Title: Garden path sentences in a relevance-theoretic perspective

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A g n i e s z k a   S o l s k a

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1. Introduction

The purpose of this paper is to examine the interpretation process of the garden path sentences, such as (1) – (5), in the light of Sperber and Wilson's (1986/1995) Relevance Theory and to demonstrate the potential this primarily pragmatic framework has for explaining the processing failure caused by factors that are linguistic rather than pragmatic in nature.

(1)   The horse raced past the barn fell.
      i.e. *The horse which was raced [by someone] past the barn fell [down].*
(2)   While the man hunted the deer ran into the woods.
      i.e. *The deer ran into the woods, while the man hunted.*
(3)   I convinced her children are noisy.
      i.e. *I convinced her that children are noisy.*
(4)   Mary gave the child the dog bit a bandage.
      i.e. *Mary gave a bandage to the child whom the dog bit.*
(5)   The old man the boat.
      i.e. *The boat is manned by the old people.*

Resorting to a colloquial expression one can say that the misleading sentences above lead the addressee 'down the garden path,' i.e. they invite him to consider one parse, hence one interpretation, and then force him

to abandon this parse in favour of another. For instance, confronted with the classic example in (1), the hearer or reader begins by treating the word *raced* as an intransitive past tense verb functioning as the main verb of the sentence but he stumbles when he reaches the word *fell*. This apparently subjectless verb may cause some readers to reject the sentence as ungrammatical. Most readers however will backtrack, revise the hypothesis they have initially made about the structure of the sentence, and reanalyze *fell* as its main verb and the fragment *raced past the barn* as a reduced relative clause modifying the noun *horse*.

2. The relevance-theoretic model of utterance comprehension

In the relevance-theoretic model of human communication and cognition, a cognitive stimulus, be it a sight, a sound, a memory or an utterance, is seen as more or less relevant to an individual depending on how many effects it yields in the individual's cognitive system and how much effort the individual needs to exert while deriving those effects. This idea is captured in the so-called Cognitive Principle of Relevance, presented in (6):

(6)   *Cognitive Principle of Relevance* (Sperber and Wilson 1995: 260):
        Human cognition tends to be geared to the maximization of relevance.

What makes utterances used in verbal communication different from other kinds of cognitive stimuli is their ostensive character, i.e. the fact that they are intentional and the overt demand they make on the addressee's attention guarantees to the addressee that what is being said is going to be optimally rather than maximally relevant to him. This notion is expressed in the so-called Communicative Principle of Relevance presented in (7), with the key concept of the presumption of optimal relevance given in (8).

(7)   *Communicative Principle of Relevance* (Sperber and Wilson 1995: 260):
        Every act of ostensive communication conveys a presumption of its own optimal relevance.
(8)   *Presumption of optimal relevance* (Sperber and Wilson 1995: 270)**:**
        (a) The ostensive stimulus is relevant enough for it to be worth the addressee's effort to process it.

(b) The ostensive stimulus is the most relevant one compatible with the communicator's abilities and preferences.

Formulated in such terms, the Communicative Principle of Relevance is a criterion which, on the one hand, regulates the sort of utterances speakers produce and, on the other hand, determines which interpretations of an utterance hearers will accept or reject. Interpreting verbal inputs is thus seen as a process automatically triggered by every utterance. It begins with the decoding phase, i.e. with the recovery of a linguistically encoded meaning, which provides input to the inferential phase, which in turn involves the construction of a range of hypotheses about the explicit content of the utterance, or its *explicatures(s)*, and about the implicitly communicated meanings, or *implicatures*. In deriving these meanings language users follow a single general comprehension procedure, i.e. they follow a path of least effort in computing cognitive effects, they test hypotheses as they become available to them and stop as soon as their expectations of relevance are satisfied (Wilson 2000: 420–421).

I would like to demonstrate that the relevance-theoretic model has the explanatory power to predict a range of phenomena connected not only with the processes of comprehending the garden path sentences but also with their very existence. There are three claims I hope to substantiate here:

— First, that the Relevance Theory can predict the high degree of failure in understanding the garden path sentences.
— Second, that it can explain why the garden path sentences are relatively rare in discourse.
— Third, that it can predict why the untenable interpretations are sometimes the first to access thus triggering the garden path effect.

3. Predicting processing failure

The high degree of processing failure follows directly from the Cognitive Principle of Relevance. Any structure which forces the comprehender to backtrack and search for a correction of previously taken assumptions is bound to increase the cost of achieving cognitive effects, and is thus less relevant. In addition, since the information load of a garden path sentence is no different from that of its unambiguous paraphrase, the extra cost expend-

ed is not outweighed by any communicative gains, which pushes the relevance further down and increases the risk of communication breakdown. Naturally, as the actual balance of cost and effect will be different for different speakers, some will be more, some less likely to flesh out the intended meaning or to fail in an attempt to do so.

This prediction finds confirmation in empirical research which revealed that in many cases the process of reanalyzing garden path sentences is only partially successful. The experiments conducted by Christianson, Hollingworth, Halliwell and Ferreira (2001) show that even after the reanalysis of the controversial structure such as (2) many readers continue to believe that the man hunted the deer although such a belief is not supported by the actual content of the utterance. The conclusion the researchers draw is that the process of natural language understanding is not an 'all-or-nothing proposition' and that instead of producing complete and detailed representations cognitive systems actually produce representations which, as they put it, are 'good enough.' This phenomenon of incomplete reanalysis is in keeping with the Communicative Principle of Relevance, which predicts that utterance comprehension is not geared towards deriving the best possible interpretation but the optimal one. It also confirms the notion that verbal understanding proceeds in the way outlined by the relevance-theoretic comprehension procedure. The moment the comprehender constructs an interpretation of the sentence that seems tenable (even though in reality it is unlicensed by the input), he judges that processing has been successful and that further operations are not necessary.

4. What makes garden path sentences relatively rare

Naturally, the increased risk of communicative failure alone does not explain why garden path structures are rare in discourse. After all, language is rife with effort-demanding constructs, such as puns, ironies, creative metaphors, jokes, long convoluted constructions or texts saturated with low-frequency lexical items. The very existence of such constructs seems to defy the notion that in making a choice as to which linguistic elements should be encoded speakers try to keep the hearer's processing effort down. However, though increasing the risk of communication breakdown, the costly constructs I have just mentioned convey a whole host of meanings which offset this risk. This is what makes them drastically different from garden

path sentences. Like other ostensive stimuli, garden path constructions automatically trigger the comprehension process. The language user assumes that they will be optimally relevant to him and continues to work on them in spite of initial difficulties. However, unlike most other effort-demanding structures, garden path structures frustrate those initial expectations of relevance. No special communicative gains await the comprehender who has been able to provide the correct analysis, except maybe the sense of amusement or satisfaction at having solved a little linguistic puzzle.

Why are garden path utterances used at all? Characteristically, they tend to appear in situations that have little to do with natural language use. They are used as test material in experiments conducted by psychologists or psycholinguists who wish to gain insight into natural language processing or by scientists interested in designing computer programs that can emulate the linguistic capabilities of human language users. Occasionally they are used by teachers to test the level of linguistic command achieved by their students. Hardly ever are they found in spoken discourse, where pauses and tonic stress would normally indicate how constituents within a sentence are grouped. One is more likely to encounter them in works of fiction or poetry, i.e. in modes of discourse where confusing the reader is sometimes a virtue but in such cases it is never clear whether they are the result of careful design or of accident. For example, the baffling fragment of the novel *Behind the Scenes at the Museum* by K. Atkinson (1995: 11), given in (9a), would not be baffling at all, if a disambiguating comma had been inserted after the word *being*, as was done in (9b).

(9a)   At the moment at which I moved from nothingness into being my mother was pretending to be asleep—as she often does at such moments.
(9b)   At the moment at which I moved from nothingness into being, my mother was pretending to be asleep—as she often does at such moments.

Given the settings in which garden path sentences can be encountered, it is hardly surprising that when writing this paper I felt much more comfortable using such expressions as 'comprehender' or 'language user' instead of a more typical 'hearer' or 'addressee.'

5. Possible sources of the garden path effect

5.1. Local ambiguities

Let us now turn to the question of what triggers the garden path effect. The difficulty hearers have in processing garden path structures is often due to some local ambiguity in the grammatical structure, i.e. a place of indeterminacy, a cut off point supporting more than one interpretation only one of which will turn out tenable. Thus sentence (1) is locally ambiguous between the main clause reading and the relative clause complex noun phrase reading. In (2) the fronted subordinate clause creates a place of indeterminacy in which an noun phrase can be given either an object or a subject reading. Sentence (3) is locally ambiguous as to what constitutes the complement of the verb *convinced*. In sentence (4) the local ambiguity focuses on the double object and in (5) the garden path effect arises due to the lexical ambiguity of two elements.

At first it would seem that sentences containing local ambiguities should be easier to process than the ones containing global ambiguities, since the ambiguity is cleared up once the whole sentence has been heard or read, thus leaving the hearer with one relevant interpretation. However, this is not the case with garden path sentences. Of the two interpretations locally available, addressees typically choose the one which will ultimately turn out to be incorrect.

5.2. The Principle of Late Closure and Theta Reanalysis Constraint

As to why this happens, one possible explanation has been suggested by Frazier and Fodor (1978) or Frazier and Rayner (1982). In their discussion of sentences such as the one about the hunter and the deer, they invoke the Principle of Late Closure, according to which when allowed by syntax, incoming material is attached inside the clause or phrase currently being processed.

The principle thus prevents the noun phrase *the deer* in sentence (2) from being attached outside the subordinate clause as this would lead to the *early closure* of the clause, i.e. the argument structure of the subordinate verb would get closed off despite the fact that the input string contains an apparently compatible object. However, as shown in Table 1, though the

principle seems to work for sentences (2), (3) and (5), it cannot account for examples such as (1), or (4), where the garden path effect (GPE) arises due to the early closure (EC) rather than late closure (LC) of a clause currently processed.

Table 1. Late closure and the garden path effect

LATE CLOSURE LEADING TO GPE:	(2) While the man *hunted* **EC** *the deer* **LC** ran into the woods. (3) I convinced *her* **EC** *children* **LC** are noisy. (5) *The old* **EC** *man* **LC** the boat.
LATE CLOSURE ***NOT*** LEADING TO GPE:	(1) *The horse* **EC** *raced past the barn* **LC** fell. (4) Mary gave *the child* **EC** *the dog bit* **LC** a bandage.

Another way of accounting for the interpretation difficulties readers encounter while parsing garden path sentences is proposed by Pritchett (1992: 15) in the form of the Theta Reanalysis Constraint, which holds that 'semantic reanalysis which reinterprets a theta-marked constituent as outside of a current theta domain is costly.'

On this proposal, during the process of reanalysis of sentence (1), the AGENT noun phrase *the horse* must be removed from the theta-domain of the predicator *raced* into the domain of the predicator *fell*, which is costly, since it violates the constraint. In (2), the NP *the deer* has to move out from the theta-domain of the predicator *hunted* to the domain of the predicator *ran* and its role changes from PATIENT to AGENT. In sentence (3) the GOAL of the predicator *convinced* is restructured in such a way that the pronoun *her* remains in the theta-domain of *convinced* while the noun *children* is removed from this domain into the domain of *are noisy,* where it assumes the role of AGENT. In (4) the string *the dog* moves out of the domain of *give* into the domain of the verb *bit*. In (5), as a result of a thematic restructuring, the word *old* becomes the head of the NP and the word *train* becomes the predictor.

The problem with both these frameworks is that they cannot explain why not all sentences containing local ambiguities trigger the garden path effect. For instance, sentences (10)–(14), modelled on the examples under analysis, do not seem to entrap the hearer in the processing failure even though they have exactly the same syntactic structures, the same set of theta domains, and sometimes even the same or at least similar ambiguous items as their garden path counterparts.

(10)   The horse raced at the Belmont died.
(11)   While the man hunted a meteorite crashed into the woods.
(12)   I convinced her viruses are dangerous.
(13)   Mary gave the child lightning scared a hug.
(14)   The old rock the boat.

5.3. A relevance-theoretic account

I believe that a more promising account of what leads to the garden path effect can be found in the relevance-theoretic idea that words and phrases may encode concepts which become activated in the comprehender's mind providing access to three types of information: (i) lexical (i.e. information about the natural language counterpart of the concept), (ii) logical (consisting of a set of deductive rules which apply to logical forms of which that concept is a constituent) and (iii) encyclopaedic (i.e. information about the objects, events and/or properties that instantiate it). In the process of utterance comprehension we draw from the encyclopaedic and possibly from the logical entries of the concepts which serve as raw material for the logical form we are trying to construct.

So what information is made accessible to us by such words as *hunted, raced, convinced or gave*? What might be the difference between the inferences drawn from the encyclopaedic entries of such concepts as *the deer* as opposed to *a meteorite, the barn* as opposed to *the Belmont*, *the dog* as opposed to *lightning*? Finally, why is the comprehender of sentence (5) more likely to access the complex concept of *the old man* than *man the boat*?

Concerning sentences (1) and (10), unlike the phrase *at the barn,* the phrase *at the Belmont* can give access to information connected with a horse-racing event at which horses do not merely race but are raced against each other, which is why the locally ambiguous sentence (10) is unproblematic while sentence (1) triggers the garden path effect.

As for sentences (2) and (11), it may be observed that only the encyclopaedic entry for *deer*, but not for *meteorite*, contains information about being a potential quarry in a hunt. This may account for comprehenders making plausible yet wrong assumptions about the deer being hunted, which in turn leads to the garden path effect in (2), but not in (11).

The phrase *her children* in sentence (3) makes a more likely candidate for being the GOAL of the predicator *convinced* than the phrase *her virus-*

es in sentence (12). Besides women having children is part of our encyclopaedic knowledge of the word, hence the string *her children* is more likely to form a complex concept than the string *her viruses*. This may account for the garden path effect in (3) and the absence thereof in (12).

The gifts people get include dogs, but not atmospheric phenomena, hence the string *give the child the dog* in sentence (4) is more likely to be treated as a legitimate set of ordered concepts than the string *give the child lightning* in sentence (13).

Finally, both *the old man* and *the old rock* form tenable concepts. However, the string *rock the boat* in sentence (5) is more of a collocation than the string *man the boat* in (14), which makes the former more likely to be interpreted as a verb phrase, which in turn precludes the garden path effect in (14) and triggers it in (5).

As can be seen, in drawing inferences based on contextual assumptions made accessible by the encyclopedic entry of the linguistically encoded concept, the comprehender is guided by his expectations of relevance. However, the inferential processes which normally help resolve interpreting difficulties in some cases may lead him astray and hamper the correct understanding of a sentence.

6. Concluding remarks

I realize that in this paper I have only scratched the surface of the garden path phenomenon. I do hope, however, that I have gone some way towards demonstrating the predictive powers of the Relevance Theory in explaining why the normal automatic smooth process of linguistic communication is sometimes doomed to go awry.

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