompany the transferred meanings in the MT dictionary.

b) signals indicative of all possible grammatical meanings. They often simultaneously "label" multiple lexical meanings (see Ba/cc and c of this §, and Sections 80, 88; cf. §§ 39c; 58; 52a c, Bc; 53Ac, Bc).

c) signals indicative of word order. They have a fixed sequence based on a universal logical sequence of all parts of speech arbitrarily established for MT purposes. They simultaneously "label" the grammatical meaning common to all members of a form class and thus often simultaneously "label" multiple lexical meanings (cf. Ba/cc and b of this § and §§ 82 a, and 37).
d) space markers indicative of the completion of a "MT word" or "MT word unit" (idiomatic MT units, see # 66), that is of those MT signal complexes that are ready for "computer digestion".

e) space markers indicative of the non-completion of an "MT word" or "MT word unit" and resulting in a mechanical "storing".

f) the reference numbers (cf. # 15a/b1, 60, 82).

#57. With the exception of the arbitrary signals mentioned under # 56 d and e (those indicative of completion or non-completion of an "MT word" or "MT word unit"), all other arbitrary signals of the FL text appear also in the TL text (# 67 and cf. #58)

#58. A special investigation has to be made in order to establish those conventional supplementary signals used in punctuation which are attributable universals (cf. Sections 12a, 77) and have MT value. They are adopted by MT and used as universal signals. They appear in the FL text as well as in the TL text (cf. # 57).

#59. Practical experience will show that in certain cases the use of one arbitrary signal will make the use of another arbitrary signal superfluous (Cf. # 33, 48, 49, 51b, 55b, 67). In cases in which, for instance, in a Chinese sentence the subject is graphically represented and distinctive enough (Cf. # 41) the use of a grammatical signal indicative of person will often not be necessary. Moreover, anyone of the signals mentioned in # 56 B a, b and c, and in # 58 can simultaneously function as space markers indicative of "completion" (# 56B d), namely when it is the last supplementary signal of the FL word and not followed by the signal indicative of "non-completion" (# 56B e). Thus spacers markers will only be necessary in the case of the absence of these signals.
#60. The reference numbers (#56B f) are automatically added by the computer after it has been "informed" of "completion".

#61. In the case of Specific MT any one of the universal signals mentioned in #56, except those mentioned under d, e, and f, may be found superfluous under certain conditions, namely wherever a conventional graphic unit in FL has its exact counterpart in TL (cf. #10, #69).

#62. All arbitrary signals have to be simple and, wherever possible, "logical" and cumulative so that they can be easily remembered and reproduced by the FL reader and recognized by the attendant of the computer and the TL reader (cf. #53 b).

(Machine Versus Man)

#63. One of the most important questions of the signal aspect of MT is the relative speed of MT versus translation by a polyglot. It is clear that the exclusion of the interpretative part of translation from the mechanization process (#13) and the resultant necessity of editing the FL texts (#15 and 32) means an enormous slowing down of the MT process. The question which has to be answered here is: Will MT be able to compete with a polyglot translator? The answer is:

#64. Only Specific MT will be seriously affected. However, in Specific MT:

a) a large amount of editing necessary in General MT will in certain cases be unnecessary on account of the close agreement of the two SL concerned (for instance in the case of German and English, cf. #61)

b) In the case of languages like Chinese and Japanese, both very important for MT, Specific MT will still be much quicker than human translation (whether done by a FL polyglot, that is a Chinese or Japanese, or by a TL polyglot, that is by a non-Chinese or non-Japanese) because the "brain" of the computer will contain an enormous amount of information difficult
to acquire by either a Far Eastern or Western polyglot, and because its "memory" is far superior to theirs. A human translation from any of these languages is much more difficult and time consuming than the editing done by the native. Here MT will be of real value.

#65. General MT will certainly be much quicker than human translation since one and the same editing of an FL text serves for the MT into all SL.

#66. Important factors in the race between computer and man will be:
   a) Specialization and division of work on the editing side,
   b) the mechanized MT dictionary (cf. Section 82a/dd, 92),

though we realize that such a dictionary can also be made available for the human translator.

C. The Meaning Aspect of MT

#67. We treat here of meaning only from the point of view of the requirements of MT (cf. #11), that is FL meaning in the mirror of TL (cf. Sections 69-71, Section 92).

Meaning Universals

#68. All possible meanings are somehow expressible in all SLs for instance by:

   a) existing graphic signals already carrying these, for example English "I pay attention to", classical Greek  
   "ἐφιλομένος" with genitive (I am making myself concerned towards), classical Hebrew  
   "לִבִּי לֹא מָעֵשָׁהוּ" (I place my heart towards),
   Chinese "注意" with accusative (I make thoughts flow to),
b) Existing graphic signals made to carry them via the phenomenon of transferred meaning, for example Chinese 電, "lightening"; 電, "electric".

c) Existing graphic signals made to carry them via the phenomenon of loan translation, for example English "automobile" (auto meaning "self", mobile meaning "movable"): Chinese 自動車 (自 self, 動 to move, 車 carriage).

d) New graphic signals which are either:

   aa) Borrowed from another language via the phenomenon of loanwords, for example German "Ersatz" (substitute) in an English text.

   bb) Created under the influence of a foreign language via the phenomenon of loanwords, for example the graphic signal "Tao" corresponding to Chinese 道 (in the taoistic sense).

   cc) Created for new concepts by:

      aaa) Initiation, for example "ABBA" in "the ABBA problem in Chinese logography" (describing a certain type of character growth).

      bbb) Derivation via the phenomenon of word formation (derivation in the narrower sense and compounding) according to the methods peculiar to each of the SL.

Fl Meaning in Terms of Tl

§67. For all practical MT purposes meaning is always satisfactorily definable by:

a) The narrower FL context, for example the meaning of "salt" in "an old salt" (an experienced sailor); as different from, for instance, "put some more salt into the soup".
b) by the TL equivalent of a graphic PL signal, for example "salt 2" (assuming that the Universal English Dictionary of Henry Cecil Wyld is our English MT dictionary and using its system of differentiating multiple meanings) equals German "Seebär" (literally "seabear", that is, "sailor").

(c) (In the case of grammatical meaning) by a universal form of grammatical definition, for example 愛 in 母愛其子 (if this means in TL "the mother loves her child").

Third person fem. sing. pres. ind. act. voice (cf. Section 77 for the concept of "attributable universals").

#70. However, apart from the interpretative work of the PL reader (an FL monoglot) which, of course, is supposed to consider the PL meanings only in terms of PL, MT is primarily interested in the meanings of PL signals in terms of TL:

#71. Different languages differ in many cases of semantic association, but also show identical metaphors in others. Thus natives may often not be conscious of a change of meaning, whereas foreigners may feel a change on account of the semantic habits of their own language (cf. Bloomfield, Language, #9.6, last section). From the point of view of MT we have here to distinguish two cases:

a) a bilingual dictionary will on the TL side often have to indicate multiple meanings where the monolingual dictionary could well ignore them. Thus from the point of view of the Chinese language 光 in 光體, "shining body", and 光頭, "shining head"
means "shining" and no change of meaning seems to have
been felt (at least originally) to have taken place
as evidenced by the fact that it did not occur to the
Chinese to add a differentiating signific ("radical") to
光 in the sense it has 光頭 (for instance the
signific 彰, meaning "hair of the head"). But in,
for instance, a Chinese-English dictionary, the indica-
tion of a change of meaning cannot be avoided because
光體 corresponds to English "luminous body" and 光頭
to English "bald head". In such cases MT has to consider
multiple meanings of FL in terms of TL.

("Shared Transferred Meanings")

b) a bilingual dictionary sometimes could on the TL side
ignore multiple meanings of FL where the monolingual FL
dictionary will have to indicate them. Thus Chinese
光 in 光身, "naked body", means "naked", in
他光有兩塊錢, "he only has two dollars", it means "only". But in terms of, for instance, a Chinese-
German dictionary no change of the central meaning seems
to have taken place, for the German equivalent for 光
in 光身 is (besides "nackt") "blöß" (naked, bare)
which, as an adverb, is used in the sense of "only"
(cf. English "bare" and "barely"). It is clear that for
the purposes of MT all "shared transferred meanings" can
be ignored by the mechanised MT dictionary (cf. Sections
81, 92)
§72. The monoglot FL reader is, of course, not supposed to be aware of the problems described in §71. The mechanized MT dictionary takes care of both cases. In the case of §71 a) it will automatically supply him with a table of transferred meanings in the form of FL synonyms. For instance, in the case of 光頭 it will give him the Chinese equivalent for "hairless head" and the appropriate supplementary MT signal (cf. §56 a/dd). In the case of §71 b) non-action of the mechanized MT dictionary will solve the problem to the satisfaction of MT (光 will be mechanically correlated to German "bloss" whether it means "bare" or "only").

§73. Cases in which the (central meaning) equivalent in TL of a graphic FL signal has transferred meanings different from those of the latter will only in exceptional cases constitute a difficulty because the TL context will mostly make the TL signal concerned sufficiently distinctive (but compare Sections 81 and 82).

(The Different Kinds of MT Meanings)

§74. We distinguish the following main groups of meanings:

a) lexical meanings according to the mechanized MT dictionary
   (Section 92) comprising:
   aa) central meaning
   bb) transferred meaning

b) grammatical meaning (See Sections 77, 83-86)

§75. Among the lexical meanings (§74 a/aa and bb) we distinguish

a) meanings which admit of a group treatment (§12 c):
   aa) meanings carried by scientific terms (cf. §56 a/bb)
   bb) certain meanings not carried by scientific terms (cf. §56a/co)
   cc) meanings characteristic of a form class (cf. §56 a/aa, 79)
   dd) meanings exclusively associated with a particular grammatical meaning (cf. §56 b, 80)
b) meanings that do not admit of a group treatment (cf. §§6 a/dd, Sections 81, 82)

(Primary assumptions)

§76. All possible lexical meanings are expressible in all SL (quotation c)

§77. All possible grammatical meanings, however expressed (by formal
differences, special words, word order, context, etc., cf. Sections 12a, 58) are
either absolute (quotation b) or attributable universals in all SL. Examples
for attributable grammatical meanings are:

a) Chinese 代表, when between two nouns, is from the point of
view of the Chinese language an anaphoric pronoun. But for
all practical purposes it has mostly been considered to be
the equivalent of "s" in "father's" or of "of the" in "of
the father", that is expressive of the grammatical meaning
"genitive".

b) From the point of view of historical grammar Japanese "hito
ga yuku" means "a man's walking". But for all practical pur-
poses it has in modern Japanese always been considered to be
the equivalent of "a man walks", and "ga", in this context
really a marker of the genitive, is tacitly considered a
marker of the nominative case (cf. O. B. Sanborn, An Historical

Thus the grammatical meaning "genitive" or "nominative" has in these cases been
arbitrarily attributed to 代表 and "ga" without harming the contextual meaning
in terms of TL. We believe that MT can profitably extend this method to many
other cases of the SL
(Multiple Lexical Meanings)

79. Of the lexical meanings mentioned in 75 only those under cc, dd and b require further discussion:

(Lexical Meanings Characteristic of Certain Form Classes)

79. It is peculiar to all possible lexical meanings characteristic of certain form classes that their distribution over the members of the form class concerned in many cases varies between each set of two languages. Thus for instance in the subformclass of auxiliary verbs of mood the central meaning of German können (to be able) is the central meaning of English "can" and of Chinese 会 (can). But of its transferred meanings "to be possible" (as kann sein) and "to be permissible" (du kannst hingenommen) the first is the central meaning of English "may" (German "mogen"), as, for instance, in "it may be" (as mag sein) and the transferred meaning of Chinese 会, whereas the second is the transferred meaning of English "can" (you can go now) and of English "may" (you may go now), and the central meaning of Chinese 会. An analogous situation is peculiar to the form class (pre- or post-) position (cf. 53B a/aa). In these cases it is "desirable and possible" (cf. 35, 36, 37, 38, 39 b) for MT to apply a "group treatment" (12 c, 75a) But whereas in the case of all other lexical meanings which admit of a group treatment (75 a/aa, bb, dd) the mere addition of a supplementary MT signal solves the problem of non-distinctiveness, the irregularity demonstrated above in the distribution of the lexical meanings characteristic of certain form classes, and the very limited number of these meanings suggests a treatment similar to that accorded all grammatical meanings (41 l1 and l2, 46, l7, l9, l9, 50, 53 bb and 63, 8b). We have, however, to point out the following difference: In the case of all grammatical meanings of all 8L "all possible transformations of a contextual word indicative of grammatical meaning (including all cases of suppletion) are considered as signals only for its lexical meanings", (46 a/s), whereas its grammatical meaning, whether or not zero-represented or merely non-distinctive (20 c), are considered as zero-represented (42).
the case of the form class meanings the treatment has to be chiastically inverted: all possible lexical meanings are considered as zero-represented, whereas all conventional graphic signals carrying them are considered as signals only for the grammatical meaning of their form class (auxiliary verbs of mood, pre- or post-positions, etc.). Their graphic transformations indicative of grammatical meaning (for instance German, "ich kann, du kannst, wir können, ihr könnt, ich konnte, etc.") will, of course, be treated like all other cases of this kind. MT will, therefore, in the case of the meanings characteristic of such form classes have to add two supplementary signals: one differentiating the lexical meaning and one differentiating all possible grammatical meanings except the grammatical meaning of the form class concerned (auxiliary verbs of mood, pre- or post-position). In the case of auxiliaries of mood this will often not mean an increase in the number of supplementary MT signals used in the clause concerned of the FL text since the principal verb accompanying such an auxiliary (the auxiliary being the finite verb) in the infinitive does not require any supplementary signal indicative of grammatical meaning. Cases like "could have" or "might have wanted" in "could have done", "might have wanted to come" have sometimes to be treated as "idiomatic signal units" by means of mechanical "storing" (See Section 87) for instance, in their German equivalents "hatte tun können" (had do can) and "er wäre vielleicht gekommen" (he were perhaps come).
Lexical Meanings Exclusively Associated or Assoicateable with a Particular Grammatical Meaning.

80. In some languages certain lexical meanings are exclusively associated or associable with particular grammatical transformations or grammatical functions. We distinguish, therefore, two cases:

a) lexical meanings exclusively associated or associable with particular grammatical transformations, for example, Hebrew ־תָּשָׁבֶתָה, meaning "he thanked", and ־תָּשָׁבֶם, meaning "he confessed", the first the causative form, the second the reflexive form of ־תָּשָׁבֶת, meaning "he threw" (compare the semasiological parallelism revealed by the form of the Chinese characters 射, meaning "to shoot, to fire" and 謝, meaning "to thank"). Such meanings are also by MT exclusively attributed to the grammatical form conventionally carrying them and not attributed to the headword of their paradigm. As for the grammatical meaning or meanings of the grammatical form concerned we have to make the following distinction:

aa) grammatical meanings of an FL signal non-essential in terms of all TL ignored by MT (see sections 46, 85, 86). For instance, the grammatical meanings "causative form" or "reflexive form" of our Hebrew examples are non-essential in terms of all TL because they are valid only as long as we consider them as forms of the paradigm of ־תָּשָׁבֶת. This is not done by MT in these cases (See 48).

bb) grammatical meanings of an FL signal essential in terms of all TL are considered as zero-represented by MT (cf. # 46 a, 56 b b; 79; 83) and will, therefore, be "labeled" (cf. # 51, 53 b b; 54 b; 56 b b) by supplementary MT signals indicative of the grammatical meanings concerned. For instance the
the grammatical meanings associated with the members of the paradigms of \( \text{perfect} \) \( \text{imperfect} \) and \( \text{third person singular} \), \( \text{active voice} \), etc. are essential in terms of all TL.

b) lexical meanings exclusively associated or associable with particular grammatical functions, as for example, Chinese \( \text{light} \) which in terms of, for instance, the English TL as a noun means "light", as an adjective carrying the (non-grammatical) meaning of the noun means "shining, brilliant, etc" as an adjective not carrying the (non-grammatical) noun meaning means "bald, naked", and as an adverb means "only". Another example is English "light" which in terms of, for instance, the German TL as a noun means "Licht", as a verb means "leuchten", as an adjective carrying the non-grammatical meaning of the noun means "hell", as an adjective or adverb not carrying the (non-grammatical) noun meaning means "leicht" (cf. \# 2; "light" meaning "leicht" is not homogenous with the "light" carrying the other meanings.)

Thus, using the supplementary signals explained in \# 53B, we would in the case of English "light" get the following distinctive TL signals: "lightn" equalling "Licht", "lightv" equalling "leuchten", "lightnaj" equalling "hell", "lightvaj" equalling "leicht". "Light" in the sense of "to light" is usually accompanied by particular prepositions ("to light off a horse", "to light from the chariot") which make it distinctive and with which it is treated as an "idiomatic signal unit" by means of mechanical "storing" (cf. \# 79, last sentence, and \# 67; see \# 38c for other examples). Here our approach makes it possible to solve the problem of "multiple meanings" for mechanical correlation in a way in which
two types of meanings — the lexical and the grammatical — can be indicated by one and the same universal supplementary MT signal. (It is clear that if the grammatical meaning of a conventional signal is "subject" or "direct object", there is no need for graphic indication of the meaning "noun". The lexical meaning will then be simultaneously represented by the supplementary signals indicating "subject" or "object". Here word order signals could also be used to make distinctive lexical meanings. See Sections 56c, 88-90).

Multiple Lexical Meanings That Do Not Permit a Group-Treatment

#51. As for the multiple lexical meanings that do not permit of a group treatment (compare "fast", adjective and adverb, meaning "firmly fixed, etc." and "fast", adjective and adverb, meaning "rapid", etc.; cf. Dr. Weaver's manuscript, p. 8, No. 5 Meaning and Context, first section), we refer to #54, 45, 56 a/dd, 71 b and 72. The solution suggested in #45 b and 72 requires the FL reader to select the incident meaning from the table of meanings supplied to him by the mechanized MT dictionary (Section 92). This selection on the FL side slows down the process of MT (cf. #45 13-18; 63-66). An alternative would be to ignore these multiple meanings on the FL side and mechanically correlate the non-distinctive FL signal with one of the TL signals carrying one of the possible meanings concerned (best that of the TL signals involved which has the largest number of "shared transferred meanings"). A mechanized TL-MT dictionary would then supply the TL reader with a table of all the possible meanings involved (of course in the form of the conventional TL signal synonyms) and he would then have to select the incident meaning. From the point of view of complete mechanization this may seem to be preferable because then no human factor would interrupt the purely
mechanical side of MT. However, from the point of view of MT as a whole, the
first alternative is still much quicker for the following reasons: Whereas the
FL reader has to select the incident meaning in a (FL) context completely intelligible
to him, the TL reader has, under the second alternative, to do this in a
(TL) context which will necessarily contain a large number of non-distinctive sig-
nals with transferred meanings different from those of the corresponding FL
signals, that is in a context that often will not be very clear.

82. Any remaining semantic difficulties of the TL text can quickly be
referred back to the FL text by means of the corresponding reference numbers
(#15 a/b1; 56 f; 60) added automatically by the computer to every "digested"
FL signal, and to every TL signal before it leaves the assembly line. Also this
process of "referring back" can be speeded up by mechanization.

Grammatical Meaning

83. All possible grammatical meanings often show great comparative
irregularity of distribution of graphic explicitness (cf. Sections 20, 79)
for instance:

a) within one and the same language:

aa) irregularity of occurrence of graphic explicitness in
the case of different types of grammatical meanings
peculiar to the same or different form classes, for
example: the occurrence of Chinese 者 between two
nouns corresponding to English "-s" after a noun, versus
the graphically mostly zero-represented meaning of "singular"
and "plural" of Chinese nouns, or versus the graphically
often zero-represented meaning of "tense" in Chinese verbs.

bb) irregularity of occurrence of graphic explicitness of
grammatical meaning peculiar to the same paradigm of
a form class, such as English "stands" versus "I, you,
we, they, stand", or versus "be)stood" (graphic indication
of "third person singular" in the present, non-indication in the past tense, non-indication of first and second person singular and plural.)

b) between each set of two languages:

aa) graphic explicitness in FL, non-explicitness in TL, for example, Modern Mandarin 孩子 (plural feminine of the personal pronoun of the third person) versus English "they" (either masculine, feminine or neuter).

bb) graphic explicitness of TL versus non-explicitness of FL, for example: English "come, comes", versus Chinese 来 (either "come" or "comes").

cc) graphic explicitness of both, FL and TL, for example Modern Mandarin 孩子, English "child", versus 孩子們 English "children".

dd) graphic non-explicitness of both, FL and TL, for example, Chinese 羊, English "sheep" (singular), versus 羊 English "sheep" (plural).

**Arbitrary Leveling of Graphic Explicitness of Grammatical Meaning**

#34. Since all possible grammatical meanings are comparatively limited in number — and even more limited for each set of two languages concerned in every MT process — and are, moreover, either absolute or attributable universals (#8 68, 77), the difficulty presented by the irregularity of the distribution of graphic explicitness of grammatical meaning described in #83 can be overcome in the following way: For the purposes of MT we arbitrarily consider all grammatical meaning of all SL contexts, whether graphically explicit or not, as represented (cf. #4 6 a/6, 50, 53 B b; see #4 6 a/6, 63, 59 for exceptions) and then raise them to the same level of graphic explicitness of grammatical meaning by means of universal supplementary MT signals (#4 47, 53 B b, 56 B b, 57). Thus, for instance,
English "he decided to go" becomes "he decide go", that is, in this particular case, it assumes a grammatical form analogous to its classical Chinese equivalent (in other cases there will still be a difference in word order). The same universal supplementary NT signals indicative of the grammatical meanings involved, added to the English and the Chinese text, make both graphically equally explicit (cf. §42). In the process of MT the supplementary signals are added on the FL side by the FL reader, on the TL side by the computer. Thus in the case of all possible grammatical meanings the irregularity described in §83 makes "group treatment" "desirable", their universality, numerical limitation and, most important, the fact that the educated FL reader infers them somehow (at least by context), makes it possible (cf. 36, 37, 38, 39a, see Section 92)

**MT Value**

§35. MT value is the importance of graphic distinctiveness of FL for TL intelligibility (cf. §89). We distinguish here:

a) **lexical MT value**, that is the importance of graphic distinctiveness of lexical meaning of FL for TL intelligibility (cf. §71 b), and

b) **grammatical MT value**, that is the importance of graphic distinctiveness of grammatical meaning of FL for TL intelligibility (cf. §65)

(grammatical Meanings Ignored by MT Signalisation)

§36. All grammatical meanings without MT value, that is non-essential in terms of all TL, are ignored by MT signalisation. We suggest here, for instance, the merging of the meanings "imperfect" and "present perfect" in German into the meaning "past tense", or of the meanings "dual" and "plural" in Hebrew into the meaning "plural" (cf. §50 b. a).
(Idiomatic Units)

§87. Every sequence of conventional graphic FL signals it, if 
value (cf. §§85, 86) is involved, considered an idiomatic unit. Such an idiomatic unit is, for the purposes of mechanical correlation, treated as if it were one conventional graphic FL signal (corresponding to one lexical form). We distinguish here:

A. Cases whose mechanical correlation is not dependant on an editorial preparation, that is uninterrupted sequences:

a) an FL sequence whose FL equivalent is not a sequence of the TL equivalents for the FL signals forming the FL sequence concerned, that is a unit expressing a universal meaning in an association of thought pictures peculiar to the FL concerned. Example: Chinese 光復, literally "light's (光) return (復)", meaning "the restoration" (or "the revolution of 1912),

b) an FL sequence which, though its TL equivalent is a sequence of the TL equivalents for the FL signals forming the FL sequence concerned, has, nevertheless, to be treated as an idiomatic unit if the semantics of its member signals differ from those of their TL equivalents. For instance Chinese 機槍 (short for 機関槍) made up of 機 ("device, machine, opportunity, etc.") and 槍 ("spear, lance, gun"), meaning "machine gun". The treatment of such sequences as units helps to differentiate multiple meanings (cf. §§41).
B. Cases whose mechanical correlation is dependent on an editorial preparation, that is interrupted sequences. In such cases the part preceding the interruption is "stored" until the part after the interruption is "signalled" to the computer. For instance, German "er haette es frueher schicken koennen," literally, "he had it earlier send could" (koennen for gekoennen), meaning "he could have sent it earlier" (See §56 d and e).

(Word-Order)

§88. Wherever the position of a part of speech in its clause or sentence is fixed by rules, position adds to its graphic distinctiveness. This additional graphic distinctiveness afforded by fixed position may in certain cases be indicative, or may be arbitrarily be made indicative, of grammatical and/or lexical meaning (for instance in Chinese .SK means subject, .Identity IV means object, and since in both cases  is a noun, it means here "light" and not "shining", "small", nor "only"; cf. 48).

If now all SL would have a fixed word order, FL word order could be easily mechanically correlated to any TL word order.

This is, however, by no means the case. The great comparative irregularity of distribution of graphic explicitness of all possible grammatical meanings in different languages (cf. §83) is, to a large extent, paralleled by a comparatively irregular distribution of semantic distinctiveness of word order. In some languages word order is highly non-distinctive (Latin), in others it is more (Chinese) or less (English) distinctive. Furthermore, the more or less semantic distinctiveness in these languages does not follow any set principle for all of them. The grammatical meanings associated or associated with position often differ.
Further complication is often presented by the ability of a language to change the order of words for the sake of emphasis or for other (non-spineemic) reasons.

(Zero-Treatment of Word Order)

§89. Under these circumstances only a treatment similar to that accorded all grammatical meanings (cf. §84) can solve our problem for MT. We may here learn from the Japanese. When the Japanese translate a Chinese classical text into Japanese, they first readjust its word order to that of their own language by means of numbers or certain characters indicative of position. In the following exemplification the words in parentheses have no equivalent in the Chinese original and have to be supplied in the English and Japanese translation. It should, however, be noted that their addition primarily satisfies requirements of English and Japanese grammar. The additional semantic explicitness they furnish goes beyond the semantic explicitness of the Chinese original. Thus their omission from the English and Japanese translations, while infringing on grammatical rules in these languages, gives the translations the same degree of semantic explicitness the Chinese original has. Furthermore the numbers (1), (2), and (3) are indicative of the Japanese sequence of the parts of speech concerned.

Chinese examples: 

Lit. Translation:

Although daily use three animal's sustenance ... 

Free Translation: Although (they) daily use (the) sustenance of (the) three (kinds of) animals ... 

Addition of Japanese Word Order Markers:

This marking shows that word order markers are added only to those words or group of words whose position differs in Japanese.
further complication is often presented by the ability of a language to change the order of words for the sake of emphasis or for other (non-syneconymic) reasons.

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Chinese examples: 雞日用三牲之養

Lit. Translation:

Although daily use three animal's sustenance...

Free Translation: Although (they) daily use (the) sustenance of (the) three (kinds of) animals...

Addition of Japanese Word Order Markers:

This marking shows that word order markers are added only to those words or group of words whose position differs in Japanese,
Readjustment of the word order on the basis of the word order markers:

日 三 禺 之 用 は (wo) 用 九 に 語 て (to) いう こと だ

In Romaji:

Hibi san sei no yo (wo) mochiu (to) iyou mon do... 

Lit. Translation: (marker of) (marker of)
Daily three animal's sustenance (accusative) use (conjunction) although...

This method of readjusting the word order of a Chinese text before translation in fact amounts to ignoring the Chinese word order and substituting another. The underlying principle can be utilized by MT and applied on a much broader and universal scale. Since all possible positions in all languages are comparatively limited in number — and even more limited for each set of two languages concerned in every MT process — the difficulty presented by the irregular distribution of semantic distinctiveness of word order mentioned above can be overcome in the following way:

a) In the case of alternative word orders in a FL we are, for the purposes of MT satisfied with only one. Thus Chinese 父子 は 反 corresponds to English "father's fault" as well as to "the fault of the father." In this case MT will be satisfied with receiving the first version as its translation.

b) Moreover, MT will, at least in the initial stage of its life, best neglect non-grammatical meanings indicated by changes in normal word order such as the meaning of emphasis.

c) Furthermore, for the purposes of MT we arbitrarily consider all positions of words of all FL contexts, whether semantically distinctive or
not, as zero-distinctive. We furthermore arbitrarily decide on a "logical" universal word order (LT word order), the fixed positions of which we denote by a set of consecutive digits (numbers or letters), the LT word order signals. We then raise the zero-distinctive word order positions of all FL texts to the same level of semantic distinctiveness by the addition of our LT word order markers (signals) in the same way as the Japanese do with Chinese texts.

These LT word order signals, besides being indicative of word position in the arbitrary "logical" MT sequence of all parts of speech, are then used by LT to simultaneously "label" the grammatical meaning associated or attributable with them and can thus often be used to simultaneously "label" multiple lexical meanings (cf. #59 Dc).

(The LT of Word Order)

#50. For the LT of Word Order we suggest two possible ways:

a) Editorial Reshuffling.

b) Mechanical Reshuffling.

a) Editorial Reshuffling.

Here the LT word order signals added by the FL editor to the FL text are by the computer transferred to the TL text unchanged. The TL editor has to translate these signals into the TL word order in the same way as the Japanese reader of a Chinese text.

b) Mechanical Reshuffling.

Here the LT word order signals added by the TL editor to the FL text (and represented by special holes on the punch-card fed into the computer) do not cause a mechanical reaction until the instruction of the punctuation.
signals indicative of the completion of a clause or sentence have been carried out by the computer. Once those instructions have been carried out, the IT word order signals, until then "stored," cause the constituent TL equivalents of the conventional FL signals to "drop out" in the sequence required by the word order principles of the TL concerned. This presupposes, of course, that each (universal) IT word order signal has been mechanically correlated to one particular position — equivalent in the TL concerned.

Golden Rule of IT

91. Apart from those problems of inexplicitness which concern lexicon and grammar, all other forms of semantic inexplicitness of an FL context are of no concern for IT. Here belong, for instance, difficulties of philosophical or philological interpretation, those due to lack of specialized knowledge of the FL reader, lack of precision, whether intended or unintended by the author, etc. etc. Also a nonsensical or grammatically incorrect FL text can be IT-ed. The computer is not expected to correct an ambiguous or faulty FL text. In this respect the Golden Rule of IT is: "FL need not to be more intelligible than FL!"

Mechanized Dictionary

92. The mechanized IT dictionary is a monoglot FL dictionary, that is it explains the meanings of FL words in terms of FL, but in the mirror of the TL concerned. For further details, see #45b, 56a/dd, 65b, 67-73, 81 and 82.