JEANNE DANCETTE
Département de linguistique et de traduction
Université de Montréal

MAPPING MEANING AND COMPREHENSION PROCESSES IN TRANSLATION

In this article we will define the problem of comprehension (and meaning) and see how observational research on translation processes can contribute to theoretical issues. The article will focus on the analysis of excerpts of the thinking-aloud protocols of three translators, presented to illustrate some of the issues raised in the theoretical section of the paper.

1. THEORETICAL AND METHODOLOGICAL CONSIDERATIONS

1.1. A Tentative Definition of Comprehension

The first question this article aims to address relates to comprehension. What is it to understand a text, i.e. a message in its linguistic form? In particular, how do the cognitive and the linguistic interact? Both our analysis of thinking-aloud protocols and the theoretical positions we have adopted maintain a distinction between the two levels, even though linguistic decoding is a matter of conceptualization.

One of the many definitions of comprehension could read as follows: To understand a text is to build a meaningful and coherent representation of its conceptual content, or text-world. It is to actualize links that may or must be established between linguistic elements in the textual structure, and non-linguistic elements pertaining to intertextual and extratextual information.

People arrive at such a representation through their linguistic competence, on the one hand, and on the other hand, through their knowledge of concepts expressed in lexical items, as well as their knowledge of how such items are
linked conceptually in phrases and sentences (in the text) and in the outside world (world knowledge). Thus, comprehension does not operate only at the semantic level, but also at a more global level where all informational input (from the text, from what we know of the world, from what we grasp of the pragmatic situation) becomes compatible, that is at the conceptual level.

The above definition captures the function of the "receiver," as opposed to the "issuer," in a communication system. More than 35 years ago, Tesnière put it in a simple way: "Parler, c'est établir entre les mots un ensemble de connexions (...), comprendre, c'est saisir l'ensemble des connexions qui unissent les mots (1959, reedit. 1988:12, cited in Fuchs 1992:32). More recently, Charolles (1982:21) proposed a definition of comprehension which is based on the psychological and functional: To understand a statement is "disposer d'une explication justifiant suffisamment qu'un locuteur l'ait produit dans les termes où il l'a produit et dans la situation où il l'a produit" [TRANSL: to have an explanation justifying to a sufficient degree that the speaker has produced it in the terms he/she has produced it and in the situation where he/she has produced it].

These definitions take into account the impact of the text on the "receiver": the text is changed in the receiver's mind into a "mental model," be it a conceptual representation or an explanation of its form and content. Following this reasoning, discovering the "mental model" being built in the receiver's mind would amount to capturing his comprehension process.

Such an approach tends to reconcile two rival positions, the linguistic and the cognitive. In the linguistic tradition, meaning is constructed through the componentiality of the different linguistic structures (whether or not they are seen
as a continuum: lexicon, morphology, syntax, semantics) in as much as each contributes to meaning. The cognitive view uses the psychological concept of a mental model to explain language understanding. This debate of constructivism versus cognitive modelling is not new. It has already been discussed by Johnson-Laird (1983) and many others. In our view, it is futile to set these positions one against the other since they are probably compatible. Indeed, they have to support each other if we want to discuss and study the cognitive facet of text reception, be it reading, listening, or translating/interpreting. We have a linguistic object -- a text -- composed of different elements. However, this object exists only in its cognitive image, in the form in which it is processed by the receiver, at a precise time in history, in a given place in the world and in a unique context.

The above discussion applies particularly to translation. Translation is a linguistic operation concerned with semantics, as well as syntax and morphology as they relate to semantics. It is also a discursive operation, an act of communication among various participants. The translator, for one, is in charge of rendering the meaning of a text; he cannot do so successfully if he/she does not understand the text, if he/she does not have a meaningful and coherent conceptual construction of the text in his/her mind. (See Dancette 1994 for an illustration of conceptual representations built by the translators.)

This tentative definition of comprehension raises the following questions that neither linguistics, the cognitive sciences, nor philosophy have yet answered: 1. Once again, what is meaning? 2. What is the role of context and memory in language understanding? 3. What is the role of lexicon? 4. What is the role of syntax?
This paper will not come any closer to solving these age-old questions. However, they cannot be ignored because studies based on the observation of translation processes continuously bring them to the fore and therefore make them real, concrete and inescapable. Indeed, when we observe translators tackle comprehension difficulties, we witness the delicate maneuvering between the interpretation of specific linguistic signs (for example, syntactic decoding), and global, intuitive capturing of the gist of a message, i.e. a swing between analytical and synthetical operations or bottom-up and top-down operations. Also, in translation, there are specific trade-offs between what is considered by the subject as a sufficient degree of understanding and a sufficient degree of accuracy in the choice of interlinguistic equivalents. This pragmatic constraint adds to the complexity of the problem in as much as comprehension operations are closely linked to the goal of translation: producing a text in another language expressing the meaning of the original.

In the standard position in linguistics, it is said that comprehension is the result of the confrontation and synthesis of both literal and contextual meaning. In this view, literal meaning rests on linguistic items while contextual meaning is carried by the act of communication. In discourse situations, meaning integrates literal and contextual meaning. It is arrived at through at least two types of operations: interpretations of textual units based on linguistic knowledge, and inferences and deductions based on extralinguistic and encyclopedic knowledge.

This position, which we presented in Dancette 1995, begs the following comments: 1) it shifts the question of comprehension onto the question of meaning; 2) it dichotomizes literal and contextual meaning. We would like
expand upon the question of meaning and qualify our previous position on contextual meaning.

1. 2. A Conceptual Theory of Meaning

The question to be posed is "What is the nature of semantic representations?"
In his book *Foundations of Cognitive Grammar* (1987), Langacker devotes a whole chapter to semantic structures, which he sees as a particular type of conceptual structure:

"The term **conceptual structure** will be applied indiscriminately to any such entity, whether linguistic or nonlinguistic. A **semantic structure** is then defined as a conceptual structure that functions as the semantic pole of a linguistic expression. Hence semantic structures are regarded as conceptualizations shaped for symbolic purposes according to the dictates of linguistic convention."(1987:97)

Langacker does not dismiss the existence of semantic structures. Contrarily to Jackendoff (1985) for example, he does not purely and simply amalgamate linguistic meaning and conceptual meaning. According to him, each grammatical unit - syntactical, morphological or lexical - results from symbolic structures that have a semantic pole. Langacker, however, departs from traditional linguistics as he opposes the canonical theory of componentiality of meaning in favour of a more global, holistic one: linguistic (symbolic) elements are not seen as discrete and autonomous, but rather as a continuum.
Our study of translators' verbal protocols seems to corroborate the assumption that conceptualizations are anchored to different structures, both linguistic and non-linguistic. This even seems to happen in a preferential manner, and perhaps sometimes in a conscious and rational way. At times, one pole will be more focused on than the other, depending on the strategies translators use to solve a problem.

In previous writings, we have used the concepts of "complementation" and "suppletion" in text comprehension to show the interaction of the linguistic and cognitive levels. We defined the mechanism as the ability to resort to another level of analysis (in case of difficulty or uncertainty) in order to generate a new hypothesis (suppletion) or to verify and strengthen tentative ones (complementation). (Dancette, 1995:192-193). These shifts of attention, whether conscious or unconscious, explain, among many factors, the variability and complexity of meaning.

1.3. The Indeterminacy of Meaning

Describing the meaning-making operations, Langacker stresses the ability to impose alternate structurings on any given "conceived situation." As a simple example, he proposes different sentences (semantically distinct) that could all be used to describe the same objective situation, though with different images: a) The clock is on the table; b) The clock is lying on the table; c) The clock is resting on the table; d) The table is supporting the clock.
There is enormous variability of meanings of a conceived situation. In translation, this phenomenon of contrasting images conveyed by a statement is of paramount importance, since the indeterminacy of meaning operates at two ends: the source and the target texts. The variability of meaning is clear when we look at all the different interpretations, points of view, nuances expressed by different translators working on the same text. On the individual level, it is all the more evident when translators are having comprehension problems and hesitate between different interpretations. As will be shown in the analysis of thinking-aloud protocols below, this ability to construe alternate images can be used to advantage for purposes of thought (to generate alternate hypotheses on meaning) and for purposes of expression (to explore alternate expressive resources).

Transformations and inferences at all levels, however, are to be tightly monitored ("mental processor," De Beaugrande 1983) in order to allow for the integration of meaning. As can be seen most clearly in experiments using recalls, readers usually arrive at one representation of the text. To do so, they select and retain what is most mutually compatible.

Shedding light on these various operations and identifying their levels might lead to a better understanding of how human beings manipulate linguistic symbols. However, one of the theoretical and methodological questions raised by the analysis of comprehension processes is whether each facet of meaning (the linguistic and the extralinguistic poles of symbolic expressions) can be analyzed and described objectively.

We think that, although the boundaries between linguistic and nonlinguistic elements are fuzzy, a distinction can indeed be drawn when we examine thinking-
aloud protocols. Some operations are applications of linguistic rules (at all levels); others are applications of rules of correspondence between the text and the reality referred to.

1. 4. Returning to the Question of Variability of Meaning: What about Contextual Meaning?

According to the standard position in linguistics, context is called on to complement the literal meaning of a statement. In line with the position outlined here, it would seem more appropriate to think of context as being part of the interpretation of a statement (Kleiber, 1994:16-17). In other words, literal meaning could not exist because interpretation is never context-free. Meaning is not an invariant; it is context-dependent. However, it is not totally variable, idiosyncratic. Indeed, predictions on meaning can be made and groups of people can agree on the meaning of a statement.

The concept of prototypicality explains this paradox. In prototypical situations, statements have to be interpreted according to a conventional meaning (not a literal meaning) because of the precise context that the statement allows for. For example, the meaning of an article taken from the financial pages of a newspaper is conventional. The article builds a definite context that forces a conventional meaning and does not leave the expert reader any room for deviant interpretations. Conversely, when we encounter statements where there is a wide semantic gap between literal and pragmatic meaning (because of metaphorical expressions, irony, and so on), these rhetorical devices of indirect meaning force
the reader to modify his/her interpretation. In such cases, the variability of interpretations constitutes the "richness" of the text.

In our experiments on comprehension processes, we have excluded texts that leave too much room for idiosyncratic, subjective interpretation. Rather, we chose texts where agreement on the meaning could be reached, in prototypical or conventional contexts.

If we were not convinced that we could describe the meaning of statements with reasonable precision and accuracy, all study on comprehension would suffer from a lack of reference to meaning. Such description of meaning, however, is not the purpose of our article. (See Dancette 1995 for a presentation of the semantic models that we find most powerful, namely the "meaning - text theory" (Mel'cuk, 1981 ), the propositional models (Kintsch & van Dijk 1983, van Dijk 1985), processural models (de Beaugrande 1980) and the theory of schemes (Schank & Abelson 1977).

In light of this discussion on meaning and comprehension, it should be clear that although our position is linguistically-based, it borrows elements from the cognitive field. Indeed, such integration is necessary to account for text comprehension.

1. 5. Aim of our Research

Our research is based on a series of videotaped thinking-aloud protocols with a group of graduate students in translation. Our aim is to describe some of the cognitive activities pertaining to comprehension that these students applied in this
particular instance and how their mental model of the text is being constructed in order to provide a coherent and meaningful representation of the text they are working on.

The above questions of meaning, comprehension and context are basic in a theory of language and cannot be avoided in studies on translation. However, the purpose of our empirical research is quite modest -- we are not aiming to build an all-encompassing, universal model of language understanding. We wonder, in fact, if there is any point in building models so wide that they would account for every language situation and every discursive phenomenon.

Rather, our goal is to provide smaller-scale models applying to given types of situations (i.e. a given sample of students, working in a given pair of languages, in specific conditions, and so on). With this kind of model, we want to offer tools to describe and explain regularities and irregularities among respondents, within the specific parameters of the experiment. So, models of this type are, by definition, limited by the constraints imposed upon them, but they gain in efficiency because of the replicability of the experiments.


It should also be noted that our purpose is pedagogical. Applied to individual cases, especially in educational settings (with students or trainees), the method of
verbalizing (thinking-aloud protocols) can be used as a training tool for students (Kussmaul, 1995). It has an explanatory power and a pedagogical capacity. It helps show what capability and what strategy was activated by the subject and what others could have been used to achieve better results. Many, if not all, students can improve their output if they understand their translation processes better and start reflecting on them.

1.6. Methodological Considerations

In theory, if not in practice, it is possible to describe cognitive phenomena such as conceptualizations built on linguistic statements in a coherent and explicit way. This claim is based on the common observation that the subjects are aware of some of their cognitive steps while reading, writing, précis-writing, translating or interpreting. This is particularly evident when they face a problem that forces them to depart from routine operations.

In this regard, translation is an excellent field of observation for two reasons. First, it is a "semantically rich" task, as compared to placing objects in a particular order, for example. Second, it is one of the most controlled tasks in as much as the translator, as opposed to a mere reader or writer, cannot avoid problems. Like it or not, he/she has to translate the entire text.

It has been observed that, when faced with a difficulty, translators generally can recall their questions, hypotheses, some of the steps of their reasoning, and therefore are generally able to talk about the process. Furthermore, if they leave clues to their process (in the translation of course, and also in a TAP or in an
interview or questionnaire following the translation task), then it becomes possible for the analyst-observer to identify the different steps characterizing their conceptual process more precisely. For example, it will be possible to see how the translator leans primarily on a specific structure (i.e. morphological, syntactical, contextual, etc.) at a given point in his/her thinking to solve a comprehension problem. Thinking-aloud protocols -- especially when they are combined with questionnaires and interviews to allow the translator to recall some of his/her thinking -- reveal interesting facts. Such facts can be used to validate or invalidate theoretical assumptions.

On a practical level, however, we must address the difficulties inherent in the methodology of "observation of processes."

Processes are not visible; only clues to such processes are visible. But these signs are not an exact reflection of what is going on in the translator's mind, since it is likely that many, if not most, processes remain unconscious. However, we should not consider this a theoretical drawback since, as previously mentioned, we do not aim to observe the all-encompassing process of text understanding in general, but more specifically the process of solving identified comprehension (and expression) problems in translation.

A second limitation inherent in process-oriented research comes from the large variety of problem-solving approaches and their inter and intra-variability. The process being observed is not a stable object. It depends on many variables (psychological, pragmatic, intellectual, etc.) that we cannot control. All this makes generalizing from process observation difficult and hazardous, unless findings are based on very large populations and significant numbers of
experiments. The validity of experimental studies, however, should not be underestimated. The fact that some variables, such as linguistic and conceptual knowledge, can be controlled makes the interpretation of the data relatively easy and objective. In this regard, models built on experimental studies are the normal expansion of the abstract models they put to the test. Thus, the validity of many assumptions or intuitions can be verified.

Despite all these reservations, the experimental approach has great potential. The observation of processes shows the importance of some components and the existence of different stages in processing the task. For example, on a cognitive level, we can distinguish steps already well-documented in other experimental studies in the cognitive sciences and in translation studies. For example, most writers identify major steps in problem-solving such as 1) Problem identification (reception of initial data, first interpretation, awareness of goals and constraints); 2) Data processing (comparisons, classifications, inferences, deductions, construction of propositions and images, transformations, etc.); 3) Response (monitoring, revision and decision-making).

2. THE ANALYSIS OF THINKING-ALOUD PROTOCOLS

2. 1. The Experiment

Some of the preliminary findings of this experiment have been presented in Dupont 1993 and, more recently, in Dancette 1994 and forthcoming. In this
article, some revisions have been made and major developments have been added.

2. 1. 1. Experimental Design

We randomly chose five graduate students in translation for the experiment. The first one had no professional experience; the second had over two years of experience in business translation as well as an MBA; the third student had two years of experience working as an interpreter. The students were asked to translate five segments of text drawn from news magazines and to verbalize their thinking while translating. The simulated situation they were given was described as follows:

"You are a freelance translator and the translation office you work for has just received a batch of English articles to be translated into French for the magazine *L'Actualité*. The reviser asks you to translate the segments of texts that have been omitted by their translator: Do it as quickly as possible but bear in mind that nobody will have time to revise your translation; it will be published as is.

You have the original English text and you are familiar with the French magazine, so find the style that fits in with the rest of the articles."

The students were given five dictionaries considered to be the most useful ones for the task: *Webster's Ninth Collegiate Dictionary* (1991), unilingual English dictionary, that we will call "The Webster," *Petit Robert* (1990), French unilingual dictionary, that we will call "The Robert," *Robert & Collins* (1990), French-English bilingual dictionary, that we will call "The Collins," *Le dictionnaire de la*
comptabilité et des sciences connexes by Sylvain (1982), bilingual English-French dictionary of business terms, that we will call "The Sylvain," and finally a French dictionary of synonyms.

The data collected in the experiment fall into three main categories: 1) the original English article and the segment translated on paper by the students, 2) thinking-aloud protocols, 3) questionnaires completed by the subjects following the translation task.

**Text and translation.** We chose the texts according to the following criteria: length, internal coherence and the type of difficulty we could anticipate. The texts were of average difficulty for "native readers," but required a certain level of knowledge in economics or finance. There was no time limit for the task.

We asked the students to write down all their variations and not to erase them. Thus, we have the sequence of their different productions. This allowed us to see what equivalents expressed the evolution in the comprehension of a given term.

**Thinking-aloud protocols.**

Instructions: The students were all given the same instructions. We asked them to verbalize everything that went through their mind during the experiment: reflexions, hypotheses, questions, bits of translation, etc. We did not want to intervene during the experiment to remind them of these instructions, even when their verbalization was poor. We preferred to take the risk of having less complete protocols instead of skewing the results with our suggestions or interruptions.

Preparation: We translated a short text in the presence of the students to show them what they were expected to do; then we asked them to translate a few lines,
following the same instructions. After this briefing on the think-aloud method, we did not intervene at any time throughout the experiment.

Recording: The students were recorded and videotaped throughout the experiment (it took them between two and three hours). They were videotaped to record some behaviours that they would not necessarily mention, such as looking up a word in a specific dictionary, and to see what they were doing when they were silent. For example, we could state that the student was rereading his text because we could see his/her pen follow the lines of the article. We could also observe that the subject said in the TAP he/she was doing something, but in fact did not do it. We saw, for example, that the subject had opened a dictionary, but did not actually use it: the subject said in the protocol that he was going to search in the dictionary; he picked it up, in fact did not open it, but nonetheless expressed new meaning hypotheses. Using only the audio protocol would have led us to believe that these hypotheses were the result of a dictionary search when in fact the video proves that they resulted from a purely mental operation.

We noted the advantage of comparing the translations and thinking-aloud protocols in cases where a formulation seemed appropriate, when in fact it was the result of a double error, one "correcting" the other. As our purpose was to focus on comprehension, such a phenomenon was interesting to note and analyze, but would have gone unobserved had we relied only on the translation.

Questionnaires. After completing the whole translation task (the five texts), the students were given a questionnaire, the purpose of which was to establish more precisely whether they knew the meaning of a few key words or concepts used in the text. The questions were indirect. For example, one of the texts contained the
terms bonds, Treasury bonds and fixed-income securities. We asked the students a) to give a few examples of securities; b) to explain what a fixed-income refers to in relation to securities. The answers allowed us to have a better understanding of what conceptual links the students established between extralinguistic elements and terms that could present a translation or comprehension problem.

We also asked the students to evaluate their comprehension difficulties, their expression difficulties for each text, as well as the quality of their translation on a scale from one to ten. When we compare these self-evaluations and ours, some discrepancies seem meaningful. It was often the case that a student found a text easy when we judged that he/she had not understood it enough to translate it properly. Such information was important because, in order to solve a comprehension problem, it is first necessary to recognize it as a problem.

2. 1. 2. Definitions and Data Classification

When we study thinking-aloud protocols and try to describe mental operations, it is important to draw the distinction between behaviors, strategies and processes. **Behavior.** We call behavior an action or a series of actions carried out by the subject, whether or not they lead to a result. We would be tempted to say, moreover, that there is always a result, be it nothing, positive, or negative. It may be a reading, a rereading, a dictionary search, silence, an expletive uttered, or the scribbling of notes on the original text.
Strategy. We call strategy a series of ordered behaviors, consciously called upon to solve a problem. For example, a systematic or purposeful exploration of the text to seek a second occurrence of a given term implies a strategy, whereas behaviors leading to a serendipitous result which the subject was not actively seeking is not a strategy. Resorting to thinking-aloud protocols allows this distinction to be drawn most of the time, even though caution should be exercised.

Process. We define process as a series of mental operations carried out by a subject, consciously or not, to complete a task. When a subject interjects, repeats a SL term, then follows with a TL equivalent, we believe that a series of specific processes has allowed him to reach this equivalence, but we cannot specify if it is the result of an association of ideas, a memory, or a deductive analysis whose details are not evident.

Behaviors are the primary data in our study, even though we know that we cannot observe them completely. They are the only objective clue to the mental process that is available. We have chosen a data classification which will enable us to identify some major categories of behavior, mainly those which have a closer relationship to comprehension. We will then see if we can deduce the processes involved by interpreting the behaviors in comparison with the other observed data (translation, questionnaire) and detect the strategies by finding recurrent chains of behavior.

2. 2. Experimental Data

2. 2. 1. Text, Protocols and Translations
Given our space limitations, we will present only one text out of the five that were used in the experiment and the protocols of only three of the five students recorded.

**Text.** *A bad week for bonds. Benchmark 30-year Treasury bonds and shorter-term issues fell heavily on Oct. 20, as traders dumped fixed-income securities in anticipation of higher federal spending under a Clinton Administration.* (Business Week /November 2, 1992)

**Protocols.** The thinking-aloud protocols are transcribed verbatim. On the basis of both the video and the audio recording, the TAPs have been broken down into segments for each identified behavior. The coding on the left refers to classes of behavior whose definitions are given below.

**ALICE**

1. READ-ART ...  
2. COM-PRO Mais qu'est-ce que c'est que tous ces dessins ici ?  
3. READ-ART ...  
4. READ-SEG bon, relisons la phrase ...  
5. MON-LEX *bonds* ... il s'agit bien des obligations, debentures ... je sais pas, faut que je vérifie dans le Sylvain ...  
6. DIC-SYL ...  
7. COM-JUST...oui, c'est bien des obligations ... bon ...  
8. COM-LANG ah ! l'anglais, des phrases juxtaposées, pas de charnières ...  
9. COM-STY probablement que je vais en remettre une ... *en effet,*
10. COM-PRO elle est difficile cette phrase ... faut d'abord que je la comprenne, mais ...

11. READ-SEG *benchmark* ... three-year Treasury bonds ... issues fell ...

12. PAR-TT ça veut dire qu'elles ont baissé ... qu'elles sont tombées ...

13. TRA heu ! les obligations et ...

14. READ ... issues ... shorter term ...

15. DIC-SYL tiens ! *benchmark* est traduit par point de repère ...

16. ALT Treasury bonds, c'est des bons du Trésor

17. MON-LEX je vais plutôt vérifier ... euh ... pour être sure parce qu'il faut faire attention dans ce texte ...

18. COM-LANG essayer d'être plus près du texte

19. DIC-SYL peut-être que je vais voir ça à Treasury ... il n'y est pas ...

on parle de Treasury bill, bon du Trésor ... avec bond ...

... bon ...

20. DIC-SYL shorter term issues ...

21. COM-PRO euh ... traders,

22. MON-CONT on parle ici de bourse, de finance, pourtant je vais vérifier dans le Sylvain ...

23. DIC-SYL dans celui-là ils donnent pas ... peut-être que dans le Robert & Collins ...

24. DIC-R&C je vais essayer de le trouver quand même ... ça se traduit par commerçant

25. MON-CONT mais ... dans ce contexte ... négociant
26. COM-JUST    ... honhon ... les négociants ... je vais mettre les
    commerçants, c'est neutre

27. READ-SEG    dumped ... fixed income securities ...

28. MON-LEX     des titres de revenu peut-être ...

29. DIC-SYL     je vais voir s'il y a income securities

30. MON-CONT    ... hum ... c'est bien les commerçants, c'est vraiment les
    commerçants, sans aucun doute c'est eux qui ...

31. TRA          [writes the rest of the translation]

RUDOLPHE

1. READ-SEG    ...

2. COM-PRO    Bad weeks for bonds ... qu’est-ce que ça veut dire ça ?

3. COM-STY     oh, c’est un commentaire, style télégraphique, rapide en
tous cas ...

4. TRA          mauvaise semaine pour les obligations ... anticipant une
    augmentation de la dette publique ... une augmentation ...

5. PAR-TT      prévoyant une augmentation des dépenses du fédéral

6. PAR-TT      sous l’administration, sous le gouvernement Clinton ...
    quoique, on peut dire administration aussi ...

7. ALT          hmm, traders, les agents de change ...

8. DIC-SYL     vérifions donc traders ... c’est pas marqué bien sûr !

9. DIC-R&C     ouais, les contrepartistes

10. MON-LES     ... pas très courant ça !
11. DIC-ROB voyons si le Robert donne mieux que contrepartiste
12. MON-LEX ... ouais ...
13. COM-JUST on peut dire «on» en fait ...
14. ALT benchmark ... benchmark 30-year ... les bons du Trésor à 30 ans ... les bons du Trésor à 30 ans
15. TRA ... qui servent habituellement de point de repère ...

benchmark ...
16. PAR-TT et d’autres titres à plus court terme, échéance ... à plus courte échéance
17. PAR-TT ont chuté ... ont subi une chute ... connu une chute ... pas lourdement, pas sévèrement ...
18. MON-LEX ont chuté tout court, parce que chute c’est déjà ...
19. TRA ont chuté le 20 octobre
20. COM-STY ça on va le mettre au début ...
21. ALT ont chuté à cause ... as traders dumped ... à cause ...
22. PAR-TT y s’en sont débarrassés en masse en fait ...
23. TRA les acheteurs se sont débarrassés en masse des titres ...
24. DIC-SYL securities ... titres, actions ? securities : actions, obligations, titres ...
25. MON-CONT bon OK, on parle d’obligations ici ... mais titre ...
26. PAR-TT ont chuté alors que ... en raison de ...
27. COM-JUST traders, on va dire les investisseurs ...
prévoyant une hausse des dépenses du fédéral sous la future administration, sous le futur gouvernement Clinton ... se sont débarrassés massivement de leurs obligations à revenus, à taux, c’est pareil ...

de leurs obligations à taux fixe et ont provoqué une chute des cours des bons du Trésor à 30 ans ... points de repère courants ...

ci qui a provoqué une chute massive des cours des bons du Trésor à 30 ans ainsi que d’autres titres à plus courte échéance ...

une chute des bons ...

d’autres titres à plus courte échéance ont également connu une baisse sévère.

Mauvaise semaine ...

alors là, ces fameux bonds, c’est des Treasury bonds, 

alors c’est des bons du Trésor ... 

encore, et on repart avec cette histoire d’obligations ...

alors «benchmark 30-year Treasury bonds» ... c’est les obligations à long terme, c’est pas les bons du Trésor parce que ce serait Treasury Bills alors on va mettre ...

Mauvaise semaine pour les obligations du Trésor
8. MON-LEX ... voilà ... les obligations ... benchmark ... alors c'est de référence ... 
9. ALT benchmark 30-year ... du Trésor à 30 ans, alors benchmark
10. ALT et les titres de court terme ont connu une ... to fall heavily
11. MON-CONT ... ah pourquoi ?
12. PAR-TT ont connu une heu ? (où est-ce qu'il est le lexique de Betty ?????) Cohen, il est pratique celui-là ... ) une chute, ont baissé
13. ALT heavily, grandement, amplement
14. DIC-ROB qu'est ce qu'il dit celui-là ? mmm... heavily lourdement, profondément, oui profondément
15. MON-STY ... non !
16. TRA ont beaucoup baissé, allez zou ! ont beaucoup baissé ce 20 octobre
17. MON-CONT dumped... je pense qu'ils s'en sont débarrassés
18. DIC-COL to dump ... to dump something ... voilà, rubbish déposer, jeter, voilà, ils s'en sont débarrassés ... ils disent
19. COM-JUST ... ah ! good, ça c'est intéressant vendre, écoulé à bas prix, le dumping mais c'est pas ça, voilà se débarrasser de, bazarder ...
20. TRA ce 20 octobre ... à la suite d'un large mouvement de vente ...
21. COM-JUST je m'en fiche que ce soit traders, traders c'est M. Tout-le-monde qui négocie sur le marché donc je l'élimine ...
22. TRA de vente des titres à revenu fixe
23. MON-CONT à savoir les obligations,
24. **READ-SEG** securities ... higher spending ... administration ... 
25. **TRA** suivi ! alors suivi, largement suivi par les négociants ou les opérateurs du marché anticipant ... 
26. **READ-SEG** higher federal spending ... 
27. **TRA** une augmentation des dépenses fédérales de l'administration Clinton. 
28. **COM-PRO** Et maintenant il me reste mon benchmarks 
29. **DIC-COL** ... 
30. **PAR-TT** juste pour dire que c'est un titre de référence, un titre de référence, voilà les obligations repères ... 
31. **TRA** alors les obligations repères du Trésor à 30 ans et les titres à court terme ont beaucoup baissé ce 20 octobre à la suite d'un large mouvement de vente des titres à revenu fixe ... 
   alors, et les émissions à court terme à la suite d'un large mouvement de vente des titres à revenu fixe, suivi par les opérateurs du marché, donc, anticipant une augmentation des dépenses fédérales de l'administration Clinton. 
32. **READ-SEG** A bad week for bonds ... 
33. **COM-STY** les obligations repère du Trésor ... les obligations repère à trente ans ... bon, puisqu'on a déjà dit que c'étaient les obligations du Trésor, je vais pas le répéter, donc ... 
34. **TRA** les obligations du Trésor à 30 ans et les obligations à court terme ont beaucoup baissé ce 20 octobre à la suite d'un... 
35. **COM-CONT** .. mmm ... Clinton
c'est quelle date ... 2 novembre 1992, il était pas encore élu, même si tous les sondages le donnaient gagnant de toutes façons ... 

36. TRA fédérales sous l'administration Clinton à ce moment là

... OK, next!

2. 2. 2. Types of Behaviors Classified

For the analysis of the protocols we noted nine major groups of behaviors, which we then sub-divided into more specific types of behaviors. These types had to help us recognize the reality described in the protocols, without having too many categories to be analyzed. In the following list, we provide a brief definition of the type of behavior observed and its abbreviation.

1- Reading the text (READ): This behavior describes the way in which the subject tackles the text. He may first read the whole SL test (READ-TXT), or the whole article (READ-ART) or may read the text segment by segment as he proceeds with the translation (READ-SEG).

2- Alternating between the SL and TL texts (ALT): The subject alternates between the two texts, in general on the level of a term or part of a sentence, repeating the original term, then his/her proposed equivalent. Sometimes an equivalent is automatically proposed and accepted; sometimes the alternating indicates hesitation or questioning.

3- Intralinguistic Repetition (REP): The subject repeats a term, a segment of a sentence or expression in either the source text or the target text. Depending on
the context of its appearance, this intralingual behavior may denote indecision, or search for an equivalent.

4- Paraphrasing: The subject paraphrases a segment in either the ST or the TT (PAR-ST, PAR-TT). It may apply to a segment of the ST to clarify a concept, or to a segment of the TT to clarify a concept or to reformulate a proposed translation.

5- Translation: The subject proposes a translation orally or writes it down and expresses it orally (TRA)

6- Consulting the Dictionary: In this type of behavior, we note only which dictionary was used (DIC-ROB, DIC-WEB, DIC-R&C, etc.)

7- Monitoring Proposed Translations: We will distinguish:
   a) Lexical monitoring (MON-LEX): The subject questions the adequacy of a term or an expression.
   b) Contextual monitoring (MON-CONT): The subject checks that his interpretation or equivalence conforms to what he understands of the SL text, the domain of the text or the reality in the outside world.

8- Extralinguistic comments:
   a) Reflexion showing identification of any problem whatsoever (COM-PRO)
   b) Extralinguistic reflexions and search aiming to clarify the context (COM-CONT): The subject tries to relate extralinguistic information to the text segment he is working on.
   c) Metalinguistic comment: judgment on the position of the author, ideas expressed (COM-META)

9- Linguistic comment
a) Justification of a translation choice (COM-JUST)
b) Comment on the author's style or on his own stylistic choices for the translation (COM-STY)
c) Comment on the language itself (COM-LANG)

Our coding grid was tested by two independent analysts: in a preliminary research (see Dupont 1993) and here. Both the segmentation and the codings concurred in many cases. Out of 100 behaviors coded in the above protocols, 19 are adjunctions (finer segmentation of the protocols) and 11 differ from the first coding. This discrepancy is due in part to the addition of a new category: COM-JUST (justification of a translation choice). The differences are caused by the difficulty to code ALT (alternating) vs TRA (translating), COM (comment) vs MON (monitoring) and to identify the various types of comments (i.e. lexical vs contextual).

2. 3. The Analysis of Comprehension Processes

2. 3. 1. From Behavior to Process

As such, behaviors are an indication of a process. However, they do not describe its totality; they reveal only the "tip of the iceberg." They sometimes reveal little about their nature because they generally are the expression of various processes occurring concomitently. Because they are not "discrete" operations, their coding may be difficult and, to some extent, depend on the subjectivity of the analyst.
Behaviors, as previously mentioned, are the primary data in our study. But noting them is only important for what it reveals of the processes and strategies used by the translators. They help the analyst to make reasonable hypotheses on what process was involved. Thus, they validate intuitions on the nature of processes.

The rest of this paper will deal with cognitive operations (or processes) as deduced from the data (protocols, translation and questionnaire). The comparative analysis of the protocols will reveal the relation between cognitive operations and the quality of the translation performance. The three subjects whose protocols have been presented produced translations of very unequal quality in terms of semantic accuracy. We will focus in particular on the coherence of the conceptual representation of the text, the productivity and efficiency of the translational strategies, with regard to how the task unfolds. For this paper, we chose to concentrate our attention on one text segment, *as traders dumped*, whose interpretation was difficult for all subjects.

2.3.2. Alice's Protocol and Cognitive Map

The grid below enables the verbal protocols to be broken down into their constituents according to the most distinguishable cognitive operations and to analyze the protocol in relation to the end product, i.e. the translation of the segment *as traders dumped*. In the left columns we mentioned the code of the corresponding behavior (as in tables above) and in the right column we identified the linguistic and extralinguistic levels at which he/she is working.
<table>
<thead>
<tr>
<th>Nature of operation</th>
<th>Protocol of verbalization</th>
<th>Locus-Focus</th>
<th>Level of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Ident. probl. lexical</td>
<td>«traders»</td>
<td>lexical</td>
</tr>
<tr>
<td></td>
<td>euh ... <em>traders</em>,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Contextualization</td>
<td>«traders»</td>
<td>textual</td>
</tr>
<tr>
<td></td>
<td>on parle ici de bourse,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>de finance,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Consult. dict. Sylvain</td>
<td>«traders»</td>
<td>lexical</td>
</tr>
<tr>
<td></td>
<td>pourtant je vais vérifier</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>dans le Sylvain; dans</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>celui-là ils donnent pas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Consult. Rob. Collins</td>
<td>«traders»</td>
<td>lexical</td>
</tr>
<tr>
<td></td>
<td>peut-être que dans le RC</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>... je vais essayer de le</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>trouver quand même ... ça</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>se traduit par <em>commerçant</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Monitor: question</td>
<td>commerçant/</td>
<td>semantics</td>
</tr>
<tr>
<td></td>
<td>mais ... dans ce contexte?</td>
<td>négociant</td>
<td></td>
</tr>
<tr>
<td></td>
<td>... <em>négociant</em> ... honhon</td>
<td>négociant</td>
<td></td>
</tr>
<tr>
<td></td>
<td><em>les négociants</em></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Decision</td>
<td>commerçant/</td>
<td>lexico-</td>
</tr>
<tr>
<td></td>
<td>je vais mettre *les</td>
<td>négociant</td>
<td>semantic</td>
</tr>
<tr>
<td></td>
<td>commerçants*, c'est</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>neutre.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Written translation.** Temps dur pour les obligations / Une mauvaise semaine pour les obligations. En effet, le jalon des obligations de trésor d’une durée de trente ans et des émissions à court terme ont dégringolé le 20 octobre, alors que les commerçants ont écoulé des titres de revenu fixes *en juin* pour anticiper les dépenses élevées du fédéral sous l’administration de Clinton.

This translation does not convey the meaning of the text. Some expressions are non-sensical: "jalon des obligations" instead of "obligations jalon" ou "obligations
repère" for benchmark obligations; others do not belong to the domain: "durée de
trente ans" instead of "à échéance de trente ans", "commerçants" instead of
"investisseurs". Even basic grammar is incorrect: "le jalon [subj. sing] ... ont
[plur.]" and shows the student's confusion.

This translation indicates that the student has not understood much of the
sentence, though, on the lexical level, she has all the equivalents she needs, except
for ...traders. Her protocol shows that she stays at the level of words, even when
she contextualizes the segment she works on (in 2). The monitoring (in 5) is
minimal: she wonders if the equivalents commerçant or négociant are appropriate;
however, it does not lead to a questioning on the referent of «traders,»(who they
are, what they trade). Obviously she does not understand the concept well. This
lack of knowledge seems to explain why she cannot interpret the text correctly.

What is striking in this protocol is that it displays no evidence of work on the
level of concepts, no inquiry about relations between propositions (for example,
the meaning of the conjunction as, that could be temporal or causal), or about the
conceptual referents.

This protocol and the failure of the corresponding translation show the
tantamount importance of the conceptual level in the construction of
comprehension.

When we analyzed the thinking-aloud protocols of the three subjects, we
discovered that we could classify their comprehension processes according to
three main levels:
- the text per se (source and target texts, with context and co-text); that is the level of reception, or reading of the source text (graphs) and the writing of the target text;
- the language or the linguistic level which we want to define as the decoding of standard linguistic objects (grammatical categories, syntax, standard or prototypical meaning of lexical items and so on);
- the notional level (which we describe as conceptualizations activated by the contact of the informational input provided by the text and the informational input stored in memory (frames, schemes, scenarios, scripts for general knowledge of the world, or personal, experiential knowledge, whether direct or indirect).

We will use our experimental data to show how these three levels interact, through what paths the linear order of the source text is transformed into a non-linear, abstract order of notions and re-transformed again into a linear form in the translation.

Below, the path followed by Alice in her work is mapped on a three-dimensional representation.
Only two planes -- TEXT and LANGUAGE -- are used. The translator looks for solutions only on the linguistic level. Even when she contextualizes traders, she stays on the lexical level: she relates the lexeme traders to the semantic fields she thinks are most appropriate, "BOURSE" (stockmarket), "FINANCE". She picks disparate elements and searches in dictionaries, but does not follow any reasoning. Her operations have no direction and fall short, hence the discontinuous form on the map.

2. 3. 3. Rudolphe's Protocol and Cognitive Map
In the extract of his protocol below, we left out the part where he works on segments not related to the unit we are interested in "as traders dumped": between 6 and 7 and between 9 and 10.
<table>
<thead>
<tr>
<th>Nature of operation</th>
<th>Protocol of verbalization</th>
<th>Locus-Focus</th>
<th>Level of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Monitor:</td>
<td>hmm, traders, les <em>agents de change</em></td>
<td>«traders»</td>
<td>lexical</td>
</tr>
<tr>
<td>2 Search (no result)</td>
<td>vérifions donc traders. C’est pas marqué, bien sûr !</td>
<td>«traders»</td>
<td>lexical</td>
</tr>
<tr>
<td>34 Search Monit.:</td>
<td>ouais, les <em>contrepartistes</em> ...</td>
<td>contrepartiste</td>
<td>lexical</td>
</tr>
<tr>
<td></td>
<td>pas très courant ça</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Search</td>
<td>voyons si le Robert donne mieux que contrepartiste</td>
<td>contrepartiste</td>
<td>lexical</td>
</tr>
<tr>
<td>6 Monitor:</td>
<td>ouais ...</td>
<td>«traders»</td>
<td>lexico-semantic</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Abstraction / neutralizat.</td>
<td>on peut dire «on» en fait.</td>
<td>«traders»</td>
<td>semantic</td>
</tr>
<tr>
<td>Translation</td>
<td>benchmark ... benchmark 30-year ... les bons du Trésor à 30 ans ... les bons du Trésor à 30 ans ... qui servent habituellement de point de repère ... benchmark ... et d’autres titres à plus court terme, échéance ... à plus courte échéance ... ont chuté ... ont subi une chute ... connu une chute ... pas lourdement, pas sévèrement ... ont chuté tout court, parce que chute c’est déjà ... ont chuté le 20 octobre, ça on va le mettre au début ... ont chuté à cause ...</td>
<td>whole segment</td>
<td></td>
</tr>
<tr>
<td>-------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
<td>---------------</td>
<td></td>
</tr>
<tr>
<td>89 Neutralizes «traders»</td>
<td>as traders dumped ... à cause ...</td>
<td>«dumped» semantic</td>
<td></td>
</tr>
<tr>
<td>10 Deneutralizes «traders»</td>
<td>les acheteurs se sont débarrassés en masse des titres</td>
<td>segment syntagm.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>securities,... titres, actions? securities: actions, obligations, titres.. bon, OK, on parle d'obligations ici... mais titres... ont chuté alors que ... en raison de ....</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11 Decides</td>
<td>traders, on va dire les investisseurs</td>
<td>«traders» lexicosémantique</td>
<td></td>
</tr>
</tbody>
</table>
Written translation. Mauvaise semaine pour les obligations. Le 20 octobre, les bons du Trésor à trente ans (qui servent habituellement de point de repère) et d’autres titres à plus courte échéance ont chuté ; à cause que Le 20 octobre, les investisseurs, prévoyant une hausse des dépenses fédérales sous une future administration Clinton, se sont débarrassés massivement de leurs obligations à taux fixe; ce qui a provoqué une chute des cours des bons du Trésor à 30 ans (qui servent habituellement de point de repère) ainsi que d’autres titres à plus courte échéance. D’autres titres à plus courte échéance ont connu également une baisse sévère.

In the first part of his protocol, Rudolphe starts with two very specialized terms that pertain to the field of finance. The first term "agent de change" seems to pop up as an automatic equivalent; the second one"contrepartiste" is given by the dictionary. They are both wrong and the translator does not choose them, though he does not explain why.

At this stage, in 7 ("On peut dire 'on' en fait"), he sets aside the lexical problem of traders and continues translating. This is what we call neutralization. He fills the syntactic slot, the nominal phrase he needs, with a word of a more general class : on, then acheteurs.

But, at this stage (between 7 and 8), he does not deal with traders anymore but with dumped and he arrives, by means of a side step so to speak, at the correct equivalent les investisseurs. It is as if his work on the whole sentence, with its notional relations, had given him this equivalent, via language associations proper to the financial domain. We call this work notional because the clues are there : in
the handling of the conjunction as and in the inverting of clauses in his translation which strengthens the logical articulation of the sentence.

Here is the three-dimensional representation of the protocol:

In our interpretation of his protocol, Rudolphe goes directly to the notional level: He knows one of the equivalents of traders, "agents de change", but a monitoring makes him reject it. He then moves (in 2) into the linguistic level in order to find other equivalents in the dictionary of accounting terms (Le Sylvain). Not satisfied with the answers on the linguistic level, he comes back to the notional and neutralizes the lexical problem of traders by using the generic on.
He can then proceed to the next unit and goes on to dumped (in 8). Paraphrasing around the concept of dump ("ils s'en sont débarrassés en fait" and then "les acheteurs se sont débarrassés en masse de leurs titres"), he picks from his own paradigm of lexemes «acheteur» and finally "investisseur". It is worth emphasizing that this paradigm is opened while working on another focus: (dumped), au détour des paraphrases".

This encounter of the linguistic and notional illustrates the concept of conceptualization "level at which linguistic and non-linguistic information are mutually compatible" (Jackendoff 1985:95) which we discussed in the first part of this paper. Contrary to Alice, Rudolph has enough extralinguistic knowledge and understanding of the financial world to use both his linguistic and extralinguistic knowledge to reach a coherent and meaningful representation of the text.

2. 3. 4. Micheline's Protocol and Cognitive Map

<table>
<thead>
<tr>
<th>Nature of operation</th>
<th>Protocol of verbalization</th>
<th>Locus-Focus</th>
<th>Level of analysis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Neutralizes «traders» dumped, je pense qu'ils s'en sont débarrassés.</td>
<td>«dumped»</td>
<td>semantic/sentence</td>
</tr>
<tr>
<td></td>
<td>Consults to dump ... to dump something ... voilà, rubbish</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Rob. Coll. déposer, jeter, voilà, ils s'en sont débarrassés ... ils disent ... ah ! good, ça c'est intéressant vendre,</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Lexical écouler à bas prix, le dumping mais c'est pas ça, voilà</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>check se débarrasser de, bazarder ce 20 octobre</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Neutralizes &quot;traders&quot;= Depersonnal.</td>
<td>à la suite d'un large <strong>mouvement de vente</strong></td>
<td>«dumped ...» semantic</td>
</tr>
<tr>
<td>---</td>
<td>-----------------------------------</td>
<td>---------------------------------------------</td>
<td>----------------------</td>
</tr>
<tr>
<td>2</td>
<td>Elision of &quot;traders&quot;</td>
<td>Je m'en fiche que ce soit <em>traders</em>. <em>Traders</em>, c'est <strong>M. Tout-le-monde</strong> qui négocie sur le marché; donc je l'élimine.</td>
<td>«traders» notional</td>
</tr>
<tr>
<td>3</td>
<td>Transfers</td>
<td><em>de vente des titres à revenu fixe</em></td>
<td>«... dumped ...» lexical</td>
</tr>
<tr>
<td>4</td>
<td>Translates</td>
<td>alors <em>suivi, largement suivi par</em></td>
<td>«traders... dumped» syntagmat.</td>
</tr>
<tr>
<td>5</td>
<td>Deneutral. &quot;traders&quot;= actantiation</td>
<td><em>les négociants</em> ou <em>les opérateurs du marché</em> anticipant</td>
<td>«traders»/ «anticipating» semantic</td>
</tr>
</tbody>
</table>

**Written translation.** Mauvaise semaine pour les obligations du Trésor. Les obligations repères du Trésor à 30 ans et les émissions de court terme ont beaucoup baissé le 20 octobre, à la suite d'un large mouvement de vente des titres à revenus fixes, suivi par les opérateurs du marché qui ont anticipé une augmentation des dépenses fédérales de sous l'administration Clinton.

Mauvaise rude semaine pour les obligations du Trésor. Les obligations repères à 30 ans et les émissions d'une durée inférieure ont beaucoup enregistré une forte
baisse le 20 octobre. Ceci résulte d'un large mouvement de vente des titres à revenu fixe suivi par les opérateurs du marché qui ont anticipé une augmentation des dépenses fédérales sous l'administration Clinton.

From the start, Micheline is on the notional level, on the level of the sentence and the logical relations between propositions. Intuitively, without understanding the meaning relations too well, she picks the central predicate of the phrase 'dump' and considers the actant 'traders' as secondary. In fact, she neutralizes "traders" (ils in 1). In 2, she spontaneously finds a nominal phrase "large mouvement de vente." With that phrase she neutralizes "traders" even more, since the object of the verb does not have to be specified; "traders" disappears altogether and she justifies the elision in 3, even though her explanation is wrong: "Traders" is not "Monsieur Tout le monde," unless big pension funds managers and big bank managers are Monsieur Tout le monde.

However, this neutralization strategy that she likes so much is abandoned when she has to specify a human actant of the predicate 'anticipating'. And, at this stage, two precise and technical words come to her: négociants and opérateurs de marché.

The three-dimensional representation shows her process and the ease with which she navigates among the three planes.
Starting from the notional, like Rudolphe, she moves ahead into the language plane and checks the dictionary for "dump." She looks for nuances that would help her to gain a more precise idea of the meaning of "dump." In the paradigm given by the dictionary, she retains "vendre." This verb activates the idiomatic expression "large mouvement de vente." This is what Cunningham (1985:235) calls a "creative response." (He qualifies such a response as a higher level of comprehension, as opposed to literal and inferential comprehension).

Here the correspondence between language and notion is perfect. Micheline therefore can translate freely and then move on to the next clause "anticipating...". In turn, "anticipating" activates a new lexical paradigm that she finds in her memory: "négociant," "opérateur de marché" to translate "traders."
In our opinion, Micheline's path, even more than Rudolphe's, illustrates an elaborate «cognitive mapping» (McGonicle 1986:143-146). Micheline conceptualizes the segment of the sentence as she projects it onto a model of reality that she has in her memory and that the text invites her to develop.

2. 4. General Comments

2. 4. 1. Two Strategies

One of the purposes of comparing translational performances is to see whether processes and strategies have an effect on semantic accuracy. In this section, we will limit our comments to two strategies that seem to be of paramount importance for solving comprehension difficulties, i.e. the use of dictionaries and the use of extralinguistic knowledge. The way they were applied by our subjects could explain the wide spread between "poor" and "good" translation performances.

Use of dictionaries as aids to comprehension difficulties. Dictionaries are not used with the same success.

Out of 31 behaviors identified in Alice's protocol, 7 are dictionary searches. Rudolphe opens dictionaries 4 times out of 33; and Micheline 3 times out of 36. The number of consultations does not correlate with the quality of the translation. The way dictionaries are used should be examined: Alice opens dictionaries whenever she does not understand a term. Both Rudolphe and Micheline open
dictionaries once an hypothesis on meaning has been formulated, in order to
monitor a translation choice or an interpretation, or also to find alternate
equivalents or synonyms.

Use of extralinguistic knowledge. The subjects differ also in their degree and
level of analysis of the text. As suggested in the first part of this paper,
comprehension is reached through the establishment of semantico-conceptual
links between different items in the text, at all linguistic and extalinguistic levels.

Only Rudolphe and Micheline, who are well versed in business and
economics, were able to comment on the conceptual content of the text,
illustrating that they were using extralinguistic knowledge to check the
plausibility and veracity of their proposed translations. For example, Micheline
looks for the date of the article and compares it with the date of the presidential
elections in her memory to explain the word *anticipating*.

2. 4. 2. Indicators of Efficient Strategies

Among many other indicators, three are of particular interest here.

The strategy of neutralization. It was used by several students in the study as seen
in how they coped with the lexeme *traders*. It seems to be common among
experienced translators. We observed that the best performers have a larger gamut
of avoidance strategies allowing them to go on with the translation and to set the
problem aside. They come back to it as they are working on another segment.

Expression of logical links between propositions. The ability to express logical
links between propositions seems to be an indicator of comprehension: the subject
has to analyze at a deeper semantic level, at the core of concepts, and has to apply abstract reasoning and deverbalization.

Both Micheline and Rudolphe reinforce causal links in their translation. Micheline cuts the sentence: "Ceci [la forte baisse] résulte de" and she strengthens the gerund form "anticipating": qui ont anticipé.

The strengthening of causal relations is even more evident in Rudolphe's text: "Les investisseurs, prévoyant..., se sont débarrassés..., ce qui a provoqué une chute. D'autres cours ont également connu une baisse sévère."

The following graphs are semantic networks showing these semantic relations and the logical relations between propositions in the sentence.

There are three main predicates 'fall', 'dump' and 'anticipate' (the origin of the arrows). The arrows lead to the actants (or arguments). The double arrows show the logical relations between each pair predicate/argument.

Number of proposed translation variations. They are indicated in the protocols in paraphrases, various comments and monitorings.

Rudolphe and Micheline's protocols are much richer in synonyms, candidate equivalents and phrases than Alice who does not resort to paraphrasing.
CONCLUSION

There are many more lessons to be drawn from the analysis of experimental data. Apart from its pedagogical value in translation classes, process-oriented research has much to offer and should pursued further. It helps us get a clearer picture of the facts and contributes to the development of more adequate theoretical descriptions of language processing and to a better understanding of comprehension itself! Translation is a good observation field because quality and efficiency are measured with generally well-defined criteria, according to the practical constraints of translation.

Note: We want to express our thanks to our research assistant Stephen Dupont for his valuable contribution, Hélène Kaufman for her help in revising and editing this chapter, and the Social Science in the Humanities Research Council of Canada for funding this research.
REFERENCES


