

Bridging Reference and the Notions of 'Topic' and 'Focus'

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1 Introduction

Erku & Gundel (1987) end their paper on the pragmatics of indirect anaphors, with the following comments:

In particular, we have suggested that an adequate account of how anaphoric expressions are recognized and interpreted must make crucial reference to the pragmatic notions of relevance and topic. Precisely how the two concepts interact in the interpretation of anaphoric reference is a question we leave for further study.
(p544)

This is the question I would like to discuss in this paper. I shall argue that topic-based approaches to reference assignment are essentially studies of the factors that affect the accessibility of candidate referents, and that a pragmatic criterion is needed to evaluate these candidates and accept or reject them. Existing topic-based approaches to reference assignment fail on two counts: in the first place, they do not accurately predict the accessibility of candidate referents; in the second place, they do not offer adequate criteria for evaluating them. I shall suggest that the correct pragmatic criterion is Sperber & Wilson's criterion of consistency with the principle of relevance, and that this should be added to existing topic-based accounts.

Erku & Gundel discuss examples like the following which involve the phenomenon of bridging reference:

- (1) We went to a Thai restaurant. The waitress was from Bangkok.
- (2) We stopped for drinks at the New York Hilton before going to the Thai restaurant. The waitress was from Bangkok.

They say that the most likely interpretation for the discourse in (1) is one in which the waitress is linked to the Thai restaurant introduced in the first sentence. In (2), on the other hand, the waitress is intuitively interpreted as the

waitress at the Hilton, in spite of what we are told about her origin. Erku & Gundel suggest, citing Sidner (1983b), that these facts can be explained along the following lines: an anaphoric expression will be interpreted as referring to the topic of the sentence; since the topic for a following discourse is most likely to be introduced in the VP of a main clause, the topic for the first sentence in (1) will be the Thai restaurant, but for (2) it will be the Hilton. The expectation is then that the second sentence in (1) will go on to talk about the Thai restaurant and the second sentence in (2) will go on to talk about the Hilton; the referring expression 'the waitress' in (1) and (2) will thus be interpreted as anaphorically linked to the Thai restaurant and the Hilton respectively.

As I find this proposal worth considering, I would like to take up the issue in this paper. The phenomenon illustrated in (1) and (2) is a particular type of reference assignment, generally known as 'bridging reference'. I will look at two topic/focus based accounts of bridging reference assignment, namely, the one proposed by Erku & Gundel (*ibid.*) and one proposed by Sidner (1983a,b), and compare them with an alternative account, namely, the relevance-theoretic account proposed by Sperber & Wilson (1986), which was elaborated particularly with regard to reference assignment by Wilson (1989). The order of the discussion will be: 1. the definition of bridging reference; 2. topic/focus-based accounts and bridging reference; 3. problems with topic/focus-based accounts and 4. a relevance-theoretic solution to their problems.

2 Bridging reference and bridging implicature

2.1 Definition

The term 'bridging' was originally introduced in the work of Clark and Haviland (e.g. Haviland & Clark 1974, Clark & Haviland 1977, Clark 1977a and 1977b) to refer to the phenomenon illustrated below:

- (3) I went to a restaurant. The wine list was exclusively French.
 (4) John went walking at noon. The park was beautiful.

In (3), although it is not explicitly stated that the restaurant had a wine list, the natural assumption is that it did, and that the wine list referred to in the second part of utterance is the one in the restaurant which the speaker went to. Similarly, in (4), although it is not explicitly stated that John went walking

in the park, the natural assumption is that he did, and that the park referred to in the second part of the utterance is the one where John went walking.

What is involved in the interpretation of utterance such as these is not only encoding and decoding of syntactic and semantic information, but also, crucially, pragmatic inferences to identify the intended referent of the definite noun phrase in the second sentence. Following Clark and Haviland, I call the inference 'bridging implicature'. However, although Clark and Haviland are the originators of the notion of 'bridging implicature', they do not offer an adequate definition of it. Thus, here I will use my own definition of the notion.

I shall talk of 'bridging implicature' when a new contextual assumption is needed to introduce the intended referent. By 'a new contextual assumption', I mean a new premise to be created by the listener to establish the existence of the intended referent, when it has not been explicitly mentioned before. Let me illustrate this using the examples (3) and (4). In (3), the antecedent of 'the wine list' is not explicitly mentioned, and in (4), the antecedent of 'the park' is not explicitly mentioned. Instead, the existence of these antecedents must be inferred from the explicit content of previous discourse. In (3), the mention of the restaurant enables the listener to make the assumption that the restaurant had a wine list, and in (4), the mention of the fact that John went walking makes accessible the assumption that John went walking in a park. These newly introduced entities can then be assigned as referents for 'the wine list' and 'the park', respectively. I call this type of new assumption, which is indispensable for identification of the intended reference, a bridging implicature. And by 'bridging reference', I mean the definite noun phrase whose referent is identified by use of bridging implicature.

2.2 Bridging reference and other types of referring expressions

Here I would like to characterise bridging reference more clearly by comparing it with other types of referring expressions: pronouns; definite noun phrases which redescribe a previously mentioned antecedent noun phrase; definite noun phrases which redescribe a previously mentioned antecedent. The three types are exemplified in (5) - (7) respectively:

- (5) I met a man yesterday. He told me a story.
- (6) I met a man yesterday. The man told me a story.
- (7) I met a man yesterday. The bastard stole all my money.

Let's consider the case of the pronoun first. Sanford (1985:195) claims that pronouns are primarily geared towards retrieval of explicitly mentioned entities. This view seems plausible. Typically, in written texts at least, pronouns are used on condition that there is no need for a new assumption to introduce the antecedent, nor for the creation of a new antecedent in the listener's mental representation. The listener is simply required to search for some representation of the intended referent in previous discourse.

Second, in the case of a definite noun phrase which shares a noun with its antecedent, as in example (6), again there is no need for a new assumption introducing a new antecedent. The case is very similar to that of pronouns.

These two types of referring expressions share the characteristics that there is an explicitly mentioned antecedent and no new entity needs to be created by the listener in order to establish the intended reference. The listener still has to infer what referent was intended, as he does in all cases of reference assignment--but he already know that this referent exists.

Third, let's consider a definite noun phrase which redescribes its antecedent, as in the example (7), the new assumption would be 'The man whom the speaker met was a bastard'. This assumption may be called an 'implicature'. Thus, this type of referring expression is quite different from the two mentioned above, because an implicature is needed in order to assign reference covertly. However, there is also a significant difference between this type of case and what I am calling bridging reference. While 'the bastard' in (7) redescribes an existing, previously established antecedent 'a man', 'the wine list' in (3) and 'the park' in (4) do not redescribe an existing, previously established entity, but require the introduction of a new entity as referent. To me, the most important characteristic of bridging reference is that there is no explicitly mentioned antecedent in the previous discourse. The antecedent must be created by the listener in his mental representation using clues given by the explicit content of the discourse. Hence, the implicature generated by (7) should be distinguished from bridging implicature.

3 Topic/focus-based accounts and bridging reference

I will now consider two topic/focus based accounts of bridging reference. First, I will consider Erku & Gundel's approach, then move to Sidner's account.

3.1 Erku & Gundel

Let us return to Erku & Gundel's examples, which I repeat for convenience here:

- (1) We went to a Thai restaurant. The waitress was from Bangkok.
- (2) We stopped for drinks at the New York Hilton before going to the Thai restaurant. The waitress was from Bangkok.

In each case, the definite noun phrase 'the waitress' in the second sentence is an instance of bridging reference. Example (1) is a straightforward case: the mention of 'Thai restaurant' enables the hearer to construct a new assumption that there was a waitress in the Thai restaurant which the speaker has mentioned. But we must consider example (2) more carefully: in this case, there are two possible candidates for the place 'the waitress' comes from, namely, the New York Hilton and the Thai restaurant. And this is where the notion of topic/focus comes in as a criterion for correct assignment of bridging reference.

Erku & Gundel claim that the interpretation in which 'the waitress' belongs to the New York Hilton rather than the Thai restaurant is preferred, in spite of her origin. Their explanation for this preference in interpretation is rather sketchy. Following Sidner, they suggest that: (a) an anaphoric expression will be interpreted as referring to the topic of the sentence (i.e. the item that is currently 'in focus'); and (b) since the topic for the following discourse is most likely to be introduced in the verb phrase of the main clause (in direct object position, if there is one) the expectation is that the second sentence in (2) will go on to talk about the New York Hilton. Any other interpretation would then be stylistically infelicitous.

To illustrate this stylistic infelicity, they give the following example:

- (8) We stopped for drinks at the Hilton before going to the zoo. The baby orangutan was really cute.

Here they claim that the discourse is judged to be somewhat odd, even though a zoo is most certainly a good candidate for a place where 'the baby orangutan' might come from. This utterance is odd, they claim, because, after hearing the first sentence, the hearer is expecting to hear something about drinking at the Hilton, not about the zoo.

Erku & Gundel's account raises two questions. First, do they provide an adequate mechanism for choosing the topic of a discourse, and hence

assigning reference to subsequent anaphoric expressions? And second, what happens when the topic chosen by their mechanism does not yield a suitable candidate for reference assignment? I shall argue that their treatment of reference assignment fails on both counts.

3.2 Problems with Erku & Gundel

Let's consider the first question. It seems that Erku & Gundel assume that there is only one topic in a sentence, which is most likely to be introduced in the verb phrase of the main clause (in direct object position, if there is one). But it is not difficult to imagine cases where this claim makes the wrong predictions. Consider (9) and (10):

- (9) I couldn't attend the semantics lecture because I had a temperature.
 (10) My brother studied very hard in order to pass the exam.

According to Erku & Gundel, in the examples (9) and (10), the topic will be 'the semantics lecture' and 'studying hard' respectively. But there are problems with this claim. In the first place, there is no reason to assume that there is always one local topic in a sentence as Erku & Gundel suggest. For example, in (9) and (10), the whole sentence may be the topic/focus. In the second place, the clearest indication of the scope of topic/focus may be not the syntactic structure of the sentence but the position of the intonational nucleus. And there may be more than one intonational nucleus per sentence, as in (9) and (10) with the stress patterns below:

- (11) I couldn't attend the seMANtics lecture, because I had a TEMperature.
 (12) My brother studied very HARd, in order to pass the exAM.

Here, it is most likely that there are two local topics/foci in each sentence, or that the scope of the topic/focus is the whole sentence. Now these are perfectly acceptable utterances. The question is : what is the hearer supposed to do? Does he somehow try to select one unique local topic and use that in assigning reference? I believe that the answer is 'no'. Let me give two examples of perfectly acceptable continuations of these sentences, which support this claim:

- (13) I couldn't attend the semantics lecture because I had a temperature. The doctor said it was flu.

- (14) My brother studied very hard in order to pass the exam. The questions were exactly what he wanted.

Bridging implicatures for these examples might be:

- (13') If you have a temperature, you see a doctor.
(14') An exam has questions.

If, as Erku & Gundel assume, there is only one local topic in each sentence, which should be the direct object in (13) and the verb phrase 'studying hard' in (14), these examples should be judged odd, because the bridging reference in the second sentence doesn't refer back to the predicted focus, 'the semantics lecture', and 'studying hard'. Hence, if one sticks to the idea that there is only one local topic per sentence, these examples also demonstrate that Erku & Gundel's claim that an anaphoric expression will be invariably interpreted as referring to the topic of the sentence is not plausible.

This discussion suggests two conclusions. First, if a notion of topic is to be used in reference assignment, then the method for computing the topic, and hence predicting the most accessible candidate referent, must deal with not only of syntactic structure but also of intonation. (I should note in passing that intonation may affect judgements of acceptability in our original examples (2) and (8). Neither Erku & Gundel nor Sidner mentions a range of further factors, such as parallelism of linguistic structure, which would have to be integrated into a fully adequate treatment. Existing treatments of topic/focus selection are thus descriptively inadequate.

Second, there is no guarantee that the current topic will be an acceptable candidate for reference assignment. Consider (15), for example:

- (15) The train pulled into the station. The passengers ran for the taxis.

Here there are two bridging references, 'the passengers' and 'the taxis'. Intuitively, the correct antecedent for 'the passengers' is 'the train' (since passengers ride on trains), whereas the correct antecedent for 'the taxis' is the 'station' (since taxis are found at stations). Hence, either there must be two topics in this discourse, and some method must be provided for deciding which bridging reference goes with topic; or there is only one topic, and at least one bridging reference has an antecedent which is not the topic. In either case, what is needed is some method for evaluating candidate reference assignments, and this Erku & Gundel do not provide.

I shall turn now to Sidner's account, which does provide a method for evaluating candidate reference assignments, and thus offers a solution to the second of the two problems just mentioned.

3.3 Sidner

Sidner (1983a) uses the term 'focus' to refer to 'the element which is talked about' and calls the process of centering attention 'focusing'. She proposes 'a process model' of speaker's focusing and hearer's tracking focus which falls into three parts: first, the hearer chooses a focus based on what the speaker initially says; then the hearer uses this focus to interpret the anaphoric expressions in the discourse; finally, the hearer updates the focus using the interpretations of anaphora which result from step 2.

The criterion for selecting focus suggested by Sidner (1983b) is based on grammatical and thematic relations in a sentence, and is set out as follows:

The Expected Focus Algorithm

1. The subject of a sentence if the sentence is a 'is-a' or 'there'-insertion sentence.
2. The first member of the default expected focus list, computed from the thematic relations of the verb, as follows: Order the set of phrases in the sentence using the following preference schema:
 - theme, unless the theme is a verb complement in which case theme from the complement is used.
 - all other thematic positions with the agent last.
 - the verb phrase.

Let me illustrate briefly how this algorithm works. When an expected focus is chosen on the basis of thematic relations, the most reliable default is the verb theme itself, i.e. the direct object of the verb. Thus, in the following example, Sidner explains that this is why the antecedent for the pronoun 'he' is the direct object NP 'her dog', which is the theme in the first sentence, rather than the NP 'a bull' in the prepositional phrase:

(16) Sandy walked her dog near a bull one day. He walked quietly along.

Sidner claims that in cases like this, the NP in a prepositional phrase following the theme cannot be the focus of the discourse unless the expected focus is explicitly overridden, as in the following example:

- (17) Sandy walked her dog near a bull one day. She saw how he threw back his great menacing horns.

In this case, the expected focus is overridden, because the following statement about horns enables us to interpret 'he' as referring to 'a bull' rather than 'her dog'. Sidner calls this phenomenon 'rejecting the expected focus', and this is what interests me here.

I should mention, however, that in addition to the algorithm above, Sidner suggests that the agent of the sentence is always a possible candidate for the focus. So it is possible to have two foci in one sentence: one is the agent (this is called 'actor focus') and another is the theme (this is called 'discourse focus'). She also mentions a variety of other factors, which will somehow have to be integrated: for example, stress and intonation, linguistic parallelism, etc.. What I am interested in, however, is her idea that the expected focus, and the resulting reference assignments, must be evaluated and either accepted or rejected. It is to her proposed criterion for evaluation that I now turn.

An important feature of Sidner's account is that for her, focus is a default notion: in other words, it is possible to reject the expected focus and choose an alternative candidate as focus if necessary. She suggests that the expected focus will be rejected when the resulting interpretation of the whole utterance yields a contradiction. This idea is illustrated in the following example:

- (18) Cathy wants to have a big graduation party at her house. She cleaned it up so that there would be room for everyone.

The anaphoric expression used in this example is the pronoun 'it'. Unlike Erku & Gundel, Sidner allows for the fact that anaphoric expressions do not always refer to the topic of the previous sentence. In (18), the expected focus is the graduation party, but in the second sentence, the use of 'it' to refer to Cathy's house indicates that the focus is on the house. Sidner explains how an alternative noun phrase can be chosen as the focus in the following passage:

[focus] Recognition and selection both depend on the use of inferences about general knowledge. For example, in [example (18)] the choice of party for 'it' can be rejected since having cleaned up an event would be rejected as incompatible with other knowledge about cleaning. Following the rejection of the expected focus, a correct [referent] can be selected because it

is available in the previous sentence. To find it, each alternative default focus must be considered in turn, until one is found which is not rejected on the basis of general knowledge.

(p288, my additions in parentheses)

For Sidner, then, focus is a default notion, which may be overridden by general knowledge. Thus, she can explain the acceptability of the following example of bridging reference, which, according to Erku & Gundel, will be unacceptable:

- (19) Someone stole my wallet at the tube station. The platform was full of people.

Within Sidner's framework, what goes on in the hearer's mind in interpreting (19) will be: (a) the expected focus is 'my wallet'; but (b) the bridging reference 'the platform' in the second sentence has nothing to do with wallets according to one's general knowledge: so (c) reject the focus and start searching for alternative candidates which are compatible with general knowledge about platforms. The hearer thus finds that 'the tube station' is a good candidate, since tube stations have platforms. Thus, he constructs the bridging implicature that there was a platform at the tube station where the speaker's wallet was stolen.

In Sidner's framework, both focus and inference based on general knowledge play crucial roles, and their functions are complementary. Sidner claims that:

. . . focusing does not eliminate the need for making inferences; it offers a constraint on how they are made. The complexity of the inferring process is constrained to asking for confirmation of the sentence prediction, thereby eliminating combinatorial search for free variable bindings and non-terminating inferring.

(1983b:p291)

What she means by this is roughly the following: in encountering a referring expression, the hearer doesn't need to check all the possible candidates for reference assignment; he can simply start with the focused item; if it yields an adequate result, he doesn't need to do any further pragmatic analysis, i.e. he doesn't need to check any other candidates; if the result is unacceptable, he

should reject it and try the next candidate; and so on until the one which fits his general knowledge is found.

Thus Sidner's ultimate criterion for evaluating candidate reference assignments seems to be that the resulting overall interpretation must be compatible with the hearer's general knowledge: in other words, she is proposing a criterion of truth, or truthfulness. And her account raises two questions: (a) does this criterion amount to a satisfactory pragmatic criterion for reference assignment?; and (b) are her proposed constraints on the order in which candidates are considered plausible? It is to these questions that I now turn.

4 Problems with Sidner's pragmatic criterion

One problem with Sidner's account is that it no longer explains the stylistic infelicity of (8):

- (8) We stopped for drinks at the Hilton before going to the zoo. The baby orangutan was really cute.

Here, the predicted focus would be the Hilton, but this would be rejected as a candidate antecedent for 'the baby orangutan' on the grounds that baby orangutans are not found at the Hilton, and the antecedent 'the zoo' would be chosen. There is no suggestion in Sidner's account that the rejection of a default focus should lead to stylistic infelicity; and indeed, in her own examples, no such infelicity results. Sidner's problem, then, is to explain why rejection of the expected focus sometimes leads to stylistic infelicity, and at other times does not.

However, the main examples I want to use to test Sidner's account are those in which two equally salient or accessible items are apparently found, as in (20) and (21):

- (20) I moved from Earl's Court to Ealing. The rent was less expensive.
(21) I moved from Earl's Court to Ealing. The rent was too expensive.

Intuitively, the preferred interpretation for (20) is that the rent in Ealing was less expensive than that in Earl's Court; and the preferred interpretation for (21) is that the rent in Earl's Court was too expensive. The question is: does Sidner's account explain how these assignments of reference are made? Let us consider first what Sidner says about choice of focus in these examples.

Her algorithm suggests that it will be one of the thematic NPs 'Ealing' or 'Earl's Court'. Sidner adds that there is a weak preference for the thematic position 'goal', although it is difficult to know how reliable the preference is. If Sidner doesn't want to use this weak preference, then she will wrongly predict that (20) and (21) are uninterpretable or ambiguous. So let's assume that however weak the preference is, it works, and see what it predicts. Since the NP 'Ealing' is the goal in both (20) and (21), we will predict that this is the expected focus in both examples. The resulting interpretations of the second sentences are: for (20), that the rent in Ealing was less expensive; and for (21), that the rent in Ealing was too expensive. Notice that in case of (21), this interpretation is not the one we preferred. While most people find both interpretation of (21) possible, there is a clear preference for the 'Earl's Court' interpretation. The problem with Sidner's account is that the 'Ealing' interpretation is capable of being true, which it is for everyone, she predicts that the 'Earl's Court' interpretation should never be considered at all. It seems, in other words, that capability of being true is not enough to make an interpretation acceptable, despite what Sidner's pragmatic algorithm claims.

Now let's look at some more examples which make a similar point:

- (22) John Major succeeded Margaret Thatcher. The government's policy was just as disappointing.
- (23) Margaret Thatcher gave way to John Major. The government's policy was just as disappointing.

The preferred interpretation of the second sentence in both examples is that policy of John Major's government was just as disappointing as that of Margaret Thatcher's government. The question is, can Sidner's account handle these preferences in interpretation? According to Sidner, the actor focus is preferred in cases like this. Thus, in (22), according to her analysis, John Major is the expected focus, and in (23), the expected focus is Margaret Thatcher. The case that interests me here is example (23).

In the case of (23), Sidner's account faces a crucial problem. The expected focus is 'Margaret Thatcher'. The evaluation procedure goes something like this: (a) test the acceptability of 'Margaret Thatcher' as an antecedent for the NP 'the government's policy'; (b) test the acceptability of the resulting interpretation of the second sentence, namely, (24):

- (24) Margaret Thatcher's government's policy was just as disappointing as John Major's.

(24) is clearly compatible with general knowledge; (c) the expected focus has passed both tests, so confirm it as a focus and stop testing. So Sidner's account chooses the interpretation (24). Notice that this isn't what we wanted. Our preferred interpretation was (25), not (24) as Sidner's account predicts!

(25) John Major's government's policy was just as disappointing as Margaret Thatcher's.

The point here is that (24) and (25) are true and false together, but it is (25), not (24), that is preferred. Sidner's account is entirely inadequate to explain this type of choice.

The reason why Sidner's account makes the wrong prediction in this case seems to stem from two wrong assumptions: 1. an expected focus which passes the acceptability test must be the intended referent (in the case of bridging reference, the NP which yields the intended bridging assumption); 2. a criterion of truth, or truthfulness, is used in evaluating the resulting overall interpretation. These assumptions fail when there is more than one interpretation which is equally compatible with the hearer's general knowledge, one of which is chosen for some reason. Since Sidner's account fails to choose the right one, it seems necessary to conclude that focusing and a criterion of truth, or truthfulness, does not yield an adequate account. Now I would like to suggest a relevance-theoretic solution to the problems that arise from Sidner's account.

5 A relevance theoretical account of bridging reference

In this section, I will first give a very brief outline of Relevance theory (Sperber & Wilson 1986). Then I shall return to the discussion of bridging reference in the framework of relevance theory.

5.1 An outline of Relevance theory

Relevance theory is a pragmatic theory which shares a basic assumption with the Gricean approach: that verbal communication involves not only encoding and decoding, but also, more crucially, the drawing of inferences, in which contextual assumptions play an important role. However, Sperber & Wilson differ from Grice in their claim that the principles governing inferential communication have their source in some facts about human cognition:

humans tend to pay attention to the most relevant phenomena available; they construct the most relevant possible representations of these phenomena, and process these representations in a context that maximises their relevance.

This has an important consequence for the theory of communication. A communicator, by the very act of claiming a hearer's attention, communicates that the information he is offering is relevant enough to be worth the hearer's attention. In other words, utterances automatically create expectations of relevance.

According to Sperber & Wilson, information is relevant to the hearer if it interacts in a certain way with his existing assumption about the world. The results of the interaction are called 'contextual effects'. Contextual effects are categorised into three types by the way they are derived from the interaction between newly presented information and existing assumptions: 1. the new information may combine with the context to yield contextual implications; 2. the new information may strengthen existing assumptions; 3. the new information may contradict and eliminate existing assumptions.

The resulting contextual effects, together with the processing effort needed to recover them, determine the overall relevance of an item of information being processed. How relevant is an utterance expected to be? Sperber & Wilson argue that it is expected to achieve an adequate range of contextual effects, and cause the hearer no unjustifiable effort in achieving these effects. Such an utterance is seen as 'optimally relevant'. Optimal relevance is defined as follows:

Optimal Relevance

An utterance, on a given interpretation, is optimally relevant iff:

- (a) it has enough contextual effects to be worth the hearer's attention;
- (b) it puts the hearer to no unjustifiable effort in obtaining those effects.

Finally, Grice's maxim of relevance can be replaced by, and all his other maxims are reduced to, the following 'principle of relevance':

Principle of Relevance

Every act of inferential communication communicates the presumption of its own optimal relevance.

Sperber & Wilson claim that the fact that an utterance communicates a presumption of optimal relevance does not mean that it will actually be optimally relevant to the hearer. The presumption of optimal relevance may

be created mistakenly: a speaker may tell you something in the mistaken belief that you do not already know it. Hence, they propose that a given interpretation of an utterance is 'consistent with the principle of relevance' if and only if a rational communicator might have expected it to be optimally relevant to the hearer. And this is the criterion that, according to Sperber & Wilson, is used in every aspect of utterance interpretation, including reference assignment.

5.2 The principle of relevance and bridging reference assignment

Now I would like to show how bridging reference assignment is dealt with in the framework of Relevance theory.

The most important factor here is the context. We assume that in the process of reference assignment, the hearer must select an appropriate referent from the context. Thus, questions such as 'what sort of contexts are available to the hearer?', 'how are they accessed?' and 'how can the hearer select the right context, in which the right referent will be found?' are the ones which should be considered.

Let us consider the first question: what sort of contexts are available to the hearer? In relevance theory, it is assumed that there are several different sources of contextual assumptions, including long-term memory, short-term memory and perception. Given that people usually do not come to the processing of new information with a 'blank mind', it seems plausible to assume that they have some kind of short-term memory store, the content of which can be regarded as the most accessible context. If the hearer has just interpreted one utterance and is about to interpret the next, his short-term memory will most likely contain the assumptions used in and derived from the interpretation of the previous utterance. Let us call these assumptions the 'immediate context'.

However, there are cases of verbal understanding where the immediate context isn't sufficient. The case of bridging reference assignment is one of them. Let's look at the simplest examples:

- (3) I went to a restaurant. The wine list was exclusively French.
- (4) John went walking at noon. The park was beautiful.

When the hearer is about to process the second sentences in (3) and (4), the most accessible context will be the assumptions used and derived in the interpretation of the immediately preceding sentences, namely, 'I went to a

restaurant' and 'John went walking at noon' respectively. However, since there is no explicit mention of 'wine' or 'park' in these preceding sentences, in order to interpret the second sentences, the hearer will have to resort to something more than just the interpretation of the first sentences. In other words, the hearer needs to extend the context. As I mentioned in section 2, what the hearer naturally does in bridging reference is to make a bridging assumption, introducing the referent. Bridging assumptions for the examples above might be:

- (3') The restaurant the speaker went to had a wine list.
- (4') The place where John went walking was a park.

Now let's consider how these assumptions might be made. This will answer our second question about contexts: how are they accessed? What is necessary in accessing these bridging assumptions seems to be encyclopedic knowledge about restaurants and wine lists for (3'), and walking and parks for (4'). Thus, we may call this type of context a 'context extended by encyclopedic knowledge'.

Encyclopedic knowledge is generally supposed to be stored in long-term rather than short-term memory. Then there must be a route by which a particular part of long-term memory is accessed. In Relevance theory, it is assumed that assumptions are composed of smaller constituents, namely 'concepts': so the interpretation of the sentences 'I went to the restaurant' and 'John went walking at noon', which are supposed to be represented in the hearer's short-term memory, can be seen as sets of assumptions composed of concepts such as 'go', 'restaurant', 'John', 'walk' and 'noon'. Each concept is conceived of as having three entries in long-term memory: logical, encyclopedic, and lexical. Since what matters here is the encyclopedic entry, I will talk only about this. The encyclopedic entry is supposed to contain information about the extension and/or denotation of the concept: the objects, events, and/or properties which instantiate it. So for example, the encyclopedic entry for the concept 'restaurant' would contain a set of assumptions about restaurants, such as 'a restaurant is a place to eat', 'there are menus and wine lists in a restaurant', perhaps 'Poons is a good Chinese restaurant' etc.. Thus, the bridging implicatures (3') and (4') might be accessed in the following way: for (3'), through the encyclopedic entries of 'restaurant' and 'wine list', the general assumption 'a restaurant may have a wine list' is retrieved, which enables the hearer to make the specific hypothesis that the restaurant that the speaker went to had a wine list; similarly, for (4'), through the encyclopedic entries of 'walk' and 'park', the general assumption 'people may go walking

in a park' is retrieved, which enables the hearer to make the specific hypothesis that John went walking in a park. These bridging assumptions in turn enable correct reference assignment to be made.

Now I would like to consider the last question: how can the hearer select the right context, i.e. the one containing the right referent? In the discussion above, I said that in interpreting (3) and (4), the hearer naturally makes the bridging assumptions (3') and (4'). These form part of the context in which the intended referents of the NPs, 'the wine list' and 'the park' are found. However, it would in principle be possible for the hearer to retrieve many other contexts from his encyclopedic knowledge. For example, hearing 'the wine list', he might retrieve his some other encyclopedic information about wine lists, such as 'The wine list at the Ponte Vecchio includes Gavi de Gavi which is my favourite'. So the question is why doesn't he seem to do this?

The answer follows from the principle of relevance and the definition of optimal relevance. Retrieval of contexts is effort-consuming. Hence the hearer, expecting the utterance to be optimally relevant is justified in choosing what is manifestly the most economical way of obtaining adequate contextual effects. Here, since the speaker is referring to a specific wine list, the hearer must assume that it belonged to a specific restaurant--and the obvious assumption is that it belonged to the restaurant the speaker has just mentioned. Thus, the correct assignment is linked to the hearer's search for an interpretation consistent with the principle of optimal relevance: the bridging assumption (3') is the one which manifestly yields adequate effects, and puts the hearer to no unjustifiable effort in achieving those effects.

6 A relevance-theoretic solution to Sidner's problem

In Relevance theory, reference assignment is considered as part of an overall process of utterance interpretation whose goal is to recognise what propositions and propositional attitudes the speaker intended to convey. The criterion for recognising the intended interpretation is one of consistency with the principle of relevance. Hence, if there is more than one candidate antecedent for bridging reference assignment, the hearer has to choose the one which leads to an overall interpretation which is consistent with the principle of relevance.

According to Sperber & Wilson, the most accessible candidate will be tested first. If there are several equally accessible candidates, it is quite compatible with Sperber & Wilson's framework to assume that these can be

tested in parallel, with the one which gives quickest access to a context in which the utterance as a whole yields an acceptable overall interpretation being selected. Thus, there is no need to compute one local topic/focus, which will determine a unique order in which candidates will be tested.

Within this framework, we can quite legitimately assume that 'John Major' and 'Margaret Thatcher' in (22) and (23) are equally accessible candidate antecedents, and that both of the resulting interpretations of the second sentences are tested in parallel. The hearer's goal in testing these is to find an interpretation which is consistent with the principle of relevance. A central claim of relevance theory is that the first such interpretation is the only such interpretation, and is the one the hearer should choose.

Often, as with example (21) above, there are two possible ways in which the second of two sentences might be intended to achieve relevance in a context created by the first: (a) as an explanation for why some action was performed; (b) as a description of the results of such action. With (20) above, as Wilson (1989) has shown for similar examples, if the intended antecedent is 'Ealing', the utterance will achieve relevance in both these ways, whereas if the intended antecedent is 'Earl's Court', it will achieve relevance in neither of these ways, and it is hard to see how it could have been intended to be relevant at all. Thus the 'Ealing' interpretation is the only one consistent with the principle of relevance.

With (21) above, the situation is rather different. If the intended antecedent is 'Earl's Court', the utterance, on this interpretation, will explain why the speaker made the move; if the intended antecedent is 'Ealing', the utterance, on this interpretation, will not explain the move, but might, with some thought, be seen as describing what the speaker found after making the move. The fact that this last interpretation requires more thought should rule it out as inconsistent with the principle of relevance, although a rephrasing along the lines of 'The rent was still too expensive' would favour it. In the absence of such rephrasing, the 'Earl's Court' interpretation should be preferred.

In the case of (22) and (23) above, an interpretation along the lines of (a) is ruled out. There is no way in which either interpretation could yield an explanation of why John Major succeeded Margaret Thatcher. Hence, the only way for these utterances to achieve relevance is along the lines of (b)--i.e. as a description of the results of the change of government. And in that case, the interpretation must be constructed around the NP 'John Major'. Hence, this is the only interpretation that will be consistent with the principle of relevance.

In the light of this discussion, let us return to our original examples (2) and (8):

- (2) We stopped for drinks at the New York Hilton before going to the Thai restaurant. The waitress was from Bangkok.
- (8) We stopped for drinks at the Hilton before going to the zoo. The baby orangutan was really cute.

These examples create two problems: first, why are they stylistically infelicitous for some people and not for others; and second, why are apparently similar looking examples, which on Sidner's account also involve rejection of a default focus, not infelicitous at all?

Relevance theory suggests the following answer. An interpretation is stylistically infelicitous when it puts the hearer to unjustifiable processing effort. Where two candidates are equally accessible, and can be tested in parallel, neither will put the hearer to unjustifiable processing effort, and either can yield an optimally relevant interpretation. However, where one candidate is highly accessible, and the intended referent is another, much less accessible, candidate, the result will be some wasted effort and a perception of stylistic infelicity. Hence, those who find (2) and (8) felicitous are testing both candidates in parallel, whereas those who find them infelicitous are testing the wrong candidate first.

This of course raises a further question: what determines the differences in accessibility of antecedents for different hearers? Here it is clear that existing accounts of topic/focus assignment give inadequate answers, and that fully adequate answers would need to appeal to all the factors, such as stress, intonation, syntactic parallelism, etc., which are ignored by existing accounts.

7 Final remark

At the beginning of this paper, I cited Erku & Gundel's comment on the interaction between topic and relevance in bridging reference assignment. Their question was: how do the two concepts 'topic' and 'relevance' interact in the interpretation of anaphoric reference? They saw their notion of topic as a crucial factor in deciding whether a speaker was being relevant, and hence in identifying the right referent. My answer to their question, at this stage, is that neither their notion of topic, nor Sidner's notions of focus, is precisely enough defined to persuade us that it plays a vital role in reference assignment. Rather, I would like to suggest that we should pursue our investigation of the mechanisms involved in reference assignment by taking, as our starting point, Sperber & Wilson's definition of optimal relevance, so that different kinds of accessibility ranking, including syntactic position,

thematic factors, recency of mention and frequency of mention, etc., can all be integrated as factors contributing to processing effort and hence to overall relevance. And this is the line I will continue to pursue.

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