partie de notre collègue et ami, le professeur Guy Rondeau.

Guy Rondeau, qui était un éminent linguiste, s'était intéressé de bonne heure de la linguistique appliquée, dont il fut un des grands pionniers, et c'est dans différents domaines de cette vaste discipline qu'il se distingua aussi bien par ses travaux scientifiques, que par ses dons d'organisateur. Depuis le milieu des années 70 il était titulaire de la chaire de terminologie à l'Université Laval (Québec) et durant les dernières années, ce fut surtout dans ce domaine qu'il concentra ses nombreuses activités. Guy Rondeau était particulièrement actif dans la coopération scientifique internationale et pendant une quinzaine d'années il fut un des piliers de l'AILA (Association internationale de linguistique appliquée), dont il fut vice-président en 1969 et président de 1975-1981. En 1978 il avait fondé le GIRSTERM (Groupe interdisciplinaire de recherche scientifique et appliquée en terminologie) et en 1982 également l'Association internationale de Terminologie (TERMIA) dont il fut secrétaire général jusqu'à sa mort.

Guy Rondeau était doué d'une force de travail peu commune et, très sollicité dans tous les pays, il trouvait souvent le temps de voyager. Ses nombreux déplacements lui permettaient, malgré les distances, d'entretenir avec beaucoup de collègues d'autres pays les relations personnelles très suivies, et c'est lors de ces fréquentes rencontres, et durant les discussions dans les congrès ou les conversations après le travail, que les collègues découvraient ses qualités humaines qui donnaient une perspective toute particulière à ses visions scientifiques et de ses activités internationales. Sa mort prématurée nous a privés d'un chercheur enthousiaste et d'un grand ami.

Jacques Qvistgaard

ROBERT DE BEAUGRANDE: TRANSLATION AS TEXT PROCESSING

1. Linguistics, semantics, translation

In the main, linguistic theory has offered a problematic basis for accounts of translation. As Georges Mounin (1963) in particular has emphasized, such problems are to a large extent artifacts of the priorities of conventional linguistics. The aspects of
language foregrounded by those priorities are by no means the central aspects involved in the process of translation.

Let us go back to the foundational deliberations of Ferdinand de Saussure, who so profoundly influenced the future course of linguistic theory. He asserted that the "sign" "results from the bond between the signifier and the signified" (1966 (1916): 65ff). The two "terms involved in the linguistic sign" "are united in the brain by an associative bond" (1966: 65ff). Moreover, the "combination" of the two "is even the sole type of facts that language has" (1966: 120f).

In one of his most famous metaphors, Saussure compared "signifier" and "signified" (or "thought" and "sound") to the "front" and "back" of "a sheet of paper" (1966:113). Such an image suggests that the bond cannot be dissolved without destroying the sign and Saussure draws this very conclusion: "the linguistic entity exists only through" the "association": "whenever only one element is retained, the entity vanishes" (1966:102f).

This close linkage of the two sides was affirmed for the language system, which is organized so as to "maintain the parallelism between two classes of differences" (1966:121). This linkage was also affirmed for discourse when Saussure envisioned "two parallel chains, one of concepts and the other of sound-images" (1966: 104). "In an accurate delimitation, the division" of the two "chains" "will correspond". Similarly, Louis Hjelmslev expressly prescribed a rigorous text analysis that "partitions the text into expression line and content line", using "a common principle" for both (1961 (1943): 70). The two lines "have mutual solidarity through the sign function" (1961: 59).

Translation would presumably be the act of separating signifier and signified in order to replace the former while preserving the latter. Yet Saussurian argument makes no allowance for any such separation, during which, as we just saw, the sign would "vanish". "Our thought", Saussure declared "apart from its expression in words, is only a shapeless and indistinct mass" (1966:111). In the same way, Hjelmslev (1961: 52, 76) described (Danish) "mening" as an "amorphous 'thought-mass'" that is "in itself inaccessible to knowledge", because it "can be known only through some formation" and "has no scientific existence apart from it".

As we see, the fundamental assumptions of modern linguistic theory imply that translation is at best incapable of methodical control and at worst impossible. Noam Chomsky too, though he rejected "Saussure's image of a sequence of expressions corresponding to an amorphous sequence of concepts" found "little reason to suppose that reasonable procedures of translation are in general possible"; for him, such "procedures" must "not involve extralinguistic information" and must be guaranteed by "the sufficiency of substantive universals" (1965: 8, 201f).
In sum, the main obstacle for designing linguistic theories of translation has been the lasting uncertainty about how to deal with "meaning" or "semantics" apart from linguistic form. The typical stance of theorists reminds me of the stance adopted by the Catholic church regarding Darwinian evolutionism in the 19th century. We are only concerned, the church said, with the human who possesses a soul; we have nothing to say about what may have otherwise been the case. Similarly, the linguists indicate that they are concerned with "meaning" -- or "content" or "concepts" or "ideas" or "thoughts" or whatever one chooses to call it -- only when these are formed by a bond with language. Whatever may be the case outside such a bond is no proper object of consideration.

We might also recall the widespread insistence (Whitney, Saussure, Hjelmslev, etc.) that the bond between signifier and signified is "arbitrary": differences between languages served as a main point of evidence (e.g. Saussure 1972 (1916): 99f). While this claim may be true for signs in the abstract, in the sense that the bond is not "natural" or "motivated" in any external manner (cf. Saussure 1972: 100f, 442ff), every act of using signs involves establishing such bonds in ways that are certainly not arbitrary. During the act of translating, for example, the bond is loosened and reformed, and the relation between the old bond and the new must not be arbitrary, but closely controlled.

Moreover, translation seems to be an instance wherein a signified can persist for a time outside a bond with a signifier: a case for which linguistic theory makes no provision. The translator is likely to undergo transitions during which the content has been activated by processing the source-language text, but the appropriate expressions for the goal-language have still not quite attained the threshold of activation (Fig. 1).

![Diagram](Fig. 1. The Saussurian sign during translation)

To account for translation, we must inquire about the cognitive processes operating upon such content (Beaugrande 1978; Krings 1986), rather than merely describe the content as "a shapeless and indistinct mass" (Saussure) or as an "amorphous 'thought-mass'" "inaccessible to knowledge" (Hjelmslev).
If modern linguistics had laid its original foundations in semantics rather than in phonology, morphology, and grammar, the entire theoretical superstructure might have been very different. In particular the basic division would have been much harder to establish in semantics (Beaugrande 1987a). It seems reasonable enough to claim that a "phoneme" has a clear systemic status independent of any one act of uttering or hearing it; but it seems quite problematic to claim that a "meaning" can be determined just as clearly independently of any act of processing it. Trying to make statements about meaning out of context is likely to breed a multitude of irresolvable disputes among semanticists, who are in fact not eliminating context altogether, but invoking disparate contexts without explicitly negotiating them.

Moreover, an irreducible disparity persists between the ordinary contexts wherein humans utilize meanings, versus the specialized contexts wherein linguists and semanticists attempt to deal with meaning in the abstract. For instance, to offer up the "lexicon" as an abstract space for absolute meanings is to forget that a dictionary, no matter how it be constructed, is itself a text intended for use in certain specialized contexts. Few people learn the majority of what they know about meaning by reading dictionaries, and many people never use dictionaries at all. Thus, it is far from clear how the "lexicon" can be a realistic basis for the meaning of text and discourse; and what status a "definition" has as a linguistic formulation for any meaning (Beaugrande 1984b).

I would make the same point about the search among semanticists for a "language-independent" representation of meaning (an idea promoted especially by Chomsky (1965) and his disciples). Whatever formalisms may be introduced -- "semantic features" (or "markers"), "semes" (or "sememes"), lexical "trees", or "conceptual primitives", along with a cadre of stylish borrowings from formal logic -- are endlessly disputatious precisely to the degree that they are independent of language. The ability to create meanings in contexts and to attain results similar to those of other speakers is far more widespread and reliable than the ability to interpret non-linguistic formalisms. Far from showing how the meaning of real texts is interpreted -- as logicians often imply -- the ostensibly "language-independent" representations call for an additional set of interpretive procedures that may not extend beyond this very use.

This brief summary of a line of argument I have developed at greater length elsewhere (Beaugrande 1984b, 1987a, 1987b) may indicate why I believe that any really workable semantics of natural language can only be a semantics of text and discourse. Otherwise, semantics will remain confined to a small set of concepts and relations -- such as proposition, predication, implication, entailment, contradiction, and so on -- that appear tractable independently of any particular context. Such a semantics foments disputes about how these entities are to be interpreted in any concrete instance, and also leaves a vast residue of unaccountable meanings that are nonetheless crucially involved in the use of text and discourse. This residue is indeed indispensable for
the linguist's own prior understanding of an example, without
which the formal analysis of selected points could not even be-
go.

2. Translation theories versus context

Let us recall for a moment an ominous episode in our own field,
namely the disaster of early machine translation. Here again, the
principal failing was the attempt to operate without due concern
for contexts. Linguistic theories for static, abstract systems
were directly transposed into programs intended to guide dynamic
processes. The main components were the familiar "grammar" and
"lexicon", which, as I noted, were beset by the utterly conflic-
ting demands of discounting contexts on the one hand, yet being
fully determinate on the other. When such "rules" and "defini-
tions" were applied by a machine, the process was prone to go out
of control and to generate absurd texts. Building bigger "gram-
mars" and "lexicons" of the same type cannot be the solution.

A similar quandary occurred when translation theory made some ve-
ry literal borrowings from descriptive linguistics in order to
depict the contrasts among languages. Catford's (1965) desiccated
taxonomy reveals the ultimate perils of what Yishai Tobin (1987)
might call the "perfunctory adoption of established linguistic
paradigms over into a theoretical model". Since descriptive lin-
guistics had postulated a hierarchy of "levels", Catford conside-
red how one might translate on just one "level" at a time. As he
moves onto the more restricted levels and eventually gets to the
written letter, the steady evaporation of context renders his
sample translations more and more preposterous.

We may also recall the perplexities that arose when large pro-
jects were mounted for "contrastive grammars" between pairs of
languages, one of them usually English. It soon became apparent
that there was no principled way to determine how many aspects of
context such "grammars" should take into account; the decision
was largely pre-empted by the nature of the linguistic theory se-
lected as the framework for comparison (cf. Coseriu 1972). If a
low-context theory such as "transformational grammar" was chosen,
as in the German-English project at the University of Stuttgart,
only a handful of useful generalizations could be made, as in
Gunter Rohdenburg's (1974) work on "secondary subjecktivations".
The now-forgotten "PAKS" reports contain mainly a desert of empty
formalisms.

The contrast between the formal patterns of two languages can at
best provide the guidelines for describing what is routinely spe-
cified and controlled in general (or unmarked) contexts, as oppo-
sed to special (or marked) contexts. In German, for example, many
motions are regularly specified regarding whether they enter a
new space (accusative versus dative); whether they move away from
or toward a given vantage point ('hin' versus 'her' and so
forth. These same factors are relevant for English only when the
context so indicates; then they have to be specified with non-
grammatical resources. Similarly, only context can decide when an
English
text needs to specify whether a past action was punctual or directional, completed or incompleted, and so on -- aspects routinely indicated in the texts of other languages, such as the Slavic group.

The traditional controversy over "literal" versus "free" translation leads nowhere because it poses a spurious choice between treating meanings either only within minimal contexts -- the "literal" approach -- or else within maximal contexts -- the "free" approach. Both of these extreme positions bear scant resemblance to the practice of ordinary translators, who treat meanings within the fluctuating contexts required to maintain appropriate limits upon indeterminacy. Available "rules" of "grammar" or "definitions" of a "lexicon" are used only to the extent that they can contribute to the control of this operation; they act as "preferences" whose value and efficiency in a specific case is decided by the context.

In recent years, the state of the art in translation theory has registered an increasing recognition of these considerations. The performance of translation computers has improved markedly through the use of large-scale "frames" or "schemas" of knowledge (cf. Wilks 1972; Cullingford 1978; Hauenschild 1987). Humans may still be used for "post-editing" the results, but this job too has gotten easier, now that the contextualization process is being more actively shared between knowledge-rich programs and human editors. The human mind remains superior to any computer in the ability to create and integrate complex, partially indeterminate contexts; but the computer has the advantage in exact and exhaustive search-recovery procedures for clear-cut, stable data, as shown by expert-knowledge systems in fields like medical diagnosis (e.g. Fagan, Kunz, Feigenbaum, & Osborn 1979).

Similarly, translation theories now show an unmistakable trend toward context-rich frameworks, as signaled at this symposium by the papers of Reiner Arntz, Brigitte Handwerker, Wolfram Wilss, Katharina Reiss, Albrecht Neubert, J. C. Santoyo, Roda Roberts, Yu Baoquan, and Stanka Stojanova-Jovceva. However, as these authorities agree, the theoretical groundwork for such an expanded scope is only beginning to be provided. My own impression is that the low-context models of established linguistics can not be extended into the high-context models we need for comprehensive theories of translation. Perhaps it is time to accept the fact and turn to exploring alternative directions.

3. Language as a control system

For some time now, I have been developing an alternative model of language that would emphasize not the "static" aspect favored by Whitney and Saussure, but the dynamic one: not the change of the language system over time, but the act of using language in context (cf. Beaugrande 1980, 1984a, 1987a, 1987b; Yates & Beaugrande 1987). The fact that each actually occurring text is likely to be new or unique in at least some of its aspects implies that any act of use might change the language -- an alarming prospect for
any linguistic theory committed to the notion of a "static" system. Probably, the stubborn doctrine that the organization of language cannot be explained with reference to its use reflects the understandable desire among linguists to make the language "hold still" long enough to be described.

Now, if linguists like Saussure and Hjelmslev had undertaken a large-scale analysis of a system of "content", they would certainly have found this system to be far from isomorphic with the system of expression in any way like the two sides of a sheet of paper. On the contrary, the system of content is vastly more complex, multifarious, unstable, and productive than the system of form (Beaugrande 1987b). No one can definitively state how many parts a meaning has, how many meanings a language has, how far any known meaning can be adapted or changed, and how many new meanings can be created. All these factors make meanings crucially unlike phonemes or morphemes, which can be enumerated and described in a relatively compact and conclusive fashion. Words (lexemes) fall in between the two extremes, being less diffuse than meanings, but more diffuse than phonemes or morphemes.

In view of this greater complexity, the major question about meanings is: what sort of control applies to the system of "meanings" such that different people -- or different texts in different languages -- can "mean the same thing?" Stated this way, our focus of orientation is operational, based on how acts of meaning may be managed, rather than formal-logical, based upon abstract ideals of rigor and clarity. The reliance of semanticists upon logic is understandable in view of their avoidance of contexts, but also unfortunate in making the description far harder than necessary by demanding much stricter controls upon meaning than are applied in normal discourse (Beaugrande 1987a).

"Control" can be usefully defined as a hypothesis of limited indeterminacy. Here again, I cannot develop the argumentation for this outlook as fully as I have done elsewhere (Beaugrande 1987b), but I shall raise some salient points. To "control" a thing is to operate as if it were at least partially determinable, enough so that an action can affect the state of the thing in some non-random way. Yet control can never be conclusively proven, since the state of the thing might have happened by coincidence; hence, control remains a hypothesis that is presupposed by every controlling action, but never verified in any absolute sense (compare here Hume's analogous critique of causality). A scientific theory is one example of control being applied to some domain of knowledge (section 5). Here too, absolute verification is not feasible, as Karl Popper (1964) has shown.

No thing could be controlled unless it appeared within some context; but no act of control has an infinite range. Instead, the act can control only some selected aspects of the context, while leaving others to their own devices. Thus, we can say that control shades off into domains of steadily greater indeterminacy; that is, control is a selective imposition of limits upon the indeterminacy of whatever is to be controlled (Fig. 2).
The benefit of stating our basic premise this way is that indeterminacy is not seen as some accident or misfunction that befalls speakers and hearers when they are careless or deluded, but the foundational and persistent background against which meaning is created through a special and transitory control act. By relying on formal logic, semanticists have proceeded as if total determinacy (respecting quantification, truth values, disambiguation, etc.) were the base state of language and the vantage point from where everything else is to be described (and perhaps deplored) as more or less deviant.

As a matter of principle, the more complex a system is, the more strategic the organization of control must be (Yates & Beaugrande 1987). To take an easy example, a language system in which every word were a name for one specific thing in the world would have to remain very simple or else break down. But when the word is
generalized to name a whole class of comparable things, the sys-

Moreover, the designation of a word can be multifariously adapted in any number of contexts. Research in cognitive psychology (e.g. Rosch 1977) shows that the set of things people may decide to designate with an ordinary word such as "bird" is irreducibly fuzzy. There are no strict criteria to demarcate the boundary between what is and what is not a "bird". This fuzziness of ordinary meanings is not a defect for a logician to eliminate, but a vital factor in their power for being controllable in a wide range of particular contexts.

To "understand" a thing is to "control" it in the sense of placing limits upon the set of things it can be or can be related to. The understanding of discourse is undoubtedly the most impressive and comprehensive example, and the act in which human beings develop the most complex faculties for sharing knowledge. To "understand" a word, sentence, or any other linguistic unit is to limit the number of things it can be significant in relation to, within the current context. Inspired by logic, conventional linguistics typically presupposes that, aside from special cases, this process is fully determinate, leading to just one precisely delimited meaning; in fact, though, such a result would be much more stringent than the ordinary understanding of discourse, wherein limits are imposed only insofar as seems appropriate. Thus it is that a resolute text analyst like Roman Jakobson can astound the world with the wealth of details he "finds" "in" a text; but to do so, he must greatly overreach the results of everyday readers (Werth 1976).

Indeed, if we tried to pursue an analysis back through all the knowledge that is presupposed for understanding of a text, our task might well become endless; compare the post-structuralist concept of "infinite intertextuality", developed variously by Roland Barthes, Julia Kristeva, and Jacques Derrida (cf. Culler 1982). Linguists who refuse to admit the text as an object of study may be struggling to keep their investigation inside well-fenced boundaries; but paradoxically, just the opposite is achieved, because isolating linguistic units from contexts only proliferates undecidable disputes about what their "meaning" might be.

The "grammars" and "lexicons" proposed in standard linguistics purchase their generality by abdicating a substantial margin of control. Yet the "grammatical rule" or "lexical definition" is usually expected to be determinate -- a demand that conflicts violently with the hesitation to include the operational criteria for deciding whether and how far it actually applies in real-life contexts. By postulating a formalized determinacy as the proper attribute for "rules" and "definitions" -- and as the proper relation between "deep structure" and "surface structure", or be-
between "genotext" and "phenotext", and so on -- theories are helpless to represent the fluctuating indeterminacy of spontaneous discourse.

In my disquisition prepared for the Congress of Linguists in Berlin this summer (Beaugrande 1987b), I propose to model the act of communicating as a rise-fall indeterminacy gradient between the speaker's targets and the hearer's targets. These targets are relatively determinate, whereas their execution and transmission are relatively probabilistic operations (Fig. 3).

Fig. 3. Indeterminate transfer during communication

Hence, comprehension is not unduly complicated by wide variations in tone or quality of voice or handwriting, in environmental noise, in personal experience, and so forth. The semantic systems, being more complex, also involve a sharper indeterminacy gradient.

Exactly how this total interchange occurs is hard to describe, particularly because the less determinate processes run without much conscious attention, whereby they gain their extraordinary efficiency (cf. Keele 1973). When we do bring attention to bear on such processes, we cannot help reorganizing them by that very act.

A "linguistic theory" can be viewed as a specialized control system being applied to a general one (section 5). Every attempt to understand the understanding of discourse is a recursive control act that restarts the processes it purports to observe. When semanticists debate about "meanings" in an attempt to get a firm grip upon them, the debate itself adds to the contexts it is trying to reduce. For example, one such debate attained some modest
limits on indeterminacy by restricting its concern to the grammatical form that dictionary definitions should have (Beaugrande 1984b) -- surely not the main issue for theories of meaning.

Inspired by the so-called "objective" sciences, linguistic theory cannot quell its enduring ambition to get outside language in order to study it. The many formulas and formalisms proposed since Saussure's day reflect an uneasy search for some neutral system to "handle" language without setting it in motion -- and possibly changing it. But this search has merely created an additional problem, namely, the indeterminate relation between the formalism and the phenomenon of language it is claimed to designate. The inevitable restarting of the process of meaning is simply postponed until the moment when the formalism has to be interpreted.

We can best live with our predicament by developing models of how meaning is processed. We can then bring into focus our own discussion as one way of dealing with meaning. We might get a better view of the relation, hitherto largely implicit, between communicating in language and communicating about language. Surely such an achievement would have enormous relevance not merely for the science of language, but also for the language of science.

4. Translation as a control process

Translation can be seen as a control process functioning on the hypothesis that indeterminacy can be limited with the aid of two language systems applied to some current purpose. Translating is more complex than communicating within a single language, but this complexity cannot be simply additive; that is, translating cannot be just twice as complex because two languages are involved. Instead, the process of translating must involve extensive control sharing between complex systems in order to balance the scale for limiting indeterminacy on either side. The overall level of this limitation should be roughly equivalent for both sides, even when the specific means for attaining it may be extremely disparate.

It should follow that the actual "universal" is control, rather than the formal abstractions that linguists have been looking for with the meager success noted by Tobin (1987) and Lauren (1987). In this sense, "universal" does not mean "independent of context", but "strategic for managing as many contexts as possible". By the same token, control may be "language-independent" in the sense that it does not demand any one set of language categories in order to be maintained; but language categories are obviously a vital means for control -- one of the most powerful that human beings have developed for wide dissemination.

We have at least some anecdotal evidence that the interface between control and language-form is variable among different speakers. As we all know, learning your first foreign language is considerably harder than learning a second or third. Apparently, the control processes of the monolingual speaker tend to be so closely dependent on the categorization of the first language
that a major reorganization is needed before a second language can be used with effective control. After that, the control processes are more diverse in their language-dependence, such that the acquisition of a third or fourth language entails far less remodeling.

In section 1, I aired the possibility that during translation, content or meaning may be at least temporarily disconnected from form or language. That idea can now be reconsidered by extending some recent research on the cognitive processes of monolingual readers. Apparently, there is a brief transition period during which the bond between form and content is processed independently of context; thereafter content gains an increasing dominance over form as context exerts its controls. Here context is the very factor which prevents content from becoming the "shapeless mass" imagined by Saussure, who had expressly excluded discourse contexts from the description of the language system ("langue").

I am thinking in particular of the intriguing findings of "semantic priming" experiments performed by Walter Kintsch and his associates at the University of Colorado (Kintsch & Mross 1985; Kintsch 1986; Till, Mross & Kintsch 1986; compare similar results in Seidenberg, Tanenhaus, Leiman, & Bienkowski 1982). In one design, the test subject listens to a passage such as "'After an unusually heavy thunderstorm, the water overflowed the bank.' At unpredictable intervals", "letter strings appear on a screen", and "the subject is asked to decide as rapidly as possible (by pressing a response key) whether the string is an English word or not" (Kintsch 1986: 15). "The reaction time" "is reduced" for a word like "'river'", due to "associative/semantic relations" with "'bank'": but unexpectedly, this effect also occurs for a word like "'money'", which is related to a context-irrelevant meaning of "'bank'". If the test is delayed, however, only the context-relevant association facilitates response.

Such data on response times indicate that during reading, "word meanings are not fully developed at the moment a word is perceived. Instead, they are constructed from a person's lexical and world knowledge and the discourse context"(Till et al. 1986: 16). The total process has three phases: in the "sense activation phase", "all lexical information that might be relevant to a particular visual or auditory input is activated, irrespective of the discourse context"; in the "sense selection phase", "context-irrelevant" "information" is "suppressed"; and in the "sense elaboration phase", the "now limited" "word meaning is enriched to the degree required by the task demands or allowed by the subject's resources" (ibid.).

Kintsch's findings suggest that the period during which meaning is detached from context, but not from linguistic form, is extremely brief, beginning about 50 milliseconds (msec) after presentation (established by Fischler & Goodman 1978) and lasting up to between 330 and 500 msec; after that, context assumes the dominant role in the processing of meaning, first for selection (another 500 msec) and then for elaboration (after 1000 msec following presentation) (Fig. 4).
Kintsch's research has led him to believe that the "information" "activated" when the words of a sentence are heard or read constitutes a "core meaning", which "is enriched by process of random sampling of related" meanings, "with probabilities proportional to the strengths of their connection to the core" meanings within the person's memory storage (Kintsch 1986: 20). Unless the resulting "network of interrelated propositions" attains "a stable pattern of activation", "recourse must be taken to strategic processes", such as "sampling" "new nodes", "inferring missing links", "reinterpreting the data", or "sophisticated problem-solving techniques" (Kintsch 1986: 20f). Transposed into my terms, this model foresees a probabilistic initial stage followed by a more deterministic stage; that is, a rise in control from immediate processing toward the subsequent stages. I am assuming that the same curve applies in reverse to text production, with the control falling; but we have far less empirical data about this end.

Let us provisionally assume that in the bilingual also, the "sense activation phase" is non-selective. If so, the presentation of a source-language text might immediately activate not merely the various senses associated with the source-language expressions, but also the goal-language expressions associated with those senses (Fig. 5).
The selection phase then narrows down to the active senses that best apply, and the elaboration phase works mainly with the goal-language expressions (Fig. 6).
In effect, the same order of control processes that steer monolingual comprehension might apply to bilingual comprehension, but with a fairly brief intercession of differential control during the selection and elaboration stages. This account might explain why the bilingual translator does not have to do twice as much processing as a monolingual speaker. The immediate contact with the source-language surface text activates a domain of meaning (or sense) that saves the decision about which expression system is relevant until a strategic stage is reached.

The system model outlined in section 3 stipulates that the "semantic targets" stand in an indeterminate relation to the execution processes of perceiving and producing discourse (cf. Fig. 3). In translation, this indeterminacy is crucial for accommodating not merely the variations within monolingual transitions (e.g. in size and shape of print), but also the variations within bilingual disparities, such as divergences in formal categories (Fig. 7).
A high-level control executive decides which language system is to be preferred, and lets the specific implementation process run probabilistically. This executive regulates the rise and fall of the indeterminacy curve, each language system being probabilistically correlated with the relatively determinate semantic targets at both ends. Differences between the systems do not cause great difficulty for the bilingual because those systems occupy a transitional rather than central or terminal role in the entire process. The bilingual maintains control with equal facility, no matter which language is being used.

Of course, context preferences for elaboration may not be fully balanced in respect to the two language systems. Due to their relative stores of experience, many bilingual speakers prefer one language over the other for a certain context. Translation into the non-preferred language will thus be more creative and effortful than into the preferred language, at least so long as wide fluctuations of indeterminacy are not tolerated.

Stipulating the exact function of "grammars" of the two language systems within the whole process cannot yet be attempted on the basis of completed psychological research. For example, Kintsch's group has not isolated this question; the presented word and the primed target were always interpretable as the same part of speech, i.e., nouns. We would have to replicate the experiments using primes which are or are not grammatically appropriate continuations at the test point—a condition Kintsch and his co-workers tried to avoid (Till et al. 1986: 9).

Nonetheless, some projections might be ventured. I would be surprised if the grammatical categories of language were not found to apply more to the selection stage than to the perception or elaboration stages. That is, grammar would be principally a transitory reductive control system whose operations are centered in a short-term storage buffer and are then assigned to indeterminacy in order that control can pass on to the conceptual organization of meaning or content. The findings of Jacqueline Sachs (1967) on a recognition test beyond sentence boundaries support this projection: people recognize a semantic change after an interval of twelve to twenty-four seconds, but not a grammatical change such as from active to passive. John Anderson (1974) obtained similar findings for grammatical change in the test sentence.

In section 1, I cited the popular idea of linguists like Saussure and Hjelmslev that discourse is a dual chain, with an "expression line" and a content line" that "correspond" because they are "united in the brain by an associative bond". In terms of the research just cited, we should rather envision linearity as a transitory, mode-dependent organizational principle for processing multidirectional associations among meanings as well as between meanings and forms. The notion of a "content line" is an artifact of the shyness about contemplating meanings outside the bond to some specific form.
We might now consider what the recent discoveries on cognitive processing suggest about how translators may be trained. As language teachers know, the naive second-language learner is continually beset by crises of control in spontaneous discourse. Traditional instruction has emphasized the "grammar" and "lexicon" at the expense of contexts, many of which are hard to simulate in a pedagogical setting, especially in the typical teacher-centered "frontal" classroom. (Schooling is after all a middle-class enterprise, and the middle class tends to prize "correctness" and conformity over experimentation and creativity.) The learner attempts to exert conscious deterministic control over the transitional selection phase that a fluent speaker handles probabilistically. When resources are pre-empted this way, the elaboration stage cannot operate with enough power and range to guarantee communicative flexibility and global coherence.

The task of an effective method is thus to "automatize" the operations related to language form. Behaviorist methodology (as in the "audio-lingual method", whose hopeful name implies some direct link between ear and tongue, bypassing the brain) assumed that sheer repetition and reinforcement can accomplish this task. The bond between form and meaning was of course envisioned as a bond between "stimulus" and "response", just as Bloomfield (1933) and Skinner (1957) demanded. In consequence, perception and selection were emphasized at the expense of elaboration. When learners had to communicate in any but the most stereotyped contexts, they tended to lose control. What is needed instead, I suggest, is a methodology in which control is maintained by a probabilistic treatment of aspects that traditional instruction, including behaviorist methods, treats as deterministic. The most extreme illustration in wide distribution is "pidginization", wherein the speaker effectively controls discourse through a highly indeterminate handling of "grammar" and "lexicon" (and maybe of articulation as well). The results are often creative and robust in comparison to the inhibited struggles of the classroom learner who finds that the established formal concerns are not very useful without a strategic organization of control.

The solution is to design a transitional "intersystem" for second-language learners. Whatever the implementation of the system may be for particular language pairs, its central strategies are fairly clear. The aspects which relate to familiar contexts are given the main focus as far as possible, especially toward the beginning. In contrast, the aspects which are markedly difficult to control deterministically should be handled probabilistically until such time as the learner has developed a set of core strategies for relating contexts to the new language in spontaneous discourse. Only then will there be adequate processing resources to control the complex formal categories, especially those in respect to which the new language systems diverge most dramatically from those of the native language.

In one situation where I acted as a consultant, a group of Jewish refugees from the Sudan required an emergency language and literacy program, directed from the University of Haifa in Israel.
They knew only Amharic, a Semitic language widely spoken in Ethiopia, and they were mostly illiterate. I suggested breaking down the overall task into stages, moving from more toward less familiar. First, the learners could use their own favorite texts, such as stories and songs, transcribed into the Hebrew alphabet, until the correspondences of sounds to symbols had become familiar. Next, work would proceed on close translations of those same texts into the Hebrew language, and after that, on elaborations of the texts, using at the outset the formulaic strategies of Amharic story-tellers (compare the well-known data for Serbo-Croatian amassed by Milman Parry (1953) and his pupil Albert Lord (1960)). All work within the Hebrew language should be approached with the transitional "intersystem" I just described. I am not adequately knowledgeable about Hebrew and Amharic to determine how this system would be designed. An example closer to home might be a universal article "'de'" in German for speakers of languages which have either a uniform article (e.g. English) or none (e.g. Chinese).

The evolution from a naive second-language learner to a skilled translator is certainly gradual and complicated. Still, the success rate of the training could be greatly enhanced by managing the process in terms of distributing control in proportion to available cognitive resources. The use of contexts should be as rich as possible, even when that means temporarily blurring over formal categories. This tactic gives due respect to the extent to which real communication, including translation, relies on contexts to maintain control of discourse.

5. Special purpose language as a complementary control system

In tribute to the theme of this symposium, I shall conclude with a look at the translation of special purpose language, a domain I shall address in detail at the LSP Symposium in Vaasa this summer (Beaugrande 1987c). The best-known case is the language of science, which, as I remarked in section 3, can be viewed as a specialized control system (Beaugrande 1987b). This control operates in a complementary structure: on the one hand, the theory controls the data by assigning the latter some set of determinable constraints, among which "n-dimensionality" (measurability) is the best-known kind; on the other hand, the data "control" the theory by manifesting a more bounded determinism than the theory strictly requires. In a well-functioning "normal science", this complementarity chiefly demarcates a falling curve of indeterminacy over time, despite occasional fluctuations. In a "scientific crisis", however, the curve is predominantly a rising one, wherein theories and data insistently remain open to multiple and irreconcilable interpretations.

The special purpose language developed by the science is intended to assist control by stabilizing relevant definitions, descriptions, classifications, explanations, and so on. These entities regulate the contextualization of scientific discourse during the phases of sense selection and sense elaboration (section 4). However, I pointed out the danger of such interventions, as we
see them in the science of semantics: an unduly forced attempt to make a model highly determinate encourages its relation to its domain to become correspondingly indeterminate (section 3). We might say that the indeterminacy "squeezed out" of the model "moves over" into the relation between the model and its domain (Beaugrande 1987b). To meet this danger, the use of special purpose language must be explicitly negotiated with respect to the contexts wherein it occurs (Beaugrande 1987c). Linguistics has been frequently beset by a failure to do so, with the result that a term like "sentence" has been used to designate a bewildering multiplicity of entities, even semantic ones.

One might imagine that the stabilization of terminology in a special purpose language of science and technology would make translation quite straightforward in comparison to everyday discourse. In fact, however, this result is by no means always the case. For example, Viktor Smith (1986: 11) found that for "natural gas systems", "the Russian terminology, by comparison with the Danish terminology, exhibits a far greater degree of coherence, differentiation, and explicitness" (compare Andersen, Jørdal, Jørgensen, & Smith 1986). His explanation is that "the Russian terminology" is intended for the "abstract description of the subject field", notably for "general introductory literature" and "manuals"; "the Danish terminology" is intended for "the description of a concrete reality", notably for "the actual components of a factually existing system" (ibid.). In consequence, Smith encountered exactly the same divergence I described (in section 2) between formal systems of languages: "even in cases where Danish and Russian operate with a comparable concept in connection with a given section of reality, the terms employed to express this concept will frequently show differences in respect of what is explicitly stated" versus "what must be considered as presupposed" (1986:9).

Hence, it appears that the translation of special purpose language does not lead off into a separate and unproblematic domain, away from that of general purpose language. Instead, special theoretical models need to be expressly correlated with general ones, provided that general translation theory continues its trend toward context-rich frameworks (section 2).

The challenge is clear. The requirements for theoretical models to describe the activities of translation and special purpose communication can no longer be forestalled with vague expropriations from the reductive, deterministic formalisms of narrow linguistic fashion. The alternative frameworks I have explored today deserve intense consideration at a time when we must seize the initiative and present our demands to the research community for theories and models that genuinely reflect the real contexts of human communication.
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