

Cohesion and coherence in the presentation of machine translation products

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Abstract. Different degrees of human intervention can be applied to the preparation of machine translation (MT) products in readying them for their ultimate use.

It is suggested here that differences in levels of postediting are associated to some extent with cohesion and coherence. The posteditor is essentially an interpreter of discourse: much of the postediting task involves either employing devices to ensure that the surface pieces of the discourse are connected in meaningful ways or else adjusting the reading of each item against the interpretation of others until the entire underlying text is made to cohere.

The presence of cohesion and coherence is examined in three versions of the same machine translation: the raw output, a lightly postedited version, and the final, fully postedited product.

1. Perspective on MT postediting. Machine translation can be delivered the end user as raw output, of course, and it can also be postedited to varying degrees. There is much to be learned from a look at the doctoring that is done when the machine stops working and the human user takes over. Certainly a linguistic study of intervention in the MT product at different levels of refinement can help us to prioritize our strategies. By stratifying the types of corrections that are made, we can begin to orient postediting policy so that today's MT systems are used more effectively, and we can also contribute to the improved performance of the systems of tomorrow.¹

In practice, time and cost constraints often lead to situations in which postediting is curtailed to one degree or another. Depending on the purpose of the translation, nuancing may be traded off for expediency and economy. The most drastic curtailment, of course, is no postediting at all, as is sometimes the policy with translations for information only. Usually, however, even with informative translations there is some type of human intervention. Newman (1988), based on experiments with the SYSTRAN and LOGOS MT systems, has recommended limiting information-only postediting to the replacement of foreign words—words not found in the MT dictionary. Somewhat more intervention is practiced at the U.S. Air Force Foreign Technology Division, where 'partial postediting' addresses seven types of target errors (Bostad 1987). SYSTRAN's Russian-English translations are passed through an automatic postprocessor (EDITSYS) which produces warning flags; whenever any of the seven types of error occurs in the output, the human operator is alerted by a flashing line across the screen. The corrections elicited by EDITSYS will affect, on average, about 20% of the output (Bostad 1987:438). As with most 'information-only' translation, the material handled by the Air Force covers a broad range of subjects and comes

from a wide range of sources. This is the opposite of constrained input in a highly limited domain, where MT systems may be able to handle most problems at the level of the algorithm and generate a usable translation that requires very little correction. This latter situation is exemplified by METEO 2, the system that translates Canadian weather forecasts; as of mid-1988, interventions were down to the point that only 3.4% of the text was being affected (Chandioux p.c.).

None of these applications, however, is what you might call 'mainstream' translation. In the everyday world, by far the greatest demand is for translations of general and technical material that leave no doubt as to the meanings intended by the original author. To produce such translations, given the current state of MT art, may require a somewhat more intensive human review than what has just been described. Still, it would be useful to distinguish levels of 'light' and 'full' postediting. At the European Commission in Luxembourg, for example, 'rapid' postediting of SYSTRAN machine translations was sanctioned under a project launched in May 1982 (Wagner 1983). Differences between rapid and conventional postediting were later examined by Löffler-Laurian (1986).

For our work at the Pan American Health Organization (PAHO), where we have been postediting machine translation for nearly ten years, it would be of great practical value to identify the differences between two such levels and to systematize their implementation. Moreover, to the extent that we are able to relate the distinctions to broad linguistic principles, our findings may be of more general interest for MT development and for translation theory as well.

2 Approach to a definition of levels. My hypothesis is that the differences in translation 'quality at the levels of rapid and full postediting can be correlated, at least partially, with syntactic corrections and degrees of COHESION, on the one hand, and COHERENCE on the other.

Of course, raw MT output, as well as that which is checked only minimally for predictable trouble spots, is bound to have some syntactic problems that need to be corrected. Once these have been dealt with, it is likely that the product may still be further improved: cohesive devices can be introduced that will establish clearer connections between the pieces, and more refined interpretations can be made of the nuances that help to convey the author's intentions to the target audience.

For the rapid postedit, Löffler-Laurian (1983) proposes that revision should concentrate on 'vocabulary changes', especially in domains for which the dictionary has not been highly developed: translations should be supplied for not-found words, and erroneous glosses should be corrected. Also, passages that are incomprehensible should be repaired. These are useful criteria. In addition, on the basis of our experience at PAHO, I would say that at this level many devices can be invoked which will enhance the cohesiveness of the text.

The full postedit, in turn, involves modifications that will bring out nuances and enable the reader to grasp the complete significance of the text. It makes the difference between a translation that is merely passable and one that is appropriate for the most demanding of circumstances. Löffler-Laurian (1983) has offered a set of four guidelines and twelve specific rules for the

posteditor working at this level.² Here the PAHO experience points, further, to interpretations leading to improved coherence.

In testing the hypothesis about the respective roles of cohesion and coherence, it is important that we work from a clear definition of each of these terms.

3 Concepts. Widdowson (1979:87) defines cohesion as 'the overt structural link between sentences as formal items', and coherence as 'the link between the communicative acts that sentences are used to perform'. He goes on to suggest that cohesion is the propositional relation between the parts of a discourse, whereas coherence is the illocutionary relation. For present purposes, the definitions of both concepts have been broadened to apply to relations *within* sentences or communicative acts as well as between them. Thus, cohesion is taken to refer to ties between elements manifest in the surface structure of the discourse, while coherence has to do with the interpretation of connectedness in the underlying text.³

3.1 Cohesion. Cohesion is easier to describe than coherence, and easier to recognize. The devices can be specified, and when applied to translation they can yield considerable payoff in terms of understandability.

According to Halliday and Hasan (1976:4), cohesion occurs when an element in discourse cannot be effectively decoded without invoking another element in the text or the discourse situation. 'When this happens, a relation of cohesion is set up, and the two elements, the presupposing and the presupposed, are thereby at least potentially integrated into a text'. They identify the following types: reference, substitution/ellipsis, lexical cohesion, and conjunction. Since these headings will be applied below to some of the corrections that are made in MT postediting, they are elaborated here in some detail.

In the case of reference, an element in discourse relies on some other element for its interpretation: information must be recovered about it--either a referential meaning or the identity of a particular thing--in order for it to be decoded. Personal and possessive pronouns, for example, set up pronominal reference. Demonstrative reference is established by demonstrative pronouns and also by the definite article *the*. Comparative reference involves identity, similarity, difference, or quantitative or qualitative relations between discourse entries. The referent may be present in the discourse situation rather than the text, in which case the reference is exophoric. Cohesion is created by the fact that the same concept enters the discourse a second time, and the cohesive tie is the connection between the two occurrences (31).

Substitution is 'the replacement of one item by another' (88). The second item, or substitute, establishes a cohesive link with the first. Whereas reference is a relationship between meanings, substitution is a relationship between linguistic items. The substitute is used to avoid repetition. In English, NPs can be replaced by *one(s)* or *same*; verbs by *do* (+*so/it/that/the same/likewise*), *be* (+*so/it/that*), *have* (+*to*); and clauses by *so* or *not*. Unlike reference, substitution cannot be exophoric; it can only involve the elements expressed in the discourse proper.

Ellipsis (142) may be seen as a special subtype of substitution in which a linguistic item is replaced by nothing. There is cohesion with the zero element in the same way as there is with the substitute.

Lexical cohesion (274) connects discourse entries not through grammatical resources, as above, but rather through lexical choice. A synonym, a broader or narrower term, or a related term revives a concept in the discourse. There is also cohesion between any pair of lexical items that belong to the same ordered set or paradigm (*Tuesday...Thursday, north...south*) and between items that often cooccur—for example, *blade...sharp, garden...dig, try...succeed, king...crown, boat...row* (285).

Conjunction is different from the other four types of cohesion because attention is focused on the meaning of the cohesive relation itself rather than on the elements that are tied together (226-227). There is a large inventory of cohesive relations under the broad heading of conjunction, and the authors have classified them according to their function: additive ('and', 'or else', 'furthermore', 'for instance', 'similarly', 'on the other hand'), adversative ('but', 'nevertheless', 'in fact', 'on the other hand', 'instead', 'rather', 'in any case'), causal ('therefore', 'with this in mind', 'it follows', 'in that case', 'otherwise'), and temporal ('next', 'at once', 'meanwhile', 'finally', 'up to now', 'in short').⁴ Presumably the authors' lists could be expanded to include such discourse markers as 'oh', 'well', 'y'know', 'I mean' (Schiffrin 1987).

In addition to using the foregoing devices, which can be formulated quite explicitly on the basis of grammatical and lexical properties, cohesion involves developing the overall fabric of the text through the distribution of new and old information and through the staging effect created by message themes (Halliday and Hasan 325, Halliday 1967-68, Vasconcellos 1985, 1986a, 1986b).

3.2 Coherence. Unlike cohesion, coherence underlies the discourse and has no predictable reflex in surface structure. Whereas cohesion has to do with relations between surface linguistic forms and between propositions, coherence involves connectedness within the communication act itself. The speaker/writer is now seen as communicator, and the listener/reader as interpreter.

The progress of a discourse is determined by the communicator's choices of meanings to be focused on. In turn, the interpreter of a discourse (in our case the posteditor) must be able to decide for each entry in the discourse which meaning type,⁵ and within it which specific meaning among possible alternatives, is intended. If the posteditor's interpretation matches the author's intention, the translation is fully successful—although in reality this success is apt to be achieved only to an approximate degree.

Communicators and interpreters assume that a text is coherent. Coherence is observed, and therefore defined, more through its absence than its presence. Lack of coherence may be illustrated by the following example (van Dijk 1972):

- (1) We will have guests for lunch. Calderón was a great Spanish writer.

Despite the strong tendency to assume coherence, it is difficult for an interpreter to see any connectedness between the two entries. Coherence is present, on the other hand, in a similar sequence:

(2) You ought to read *Wombats Galore*. Bruce McQuarrie is a great author.

Even though in fact it is nonsense contrived precisely to make this point (Stubbs 1983:124).

Some authors would assign part of semantic connectedness to cohesion,⁶ but the position taken here is that coherence, rather than cohesion, underlies the interpretations of textual meaning. For Sanders (1987), it is coherence which provides the communicator with the cognitive basis for formulating discourse entries so that control is exercised over the way he or she is understood (7). From the perspective of the interpreter, who in the case of written text is distanced from the author at least in time if not in space, readings have to be adjusted back and forth as the discourse unfolds until each discourse entry has a specific interpretation that fits with what went before (84).

A single word may constitute a discourse entry, and its reading has to be adjusted against others in the context until they are made to cohere as much as possible. Sanders illustrates this process with a well-known sentence:

(3) Colorless green ideas sleep furiously.

At first we are struck by blatant incoherence. This is because we give an unmarked interpretation to each of the terms. However, if we force ourselves to assume that the message is coherent, we can try to read different meanings into the components until a coherent interpretation of the whole is arrived at. Each term is examined for its range of possible meanings, and the various options are tested against the surrounding context. To start with, by looking ahead we know that *colorless* does not readily apply to the upcoming concepts of *green* and *ideas*, so we backtrack and interpret it as 'lackluster'. We then rethink the meaning of *green* and reject the more usual one of 'a color' in favor of 'unripened'. And so on. Sanders' result is:

(3') Lackluster unripened ideas lying dormant are volatile.

The process that Sanders describes is constantly exercised in translation, especially in the postediting of machine output. Postediting is an ongoing process of interpretation, since the pieces of the target language are already given. The job of the posteditor is to examine these pieces, make a 'specific interpretation' of the meaning intended by the author, and adjust the wording so that the text becomes more coherent. The computer can and often does generate a set of pieces which an interpreter can appreciate as a fully understandable translation which is both grammatically and discursively well-formed.⁷ But this judgment has to be made by the posteditor, and such sentences may be intermixed with others that are less felicitous.

4 Cohesion and coherence in postediting. In our work at the Pan American Health Organization with Spanish-English and English-Spanish MT (SPANAMtm and ENGSPANtm, respectively⁸), we have found that a conventional postedit is usually accomplished in two passes: a first 'rough draft' and then a final polishing. This has been our typical experience over the last ten years. We would like to know now whether these two passes could be made to correspond to linguistically describable levels.

What is really done in each of the two passes? Are there linguistic criteria that distinguish one level from the other? And finally, are there purposes for which raw MT and first-pass MT are adequate? Up to now the answers to these questions have eluded us. No one has been able to tell posteditors exactly what to look for. Of course, with many of the changes that are introduced there is general agreement on the need for something to be done—if not on the solution. But with other changes there is debate about whether they are essential or even worthwhile at all. So far, it has been difficult to clarify how they contribute to making the translation more explicit—and therefore more useful.

To address these questions, I singled out one of the jobs in our regular Spanish-English production stream for which it was possible to reconstruct three different versions: the raw output (presented in side-by-side form at Appendix A and in target-only form as Appendix B), a first-pass postedit (Appendix C), and the final translation (Appendix D). The complete text was a 7,000-word report on the status of nutrition in Latin America, a subject on which SPANAM has often been exercised in the past. The first 312 words, which are fairly typical of the rest of the document, were examined in depth and are discussed at each of the two levels in the following sections.⁹

4.1 The first pass. For both the first pass and the final translation, the changes that had been made were grouped under three broad headings: syntactic corrections, cohesive devices, and interpretations for coherence. An effort was made to assign all the changes, including lexical choices, to one of another of these categories.

At the level of the first pass, the posteditor made a total of 33 changes (shown in Appendix B).^{10, 11} The distribution was as follows:

Syntactic corrections	9	27%
Cohesive devices	21	64%
Interpretations for coherence	3	<u>9%</u>
		100%

Syntactic corrections. Three of the syntactic changes were merely punctuation: one a comma to mark a nonrestrictive relative clause [line 13], another a comma to match an existing comma for a parenthetical phrase [line 17], and the last a hyphen [line 22]. Two others also involved the further marking of a nonrestrictive relative clause: omission of *and* as a translation of the Spanish clause-marker *y* and substitution of *which* for *that* [both on line 13]. Two were corrections in prepositional government (*place demands on* [line 13] and *suffer from* [line 21]). An adjustment was made to accommodate the fact that *contribute* in English cannot be followed by an infinitive [line 16],

The last correction was a VSO construction that could not easily be 'quick-fixed' (see Vasconcellos 1986a) and required the movement of four words to the end of the sentence.

Of the nine syntactic corrections, two (22%) were made using macros, indicating that these were operations commonly performed by posteditors. (Use of a macro, of course, speeds up the process.)

Cohesive devices. Of the 21 cohesive devices, 12 (57%) had to do with definiteness, a subcategory of referential cohesion: two called for insertion of the definite article and nine for its deletion (the changes on line 2 were counted twice, once as deletion of the article and once as conjunction). Seven of the other nine devices could be accounted for in terms of conjunction. In five instances, conjoining of the terms in an enumeration was highlighted cohesively by repetition of the preposition [lines 2 (twice), 5,6] or downgraded by the deletion thereof [line 20]. In another case [line 9], a relative clause marker was changed from a comma to a dash, giving more independence to the conjoining relation. Also under conjunction, the head noun *capacity* was redundant in the premodifying enumeration of the NP whose head was *performance*. The other two changes had to do with discourse texture. In one, the information structure was preserved by postposing the concept *disadvantaged* [line 7] after *populations*. In the other, movement of the word *usually* (from the Spanish *generalmente*) to the front of the clause gave it thematic status [line 10].

Of the 21 cohesive devices, 12 (57%) were introduced using macros.

There were also interpretations for coherence at this level. The word *exist* [line 7] emphasizes the notion of 'existence' in a context where it does not apply. Changing the translation *usually* to *in general* [line 10, counted previously as a move for purposes of thematization] brackets the clause that follows and appears to approximate more closely the meaning originally intended. Finally, deletion of *aspects of* seems to tighten the coherence in English.

4.2 Final translation. At this maximum level of refinement 14 additional changes were made, which showed the following breakdown:

Syntactic corrections	0	0%
Cohesive devices	(?) 3	21%
Interpretations for coherence	11	<u>79%</u>
		100%

As it can be seen, there was a clear preponderance of interpretations with a view to improving coherence. Only three of the changes could be regarded as cohesive devices, and in each case an underlying motivation of coherence could be argued.

One of the changes that was classified as cohesive was the replacement of *however* by *nevertheless* [line 3]. In surface structure, this is a cohesive relation expressed through a conjunction. On the other hand, the interpretation that led to the change might well be considered to involve coherence. This was also true of the changes in the conjunctions from *in*

general to in sum [line 10]. The other candidate cohesive device was the use of commas to bracket the phrase on lines 24-25. Again, although the device is a surface-structure mechanism, one could argue that it was necessitated by the expansion which had been added between the commas.

Eight (73%) of the remaining 11 changes were clear-cut expansions beyond the propositional content given by the machine translation [two insertions on line 7 plus those on lines 16, 17, 18, 24, 26, and 27]. Because the material had not been present in the discourse, these changes could only be classed as interpretations for coherence. Two others [lines 10 and 40], although they did not expand the number of words in the text, added further semantic specificity which had not been there before, and in this sense they were also expansions. Finally, the use of *to* [line 28] adds force to the claim being made.

5 Discussion. The foregoing analysis bears out the difficulty of separating cohesion and coherence. In several of the examples it seemed that even though cohesive devices had been used, because of the circumstances of postediting there was also a strong component of interpretation for coherence.

For instance, the changing of *however* to *nevertheless* [line 3] and *in general to in sum* [line 10] were both further refinements of cohesive relations that were already present in the discourse--and in fact had been introduced during the first pass. It looks as if two different types of motivation were at work. In the first pass, the need for a cohesive tie was detected, and the material introduced was a close approximation of the original Spanish. In the final polishing, however, the posteditor became interpreter and proceeded to introduce semantic components which represented a slight departure from the unmarked meaning of these conjunctions, doing so in the interest of coherence.

What have we learned from this exercise? In the sample studied it was clear that syntactic corrections and cohesive devices predominated in the first pass and that interpretations for coherence accounted for the changes in the final translation.

In the haste of work, the distinction between these two levels tends to blur: during the first pass it may happen that interpretations are introduced, while in the final review action may be taken on opportunities that were missed the first time around. It is not reasonable to expect that posteditors will follow a rigorous separation between the two. Still, time can be saved for some applications if an effort is made to limit changes to syntactic corrections and cohesive devices.

As far as the contribution to MT development is concerned, it is reasonable to hope that many cohesive devices can eventually be written into basic algorithms or inter- or postprocessors. On the other hand, it is also important to recognize the posteditor's role as interpreter of coherence, and to understand that this aspect of human performance is beyond formalization,

<p>Una nutrición adecuada es esencial para la salud del individuo, la productividad colectiva y el bienestar social. Sin embargo, las carencias nutricionales continúan altamente prevalentes en la Región, particularmente la desnutrición energético-proteica y las deficiencias de hierro, de vitamina A y de yodo.</p>	<p>OK / Adequate nutrition is essential for health of the individual, the collective productivity and the social well-being. However, the nutritional deficiencies continue to be highly prevalent in the Region, particularly the energy-protein malnutrition and deficiencies of iron, of vitamin A and of iodine.</p>
<p>Es evidente que existen poblaciones subprivilegiadas en términos de disponibilidad y consumo de alimentos; atención de salud, saneamiento ambiental, educación, oportunidades de trabajo y organización social, las cuales viven generalmente en situación de pobreza crítica. Dichas condiciones están agravadas por los cambios demográficos que están ocurriendo en Latinoamérica y el Caribe y que crean nuevas demandas al sistema alimentario.</p>	<p>PP 27 // It is evident that there exist disadvantaged populations in terms of availability and consumption of food, health care, environmental sanitation, education, job opportunities and social organization, which live usually in a state of critical poverty. Said conditions are aggravated by the demographic changes that are occurring in Latin America and the Caribbean and that place new demands to the food system.</p>
<p>Las deficiencias nutricionales agravan los problemas de salud y contribuyen a elevar las tasas de morbilidad y mortalidad especialmente en niños menores de 5 años, ocasionando alteraciones funcionales con efectos inmediatos y repercusiones a largo plazo en las áreas de capacidad mental, social, inmunológica, reproductiva y de rendimiento físico.</p>	<p>PP 45 TU // Nutritional deficiencies aggravate the health problems and contribute to increase the rates of morbidity and mortality especially in children under 5, causing functional alterations with immediate effects and long-term repercussions in the areas of mental capacity, social, immunological, reproductive and of physical performance.</p>

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 #HDR99S999999 NUTRITION UNEDITED MACHINE TRANSLATION

Concomitantemente, otros grupos de población sufren NO 23 2/ At the same time, other population groups suffer chronic enfermedades crónicas--cardiovasculares, diabetes no 2.2 diseases--cardiovascular, non-insulin dependent diabetes, insulino dependiente, obesidad y algunos tipos de cáncer-- 2.3 obesity and some types of cancer--in whose etiology plays en cuya etiología juega un papel importante la malnutrición 2.4 an important role malnutrition due to imbalance of debida a imbalance de nutrientes y exceso relativo de 2.5 nutrients and relative excess of energy. energía.

Puesto que la nutrición y la salud no pueden existir en NO 14 TU 2.6 Because nutrition and health cannot exist independently forma independiente y ambas son esenciales para el 2.7 and both are essential for the development and the well- desarrollo y el bienestar de la población, una alimentación 2.8 being of the population, an adequate diet is essential for adecuada es esencial para ambos aspectos del bienestar 2.9 both aspects of the individual and collective well-being. individual y colectivo. Todos los factores que inciden en OK 3/ All the factors that affect the availability, acquisition, la disponibilidad, adquisición, distribución intrafamiliar, 3/ intrafamily distribution, consumption and utilization of consumo y utilización de los alimentos deben tenerse en 3.2 the food should be taken into account in the plans and cuenta en los planes y programas dirigidos a lograr y 3.3 programs directed toward achieving and maintaining a good mantener un buen estado de salud y nutrición. 3.4 state of health and nutrition.

El control y prevención de la malnutrición no puede ser OK OK 3.5 The control and prevention of malnutrition cannot be responsabilidad exclusiva del sector salud. Es necesario OK 3.6 exclusive responsibility of the health sector. It is poner en marcha políticas y programas coordinados dirigidos 3.7 necessary to implement policies and coordinated programs a la identificación, vigilancia y corrección de los 3.8 directed toward the identification, surveillance and diversos factores que afectan el estado nutricional y el 3.9 correction of the various factors that affect the consumo de alimentos. 3.10 nutritional status and the consumption of food.

Appendix B: Target-only raw MT output with first-pass changes.

1 Adequate nutrition is essential for^{the} health of the
 2 individual, ^{for} the collective productivity and ^{for} the social well-
 3 being. However, ~~the~~ nutritional deficiencies continue to
 4 be highly prevalent in the Region, particularly ~~the~~ +energy-
 5 protein+ malnutrition and deficiencies of iron, ~~of~~ vitamin A
 6 and ~~of~~ iodine.
 7 It is evident that there ^{are} ~~exist~~ disadvantaged ^{which are} populations,
 8 in terms of availability and consumption of food, health
 9 care, environmental sanitation, education, job
 10 opportunities and social organization, ^{-in general,} ~~which~~ live ^{usually}
 11 in a state of critical poverty. Said conditions are
 12 aggravated by the demographic changes that are occurring in
 13 Latin America and the Caribbean, and ^{which} ~~that~~ place new demands
 14 ^{on} ~~to~~ the food system.
 15 Nutritional deficiencies aggravate ~~the~~ health problems
 16 and contribute to increase, ~~the~~ ^{the} rates of morbidity and
 17 mortality, especially in children under 5, causing
 18 functional alterations with immediate effects and long-term
 19 repercussions in the areas of mental ~~capacity~~, social,
 20 +immunological+, reproductive and ~~of~~ physical performance.
 21 At the same time, other population groups suffer ^{from} chronic
 22 diseases--cardiovascular, non-insulin-ⁱⁿdependent diabetes,
 23 obesity and some types of cancer--in whose etiology plays
 24 an important role malnutrition due to imbalance of

25 nutrients and relative excess of energy

26 Because nutrition and health cannot exist independently

27 and both are essential for the development and the well-

28 being of the population, an adequate diet is essential for

29 both aspects of ~~the~~ individual and collective well-being.

30 All the factors that affect the availability, acquisition

31 intrafamily distribution, consumption and utilization of

32 ~~the~~ food should be taken into account in the plans and

33 programs directed toward achieving and maintaining a good

34 state of health and nutrition.

35 The control and prevention of malnutrition cannot be *the*

36 exclusive responsibility of the health sector. It is

37 necessary to implement policies and coordinated programs

38 directed toward ~~the~~ identification, surveillance and

39 correction of the various factors that affect ~~the~~

40 nutritional status and the consumption of food.

Appendix C: First-pass postedit with final changes.

1 Adequate nutrition is essential for the health of the

2 individual, for collective productivity and for social well-

3 being. *Nevertheless* ~~However~~, nutritional deficiencies continue to

4 be highly prevalent in the Region, particularly energy-

5 protein malnutrition and deficiencies of iron, vitamin A

6 and iodine.

7 *Unquestionably,* ~~It is evident~~ that there are *some* populations which are severely disadvantaged

8 in terms of availability and consumption of food, health
9 care, environmental sanitation, education, job
10 opportunities and social organization--in ^{sum} general, which live
11 in a state of critical poverty. These conditions are
12 aggravated by the demographic changes that are occurring in
13 Latin America and the Caribbean, which place new demands
14 on the food system.
15 Nutritional deficiencies aggravate health problems
16 and ^{then} contribute to increased rates of morbidity and
17 mortality, especially in children under 5, ^{as well as} causing
18 functional alterations ^{that have both} with immediate effects and long-term
19 repercussions in the areas of mental, social,
20 immunological, reproductive and physical performance.
21 At the same time, other population groups suffer from chronic
22 diseases--cardiovascular, non-insulin-dependent diabetes,
23 obesity and some types of cancer--in whose etiology
24 malnutrition ^{in the form of} due to ^{an} imbalance ^{of}
25 nutrients ^{intake} and relative excess energy, plays an important role.
26 Because nutrition and health cannot exist ^{one} independently
27 ^{of the other, together they are} and both are essential for the development and the well-
28 being of the population, an adequate diet is essential ^{to} for
29 both individual and collective well-being.
30 All the factors that affect the availability, acquisition
31 intrafamily distribution, consumption and utilization of

32 food should be taken into account in the plans and
33 programs directed toward achieving and maintaining a good
34 state of health and nutrition.
35 The control and prevention of malnutrition cannot be the
36 exclusive responsibility of the health sector. It is
37 necessary to implement policies and coordinated programs
38 directed toward identification, surveillance and
39 correction of the various factors that affect
40 nutritional status and ~~the consumption of food,~~ ^{intake}

Appendix D: Final translation.

1 Adequate nutrition is essential for the health of the
2 individual, for collective productivity and for social well-
3 being. Nevertheless, nutritional deficiencies continue to
4 be highly prevalent in the Region, particularly energy-
5 protein malnutrition and deficiencies of iron, vitamin A
6 and iodine.
7 Unquestionably, there are some populations which are severely
8 disadvantaged
9 in terms of availability and consumption of food, health
10 care, environmental sanitation, education, job
11 opportunities and social organization—in sum, which live
12 in a state of critical poverty. These conditions are
13 aggravated by the demographic changes that are occurring
14 in Latin America and the Caribbean, which place new demands
15 on the food system.
16 Nutritional deficiencies aggravate health problems
17 and thus contribute to increased rates of morbidity and
18 mortality, especially in children under 5, as well as causing
19 functional alterations that have both immediate effects and long-term
20 repercussions in the areas of mental, social,
21 immunological, reproductive and physical performance.
22 At the same time, other population groups suffer from chronic
23 diseases--cardiovascular, non-insulin dependent diabetes,
24 obesity and some types of cancer--in whose etiology
25 malnutrition, in the form of unbalanced
26 nutrient intake and relative excess energy, plays an important role.
27 Because nutrition and health cannot exist one independently of the

27 other and together they are both essential for the development and the
well-
28 being of the population--an adequate diet is essential
29 both to individual and to collective well-being.
30 All the factors that affect the availability, acquisition
31 intrafamily distribution, consumption and utilization of
32 food should be taken into account in the plans and
33 programs aimed at achieving and maintaining a good
34 state of health and nutrition.
35 The control and prevention of malnutrition cannot be the
36 exclusive responsibility of the health sector. It is
37 necessary to implement policies and coordinated programs
38 aimed at identification, surveillance and
39 correction of the various factors that affect
40 nutritional status and food intake.

Notes

1. This is in fact the rationale behind the Augmentor component of KBMT-89, the knowledge-based MT constellation being developed at Carnegie Mellon University (Nirenburg in this volume).

2. Löffler-Laurian's general guidelines for conventional postediting (1986, translation from the French by MV): respect the raw translation as much as possible; change only that which absolutely must be changed; make the changes as simple as possible; and change what is unfaithful, incorrect, or incomprehensible. Her specific rules are: (1) provide the correct technical terms, proper names, and abbreviations; (2) resolve ambiguities; (3) check relationships between verbs and their arguments and within NPs; (4) check logical relationships in long sentences; (5) when restructuring is necessary, chose the most economical approach; (6) watch for differences in punctuation between the two languages; (7) watch for differences in verb tenses between the two languages; (8) change modality and qualification to conform to target language usage; (9) make certain that negations are correctly rendered; (10) impose parallel structure in enumerations; (11) provide functional equivalents for idiomatic phrases; and finally, (12) concentrate on going straight to the point. She concludes by emphasizing that to work quickly does not mean that quality has to be sacrificed.

3. It will be seen later below that in the case of cohesion this interpretation fits with the model of Halliday and Hasan (1976) and in the case of coherence with that of Sanders (1987).

4. Semantic meanings are given between single quote-marks, whereas English lexical items are italicized.

5. Types of meaning other than propositional meaning are variously categorized in different linguistic models. Bühler (1934) identified three functions of language--the referential, the expressive, and the conative. Jakobson (1960) developed a scheme of six. Halliday (1977) sees language as having three generalized functions--ideational, interpersonal, and textual--each of which corresponds to a subset of interdependent systems that convey different types of meaning. Sanders (1987) speaks of propositional

content, illocutionary act, and implicature. Common to all these models is the fact that, depending on the intentions of the communicator, the choice can be made to focus on one or another of the meaning systems while the remaining systems still continue to be instantiated in the text.

6. See Brown and Yule (1983:195-199) for a discussion of the place of semantic connectedness.

7. See Stubbs (1983:84-103) for a discussion of discursal well-formedness.

8. SPANAMtm (Spanish-English) and ENGSPANtm (English-Spanish) are MT systems developed in-house by the Pan American Health Organization in order to meet internal translation needs (see Vasconcellos and León 1988). SPANAM has been in practical use since January 1980 and ENGSPAN (development partially supported by Grant DPE-5543-G-SS-3048-00 from the U.S. Agency for International Development), since 1985. ENGSPAN has since been installed at AID and at international agricultural research centers in Colombia and the Philippines. SPANAM's dictionaries have more than 62,000 entries; ENGSPAN's, about 55,000.

9. Segmentation of the sample was dictated by the amount of text that would fit on a two-page side-by-side display.

10. These calculations do not include the serial comma, which is house style, or deletion of the plus (+) signs indicating terminological reliability. For both these operations there are macros which accomplish them quickly.

11 The sample text had been purged of dictionary problems that could easily be remedied, and in this sense the experience was different from typical postediting, which would be expected to include more corrections for such basic errors as not-found words.

References

- Bostad, Dale A. 1987. Machine translation: The USAF experience. Proceedings of the 28th Annual Conference of the American Translators Association (Cleveland, 16-19 October 1986), ed. by Karl Kummer. 435-43. Medford, N.J.: Learned Information, Inc.
- Brown, Gillian, and George Yule. 1983. Discourse analysis. Cambridge, London: Cambridge University Press.
- Bühler, Karl. 1933 [1982]. The axiomatization of the language sciences. Translation of Die Axiomatik der Sprachwissenschaften by Robert E. Innis. In: Karl Bühler: Semiotic foundations of language theory. 77-164. New York and London: Plenum.
- Halliday, M.A.K. 1967. Notes on transitivity and theme in English. Parts 1 and 2, Journal of Linguistics 3.37-81, 199-244. Part 3, 4.179-215.
- Halliday, M.A.K. 1977. Text as semantic choice in social contexts. Grammars and descriptions, ed. Teun A. van Dijk and Janos Petöfi. Berlin and New York: De Gruyter. 176-225.
- Halliday, M.A.K., and Ruqaiya Hasan. 1976. Cohesion in English. London: Longman.
- Jakobson, Roman. 1960. Closing statement: Linguistics and poetics. Style in language, ed. by Thomas A. Sebeok. 350-77. Cambridge, Mass.: MIT Press; New York and London: Wiley.
- Löffler-Laurian, Anne-Marie. 1986. Post-édition rapide et post-édition conventionnelle. Part 1, Multilingua 5.81-8. Part 2, 5.225-29.
- Newman, Patricia E. 1988. Information-only machine translation: A feasibility study. In: Technology as translation strategy, ed. by Muriel Vasconcellos. 178-189. Binghamton: State University of New York Press. American Translators Association Scholarly Monograph 2.
- Sanders, Robert E. 1987. Cognitive foundations of calculated speech. Albany: State University of New York Press.

- Schiffirin, Deborah. 1987. Discourse markers. Cambridge, New York: Cambridge University Press. *Studies in Interactional Sociolinguistics* 5.
- Stubbs, Michael. 1983. Discourse analysis: The sociolinguistic analysis of natural language. Chicago: University of Chicago Press.
- Van Dijk, TA. 1972. Some aspects of text grammars. The Hague: Mouton.
- Vasconcellos, Muriel. 1985. Theme and focus: Cross-language comparison via translations from extended discourse. Georgetown University dissertation.
- Vasconcellos, Muriel. 1986a. Functional considerations in the postediting of machine-translated output: Dealing with V(S)O versus SVO. *Computers and Translation* 1.21-38.
- Vasconcellos, Muriel. 1986b. Humor through the listener's voice: A functional model for the capture of humor in translation. *Babel* 32.134-45.
- Vasconcellos, Muriel, and Marjorie León. 1988. SPANAM and ENGSPAN: Machine translation at the Pan American Health Organization. In: *Machine translation systems*, ed. Jonathan Slocum. 187-235. Cambridge, New York: Cambridge University Press.
- Wagner, Elizabeth. 1985. Rapid post-editing of Systran. In: *Tools for the trade: Translating and the Computer* 5, ed. by Veronica Lawson. 199-213. Amsterdam: North-Holland.
- Widdowson, H.G. 1979. *Explorations in applied linguistics*. London and Edinburgh: Oxford University Press.