# *Assessing a scenario-based account of bridging reference assignment**

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## 1 Introduction

Clark (1977) claims that a hearer has to make an inferential bridge in order to assign a referent to referring expressions in (1) and (2):

(1) I went to a French restaurant. **The waiter** was very sexy.
(2) Harry fell several times. He didn't like skiing at all. **The snow** was cold and wet.

For (1), the bridging assumption would be 'There was a waiter in the French restaurant to which the speaker went' and for (2), 'There was snow when Harry was skiing.' This type of reference is called 'bridging reference', and it has been suggested that the process of bridging inference making is time-consuming (see for example, Haviland & Clark, 1974; Clark & Haviland,1977).

Sanford & Garrod (1981) suggest a rather different view, based on the assumption that the hearer constructs a mental model of what the speaker is saying as soon as it is possible for him to do so. I will discuss the details of their account later, but its outline is roughly as follows: (a) our long-term memory is organised in a situation-based way and in chunks each of which can be retrieved as a unit; (b) hence, if an appropriate chunk, which they call a 'scenario', has been successfully retrieved from a hearer's long term memory to form part of his mental model of a discourse at some stage before he encounters a bridging reference, a slot for the referent is most likely to be in the mental model; (c) therefore, reference resolution will be rapid and automatic because the hearer does not make any inferential bridge involving a search for the reference in the whole general knowledge base, which is supposed to be much more time-comsuming. They call successful reference assignment achieved through use of a selected scenario 'primary processing' and distinguish it from what they call 'secondary processing'. Secondary processing, which is more time-consuming, takes place when primary

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processing fails for some reason, such as that there is no current scenario available or that the current scenario is inappropriate for interpreting the new input.

Let me explain their idea of primary processing using examples (1) and (2). According to Sanford & Garrod, on hearing the first sentence (the first two sentence for (2)), the hearer retrieves a scenario: for example, a 'going to a restaurant' scenario for (1) and a 'learning to ski' scenario for (2), with slots for WAITER and SNOW, respectively. As a result, the hearer need not make an inferential bridge or search for a referent from the whole knowledge-base on encountering the bridging reference 'the waiter' or 'the snow', because there is an appropriate antecedent already waiting in his mental model of the discourse.

In this paper, I will examine the plausibility of Sanford & Garrod's scenario-based account, point out two crucial theoretical limitations: (a) a problem of computation (selection) of the scenario and (b) a problem of representation (content) of the scenario. I will try to show that, although it seems plausible to assume that our knowledge is stored and retrieved in a situation-based way, and each such chunk certainly plays an important role in facilitation of language processing, such a role is merely a part of the whole mechanism of language comprehension, which Sanford & Garrod's scenario-based account does not satisfactorily explain. I will then propose an alternative explanation of the phenomenon of bridging, using Sperber & Wilson's relevance theory. I will demonstrate that a relevance-theoretic approach can offer a better account of the role of context selection in the overall utterance interpretation process of which reference assignment is a part. On this account, examples which cannot be handled in a scenario-based account can be explained. To conclude, I will propose that relevance theory can shed some light on how situationally organised chunks of knowledge are effectively used.

## 2 The scenario-based account

### 2.1 Sanford & Garrod's basic assumptions

Sanford & Garrod assume that language understanding is a process in which linguistic input and a knowledge-base (or memory) interact. Their main interest is in describing how this interaction takes place. A crucial feature of their account is a view of how conceptual information must be stored in the mind, in order to be able to be utilised in the process of language understanding.

The idea that language understanding involves not only decoding linguistic information, but also contextual factors linked to stored conceptual information, is not a novel one. In fact, Sanford & Garrod owe much of their basic framework to

the works of Minsky (1975), Norman et al. (1975) and especially Schank (e.g. Schank & Abelson 1977). I do not want to discuss those accounts here, but they share the basic assumption that conceptual information is stored in the mind in situation-based way, in modular or quasi-modular chunks. Minsky calls the chunk a 'frame', Norman et al. call it a 'schema' and Schank a 'script'. Thus, according to their account, the knowledge-base consists of a large number of frames/schemata/scripts.

Sharing this basic assumption, Sanford & Garrod propose their own account, in which each chunk of the knowledge-base is called a 'scenario', to which I now turn.

## 2.2 Scenario and the domain of reference

Among different aspects of language understanding, Sanford & Garrod are mainly interested in reference resolution, and the notion of a scenario is discussed largely in relation to this. Their main proposal is that the reader uses the text to identify an appropriate domain of reference, loosely corresponding to what the text is about, and that he then uses the identified domain to interpret the subsequent text as far as this is possible. The domain of reference is called a 'scenario', which is conceived of as one particular part of the knowledge-base.

Sanford & Garrod argue that this view is more plausible than that of Kintsch (1974) and Clark (1975), who assume that the mental representation of a text consists of a concatenation of propositions derived directly from its constituent sentences. In this type of account, Sanford & Garrod point out, the major problem for the reader is seen as one of linking together text-based propositions, and the predominant mechanism as one of using propositional argument repetition as a means of cohesion, so that it is only when argument repetition fails that background knowledge is invoked. Clark's account of 'bridging' is one example of this view, and I would like to look at it briefly now.

According to Clark (ibid. and Clark & Haviland 1977), a speaker and a listener have an implicit communication contract which depends on the given-new structure of the language: the speaker must agree to try to construct his utterances so that the given information contains things that he believes the listener already knows and so that the new information is in fact new to the listener; the listener for his part tacitly agrees to interpret the sentences as if the speaker were trying to do this. Thus, when the listener hears, for example, a definite NP anaphor, he takes it as given information and starts searching for a matching antecedent in his memory. When there is no exactly matching antecedent, what he is most likely to

do is to make a bridging inference or implicature. The following example is a case in point:

(3) We checked the picnic supplies. The beer was warm.
(from Haviland & Clark 1974)

On encountering the second sentence, the listener takes 'the beer' as given information and so sets out to find some matching antecedent. However, there is no mention of beer in the preceding sentence. So he has to make a bridging inference that the beer was part of the picnic supplies. According to an experiment Clark reports (Haviland & Clark 1974), when subjects had to make a bridging inference, comprehension time was reliably increased by about 200 msec.

Sanford & Garrod argue that Clark's Given-New model can not in itself account for how and when the reader builds inferential bridges between items mentioned at different points in the text; the details of this I will not discuss here. However, let me mention one crucial difference between the two approaches: while Clark suggests that bridging inference is always necessary when a referring expression does not have a direct antecedent in the previous text, Sanford & Garrod claim that any item mentioned in a lexical decomposition, or part of a scenario already used in the interpretation of the text, will be able to act as antecedent without any additional bridging inference being made. The following shows how Sanford & Garrod see the difference between their own approach and Clark's:

> The essential difference between an account such as Clark's and the one which is being entertained here may be expressed in terms of a contrast between data-driven and concept-driven processes. With an interpreter working in the data-driven mode, any decisions about how events mentioned in the current sentence can be related to previous material only arise as a result of the local analysis of the sentence in question. When interpretation is concept-driven, however, decisions, and sometimes potential inferences which could relate to the event, may be made even before the critical sentence is encountered (Sanford & Garrod 1981: 101).

Sanford & Garrod assume that the reference domain consists of those individuals explicitly mentioned in the text, plus those retrieved from long-term memory as part of the setting for the text, although the latter are only implicit. And on the basis of this assumption, their scenario-based account has been developed.

### 2.3 The content of the scenario

Sanford & Garrod predict that if an appropriate scenario is constructed in the reader's mind, there will be no measurable increase in reading time when an entity implied by the scenario is introduced; if, on the other hand, an inappropriate scenario is evoked, there is an increase in reading time for the same sentence due to the extra bridging process (ibid. 112). This is confirmed by an experiment based on the following materials:

(4) Appropriate scenario
Title: In court
Fred was being questioned (by a lawyer).
He had been accused of murder.
Target: **The lawyer** was trying to prove his innocence.

(5) Inappropriate scenario
Title: Telling a lie
Fred was being questioned (by a lawyer).
He couldn't tell the truth.
Target: **The lawyer** was trying to prove his innocence.

In the experiment, the time taken to interprete the target sentence either in an appropriate or an inappropriate context is measured. For the appropriate scenario condition, it is expected that as part of the structure of the 'court' scenario evoked by the title, a slot for 'lawyer' is required. The mention of 'lawyers' in the first and target sentences would be predictable. This would not be the case in the inappropriate scenario condition. In order to test this, for both conditions there is an option in the first sentence whererby the phrase 'by a lawyer' can either be present or absent. It is predicted that under the appropriate scenario conditions no differential reading-time effects would emerge for the final sentence .

The result of the experiment was as predicted. The explanation goes as follows: the title 'In court' evoked a 'court' scenario, which has a slot for 'lawyer' as part of its structure; as a result, the reference of 'lawyer' in the first and target sentence would be predictable, even if there is no mention of 'lawyer' in the first sentence; however, because there is no slot for 'lawyer' in the inappropriate scenario 'Telling a lie', the target sentence is read much more slowly when that title is given.

Sanford & Garrod propose that a scenario not only contains a representation of entities relevant to the situation being modelled, but also includes such very basic relationships as 'Lawyers probe witnesses and defendants for evidence' and

'The jury evaluates the evidence and gives a verdict', etc.. In other words, scenarios might be representations not only of entities, but also of the roles those entities play in the situation which the scenario represents. Therefore, if an entity in a scenario does not play an appropriate role, it will cause comprehension difficulties.

### 2.4 Selecting an appropriate scenario

This experiment raises an immediate issue: in order for a scenario to work properly, it must be the most appropriate one for the given discourse. In the experiment cited above, titles such as 'In court' and 'Telling a lie' are used to evoke the matching scenarios in the subjects' minds. But the question is: in a real situation, how can the most appropriate scenario be selected?

Sanford & Garrod's answer is as follows: 'the success of scenario-based comprehension depends upon the writer employing suitable descriptions to elicit appropriate scenarios at the right time.' (ibid.127). In order to elicit a scenario, it is crucial for a piece of text to constitute a specific 'partial description' of an element of the scenario itself. Here is their example of an appropriate partial description for the 'restaurant' scenario:

(6) The waiter brought the soup.

Sanford & Garrod say that 'such a statement portrays an action which is central to the scenario, and the action involves someone (waiter) who fills a definite role slot in it'; they add that 'the crucial thing appears to be that the scenario is singled out by the intersection of these two pieces of evidence: neither piece of evidence is quite sufficient by itself'(ibid.p128).[1]

Sanford & Garrod then summarise their answer as follows: 'there are thus two complementary aspects to scenario selection: the specificity of description of roles and actions, and the interests of the reader, which would be reflected in the availability of various scenarios' (ibid.129).

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[1]Sanford and Garrod notice that there are cases where the description is so general as to be applicable to a wide range of situations, and is thus unlikely to be sufficiently selective to call up a particular scenario representing that situation, such as 'John opened the door' (ibid. 129). But they do not give a full explanation for how scenarios can be retrieved in these cases.

## 2.5 The structure of the scenario-explicit and implicit focus

As I mentioned in the section 2.1, those who believe that conceptual information is stored in the mind in a situation-based way share the view that each chunk of such information is modular. Sanford & Garrod share this assumption. They also assume that during reading and conversation, not everything previously mentioned is equally accessible for reference, due to the nature of 'working memory' (Baddeley & Hitch 1974; Baddeley 1976), which is conceived of as a mental workspace of limited capacity. Since working memory is limited, only a relatively small subset of one's memory representation is easily accessible at any given time in language comprehension. This small subset is determined by 'topicalization' or 'foregrounding' (Chafe 1972) and 'recency'. In other words, the topic of the sentence, often the early part of the sentence, and recently mentioned items, take up a large proportion of the foregrounded working memory space.

Thus, an activated scenario is conceived of as the modular subset of memory representation which is foregrounded, and which is currently being used in processing. Sanford & Garrod call this 'focus', and if a scenario is currently active, they say it is 'in focus':

> By focus we mean that the scenario both as an interpretive structure and domain of reference is currently available to the processing system (ibid. 151).

Along the same lines as Grosz (1977), they divide focus into two kinds: explicit and implicit. In their framework, entities mentioned explicitly in the text are said to be in 'explicit focus' as long as they are represented in working memory, while entities implied by the text but not mentioned explicitly, and provided by the current scenario, are described as being in 'implicit focus'.

Sanford & Garrod go on to define certain partitions of memory as independently addressable and capable of being treated by a processor as distinct search domains. They suggest that a minimum of four such domains are necessary in order to describe memory access during comprehension. The first distinction is between search domains which are 'in current focus' and those not in current focus. Moreover, given that some information can be accessed rapidly and easily, while other information is more difficult to retrieve, Sanford & Garrod claim that the easily accessible information can be considered as being in dynamic partitions of memory, since the contents of the partitions change as the text unfolds. By contrast, both general knowledge and the long-term representation of the text are relatively stable, and they see them as being represented in static partitions of memory. The second distinction is the one between explicit and implicit focus.

## 2.6 The nature of focus

In this section, I will look more closely at explicit and implicit focus and at what happens to them during comprehension.

Sanford & Garrod claim that the two types of focus have only one feature in common: they serve to provide a retrieval domain which incorporates the information most pertinent to understanding the text at any given time. Besides this, explicit and implicit focus have very different properties. Explicit focus is conceived of as consisting of representations of items mentioned in the discourse, which they call 'tokens', and pointers to scenarios. Implicit focus is more complex structurally, since it consists of scenario representations, made up of slots and default specifications, bound together by relational programmatic information.

This difference in properties affects reference resolution. When this results from a search of explicit focus, the outcome of the search process is 'a note that the partial description matches a specified token'. When it results from a search of implicit focus, on the other hand, there will be no token corresponding to the partial description, but there may be a slot corresponding to it in the scenario. Thus, the outcome of a successful search will be a note that the partial description matches a slot in implicit focus.

When linguistically 'new' entity is incorporated into the memory representation, Sanford & Garrod propose that this is done by the following two types of CONSTRUCT operation:

(a) CONSTRUCT (in explicit focus, on basis of partial description, token)

(b) CONSTRUCT (in explicit focus, on basis of implicit focus slot, role description scenario)

Thus, whenever implicit focus is implicated in a search procedure, the consequent CONSTRUCT results in mapping between a token in explicit focus and the scenario itself. For example, when 'the waiter' is introduced as linguistically 'new' entity which is represented as a role slot in the current scenario, the resulting structure in explicit focus would be:


where scenario 1 is a token specifying the address of (say) a 'restaurant' scenario in long-term memory. Here, scenario 1 must have been currently singled out in implicit focus, in order for such a mapping to come about.

Sanford & Garrod also explain the difference between explicit and implicit focus in terms of the organisation of memory. They suggest that explicit focus is a short-term store of limited capacity, and therefore, as new tokens are added, old ones will be gradually diminished, until, eventually, they are no longer in focus at all. By contrast, there is no reason to suppose any capacity limitation for implicit focus, since this is thought of as a partition of long-term memory which is simply currently privileged in terms of ease of access. Accordingly, they also suggest that the search domain 'implicit focus' is really an address in a partition of long-term memory.

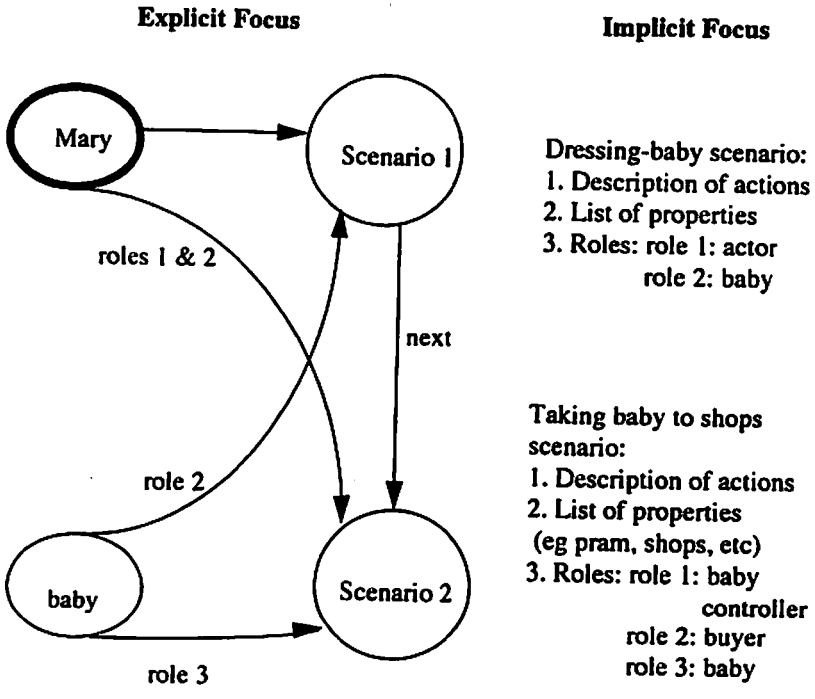
Now let's look at how reference resolution take place in each focus. Sanford & Garrod propose that the processor will execute a RETRIEVAL operation of the following sort:

RETRIEVE (a) domain: focus
(b) partial description: noun-phrase (or pronoun decomposition)
(c) return: token identity (if explicit focus), slot identity (if implicit focus)

When a RETRIEVE operation is successful, the return will be the identity of either a token (in explicit focus) or a role slot (in implicit focus). In order to integrate the new information associated with a description, a further CONSTRUCT operation must take place. If the entity being mentioned already has a token in explicit focus, then the new information is simply attached to this token. If the reference only retrieves a role slot, then a new token for the entity is set up in explicit focus, and an identity mapping is made into the appropriate role slot. The outcome of this process may be represented as a token for the entity connected to a token labelled with the scenario address. Sanford & Garrod show this connection as an arc labelled in terms of the role specification to be found in the scenario. In this way, all CONSTRUCT products are deposited in implicit focus. Figure 1 is the hypothetical state of explicit and implicit focus, suggested by Sanford & Garrod, after interpretation of the sentences: 'Mary was dressing the baby. When she had finished, they went to the shops'.

Figure 1. Hypothetical state of explicit and implicit focus after interpretation of the following sentences (Sanford & Garrod, 1981):

*Mary was dressing the baby. When she had finished, they went to the shops.*



## 2.7 Primary and secondary processing

As we saw in the previous section, Sanford & Garrod assume that reference resolution can succeed when there is either a token in explicit focus, or a suitable slot in implicit focus, or both. They call this direct interpretation process 'primary processing'. Primary processing is thought of as automatic and rapid. If no current scenario is available, however, or if the current one is inappropriate for the new input, primary processing will fail. In this case, Sanford & Garrod suggest that 'secondary processing' is called for. And secondary processing is thought to be time-consuming.

Secondary processing takes place in any situation where primary-level descriptions are inadequate to select a unique referent. One crucial case happens when some new event is described which cannot map into a current scenario. Another major function of secondary processing is the selection of scenarios for implicit focus, at the outset of discourse.

In terms of memory structure, primary and secondary processing are seen as follows. Primary processing is processing within the constraints of the local topic of the discourse itself, embodied in the focus partitions of memory. By contrast, the search domain for secondary-processing is large, comprising the entire memory space. In this way, secondary processing provides the means by which new topics can be introduced, or earlier topics reintroduced to current focus.

## 2.8 Pragmatic considerations

Before finishing the outline of Sanford & Garrod's account, let us look briefly at how they relate it to pragmatics. Their view of pragmatics seems to be broadly Gricean, and they suggest that their scenario-based account fits Grice's Cooperative Principle:

> Conversation can then be thought of as A trying to isolate a scenario in B's current focus,...To the extent that A's utterances successfully isolate an appropriate scenario for B, B is understanding A in the way A intends. (Sanford & Garrod 1981: p190)

> Grice's maxims can be related to the scenario-based theory of comprehension which we have developed in this book. For instance, the maxim of quantity relates directly to the question of specificity discussed in Chapter 6...Similarly, maxims (3) (relation) and (4) (manner) may both be construed as requiring the speaker to relate new utterances to any existing

> scenario-based model in an unambiguous way. (Sanford & Garrod ibid.:p189)

So it seems that Sanford & Garrod assume that there is an expectation on the part of the hearer that the speaker will not say things which are clearly unrelated to the scenario-based model in the hearer's mind, unless the topic of the discourse is being changed. In other words, they believe that the context for interpretation of incoming information is largely present in advance of the utterance. However, as I will argue in later sections, this is too strong an assumption; in actual verbal communication, a hearer cannot have access to all the contextual assumptions needed for interpretation before the utterance is processed. This assumption creates serious problem for their theory. My hope is that relevance theory, one of whose strong points is its ability to explain the nature of context selection/construction, can suggest one way of improving their insights.

## 3 Limitations

3.0 Now I would like to approach the limitations of Sanford & Garrod's account from two different points of view: one concerns the computation of the scenario, and the other the representation of the scenario.

### 3.1 Computation of the scenario

Sanford & Garrod suggest that what is needed for a hearer to select an appropriate scenario from long-term memory is a partial description which is specific enough to enable him to do so. For example, if a hearer comes across an utterance such as (7),

(7) James and Anita had a holiday in Cannes last month.

this should be enough to select, say, the 'having a holiday in Cannes' scenario. However, things do not seem to be so simple, because exactly the same utterance may lead a hearer to select different scenarios, depending on available contextual assmptions. Let us imagine two different situations as follows, in which (7) might be uttered:

(8) A. Available assumptions: 1. Anita is Peter's girlfriend.
2. James is Peter's best friend.
Utterance: James and Anita had a holiday in Cannes last month.
Scenario: 'stealing best friend's girlfriend' scenario

B. Available assmptions: 1. James is a rich young executive and he is Anita's new boyfriend.
2. Jane and Mary feel envious of her.
Utterance: James and Anita had a holiday in Cannes last month. (uttered by Jane, to Mary)
Scenario: 'having a rich young boyfriend' scenario

These examples show that a partial description which is specific enough to select one particular scenario does not always lead a listener to select that scenario. It might be wondered how exactly the above scenarios are different. This will be discussed in detail later, but meanwhile, a commonsensical explanation such as the following might do. These scenarios differ in implicit focus, i.e. in the slots or default specifications of implied entities. Thus, in the 'having a holiday in Cannes' scenario, there might be slots for various activities one can do in Cannes, places to visit, local food and drink, etc, whereas in the 'stealing best friend's girlfriend' scenario, there might be slots for people who are more or less involved with James, Peter and Anita, and slots for predictable consequences of what is going on, etc.. In the 'having a rich young boyfriend' scenario, on the other hand, there may be slot for a first class Air France ticket, a slot for the best hotel in Cannes, and a slot for a party with celebrities. Thus, the contents of implicit focus for these scenarios are quite different.

This raises the question of how the contents of implicit focus are decided. My assumption is that they are decided by the explicitly mentioned content of the utterance AND contextual assumptions available in the situation of utterance. I will discuss the issue further in a later section, but first, let us look at how Sanford & Garrod might answer this question. Their only comment on contextual factors is the following: 'which events and roles are central to a situation depends upon the interests of the individual reader' (Sanford & Garrod 1981: 129). This needs to be developed further in order to be integrated into their account.

Unfortunately, instead of considering the contextual aspect further, Sanford & Garrod take almost the opposite direction. In their paper, 'Topic Dependent Effects in Language Processing' (Garrod & Sanford 1983), they emphasise the 'global topic of discourse' as the most crucial factor affecting scenario selection. This seems to me to lead to an over-dependency on linguistic information. I will discuss problems generated by their claim in the next section, but meanwhile I

would like to emphasise that these problems stem from the very fact that they have given up searching for a way to accommodate contextual factors more appropriately.

Let me illustrate briefly what Garrod & Sanford mean by the 'global topic of discourse' using their own example:

(9) **Learning to ski**
Harry fell several times.
He didn't like skiing at all.
The snow was cold and wet.

According to Garrod & Sanford, the text as a whole is about learning to ski, and this could properly called the 'global topic' of the discourse. The function of the global topic is to enable the listener to set up an appropriate scenario, consisting of not only an explicit focus, but also an implicit focus. Thus, 'for a text with a well defined global topic such as 'Learning to ski', a mental model is evoked in the reader which consists in part of a representation of things, and perhaps events, which are a normal part of our knowledge of learning to ski'. (p276).

Now consider how Garrod & Sanford see the global topic of discourse as being identified. Within their framework, a listener can decide on the global topic of discourse ONLY by using the explicitly mentioned contents of the discourse as clues. In other words, contextual factors are completely ignored. As a result, Garrod & Sanford cannot explain the phenomena illustrated in (8). Within their account, the scenario for (7) will always be the 'having holiday in Cannes', regardless of what assumptions are available to the hearer.

It seems reasonable to conclude that Garrod & Sanford cannot give a satisfactory explanation of how a listener selects an appropriate topic. This neglect of contextual factors causes other serious problems, problems concerning the contents of implicit focus, to which I now turn.

### 3.2 Representation of the scenario

Let me repeat my main questions concerning representation of the scenario: a. is it possible to decide exactly what slots there are in a particular scenario at a given time?; b. what are the factors which affect the contents of implicit focus? Let us start with the first question. In fact, this is raised by Garrod & Sanford themselves, and they do not give any clear answer. Referring to the example used in their experiment, which is quoted in (9) above, they wonder:

> In the example described above, the claim was made that some representation of snow' was part of the scenario for 'learning to ski'. One might also expect representations of other entities to be part of the scenario, such as 'skis', 'sloping ground', 'piste', 'instructor' etc. Clearly, there is a problem here - where does the scenario representation end? How is it possible to decide what is in a scenario (p280)?

This is a crucial question for Garrod & Sanford, because of their distinction between primary and secondary processing, which rests solely on whether the referent is currently in the hearer's mental model of the discourse, i.e. focus/scenario, or not. Let me outline part of their experiment, to show how important it is to specify the content of a scenario in their framework, in order to account for different degrees of processing difficulty.

The following is a pair of texts drawn from twenty sets used in their reading-time experiment, whose results were presented as evidence for the importance of discourse topic. In each case a pair of titles were used to indicate an appropriate or an inappropriate topic with respect to the target sentence. There was also an option in the initial context sentence, which could either mention the critical referent or not. Thus each passage could be presented in either the appropriate or inappropriate topic condition and either with or without the stated antecedent.

(10) APPROPRIATE TOPIC PASSAGE

| | |
|---|---|
| Title: | Learning to ski |
| Context sentence: | Harry fell several times (in the snow). |
| Filler sentence: | He didn't like skiing at all. |
| Target sentence: | The snow was wet and cold. |

(11) INAPPROPRIATE TOPIC PASSAGE

| | |
|---|---|
| Title: | Cross-country running |
| Context sentence: | Harry fell several times (in the snow). |
| Filler sentence: | He hated running in winter. |
| Target sentence: | The snow was wet and cold. |

They found that under the appropriate topic condition, there was only a small reading time difference of 21 msec in favour of the stated antecedent, whereas under the inappropriate topic condition the corresponding difference was 104 msec. Garrod & Sanford take the result as confirmation of their 'intuitions about the importance of discourse topic in the resolution of reference'. They comment that 'provided a representation of an entity is part of the mental model set up by the

discourse, [in the examples shown above, a slot for 'snow'], it is given, and a reference to the entity can be resolved equally easily whether it has been mentioned explicitly or whether it is represented as an implicit component of the global topic' (p279) (my addition in parenthesis).

Thus, it is clear that Garrod & Sanford distinguish primary and secondary processing by whether an entity referred to by a bridging reference has a matching slot in the hearer's scenario or not. If there is a matching slot under the appropriate topic, as in (10), this is a case of primary processing and if not, as in (11), it is a case of secondary processing.

It is important for Garrod & Sanford, then, that the contents of implicit focus should somehow be specified. But they do not offer a full explanation of how this can be done. It may be perhaps reasonable to take the following claim about secondary processing and change of topic as a partial answer:

> Under what circumstances therefore might such an apparently maladapted form of processing be of communicative value? Looked at in terms of the reader's assessment of discourse topic, secondary semantic analysis can be seen as a device for registering shifts in topic. For, whenever it is impossible to resolve a reference during primary processing, this must mean that the reference introduces in some way a new topic (p295).

On this view, the time difference between (10) and (11), for example, is explained as follows: when a hearer encounters the target sentence in (11), he has to construct a new slot for 'snow', and realises that the topic 'cross-country running' must be changed to accommodate the new slot. This implies that the hearer can roughly specify the contents of a scenario by looking at the topic; if he cannot find a matching slot, the topic itself has to be changed. Thus, their suggested answer to our first question seems to be that we cannot strictly specify the contents of implicit focus, but the topic of the discourse will give a rough idea about what slots there are in the scenario under the topic.

This might also be Garrod & Sanford's suggested answer to our second question: what are the factors which affect the contents of implicit focus? Their answer is, as I understand it, that the only relevant factor is the topic of discourse, which, we should recall, is somehow worked out using the explicit content of the discourse alone.

However, this causes a problem. What follows is that a hearer may need to change his scenario every so often, and in ways that seem to me absurd. To illustrate the problem, let us return to example (7). If, as Garrod & Sanford imply, a hearer decides what the text about using the explicitly mentioned content of the utterance alone, most probably the global topic of (7) will be 'having a holiday in

Cannes' and a matching scenario will be selected. Then, if, in situation A, the speaker goes on to tell the hearer, 'Peter doesn't know about it, but his sister seems to suspect it. Which is Peter going to choose: the friendship, the love or neither of them?', the hearer will have to change the topic from 'having a holiday in Cannes' to something else, in order to find slots for those referring expressions. Similarly, if, in situation B, the speaker goes on to say, 'The luxurious suite facing the sea must cost a fortune. I heard George Michael was around there at the same time; maybe he was at the party with them,' again the hearer will have to change the topic to something else.

The issue is this. In situation A, knowing the relationships between James, Peter and Anita, would the hearer not activate the 'stealing best friend's girlfriend' scenario immediately on hearing (7)? Surely this would be the way to grasp the intended relevance of (7)? Yet according to Sanford & Garrod as I understand it, this scenario would not be immediately activated because it has not been explicitly cued. Alternatively, if it has been explicitly cued, then so have an indefinite range of further scenarios having to do with James, Peter, Anita, Cannes, etc, and the question is how the hearer chooses an actual scenario from this indefinite range.

However odd this account seems, Garrod & Sanford cannot offer a better explanation, because they set up a framework in which the hearer has to rely too much on the explicitly mentioned content of the utterance. My own assumption is, as I mentioned earlier, that the contents of implicit focus are decided both by the explicit content of utterance and the contextual assumptions available in the situation of utterance. On this assumption, a hearer should not have to change his scenario unnecessarily often. Also it allows the speaker to assume that the hearer uses available contextual assumptions to set up necessary slots in his scenario. As for the question whether it is possible to decide exactly what slots there are in a particular scenario, I do not expect it to be possible. I believe that it will not be necessary to specify the exact contents of implicit focus, if one has a more plausible account of how slots and default specifications are actually set up in the mind. (I assume that the nature of implicit focus is best captured not by an on-or-off activation system, but a system with variable activation. This is confirmed by the results of experiments done by psychologists such as Sharkey & Mitchell, 1985; Walker & Yekovich, 1987).

### 3.3 Examples: Sanford & Garrod's problem

Here, I would like to give some examples of bridging reference which cannot be handled with a scenario-based account. First, recall Sanford & Garrod's examples of bridging reference assignment mentioned above:

(4) Fred was being questioned. He had been accused of murder. **The lawyer** was trying to prove his innocence. ('Court' scenario)

(9) Harry fell several times. He didn't like skiing at all. **The snow** was cold and wet. ('Learning to ski' scenario)

Recall that their account of these examples goes roughly like this: in (4), the 'court' scenario is activated before the hearer encounters the phrase 'the lawyer', and therefore assigning a referent to it requires no extra effort; similarly, in (9), the 'learning to ski' scenario has been activated before he encounters the phrase 'the snow', and reference assignment is equally effortless.

However, there are cases of bridging reference which cannot be explained as simply as this. I would like to discuss three kinds of such cases: (a) cases where there is more than one candidate referent in a given scenario; (b) cases where there is more than one scenarios involved in previous discourse, each involving a potential referent; (c) cases where bridging reference is used to refer to something which may not be represented in the scenario being activated.

Let us start with type (a), where the hearer has to choose the right referent from several candidate referents. The following examples illustrate:

(12) A. How long have you and John been together?
B. Well, about two months. I used to see a Japanese guy, but I stopped seeing him and started going out with John after Easter. **The conversation** was less boring.

(13) A. How long have you and John been together?
B. Well, about two months. I used to see a Japanese guy, but I stopped seeing him and started going out with John after Easter. **The conversation** was too boring.

Both in (12) and (13), the bridging reference is 'the conversation'. Notice that there are two possible candidate referents in the previous part of utterance, namely 'a Japanese guy' and 'John'. Intuitively, the preferred interpretation for (12) is that the conversation with John was less boring than that with the Japanese guy; and the preferred interpretation for (13) is that the conversation with the Japanese guy was too boring. The question is: does Sanford & Garrod's scenario-based account offer a proper explanation for these interpretations? Suppose that in A's mind there is, say a 'being together (with John)' scenario, and in which there may be a slot for 'conversation'. A may have this scenario in mind when asking the question, and keep it in mind when processing the answer. Then probably 'the conversation'

should be interpreted as being with John. This explanation works for (12), but how about (13), where the preferred interpretation is that the conversation is with the Japanese guy? Then the previous account makes the wrong prediction. However, there is another possible way to explain (13): hearing 'I used to see a Japanese guy', A changes the scenario to, say 'being together (with a Japanese guy)', and in that scenario, there is a slot for 'conversation' which should be interpreted as the conversation with the Japanese guy. But then notice that this account will make the wrong prediction for (12). A third explanation must be that in the 'being together (with John)' scenario there are two slots for 'the conversation', one with John and one with the Japanese guy. Here the problem is that there is no criterion for choosing between the two.

Now let us look at an example of type (b), where there is more than one current scenario and the hearer must choose both the right scenario and the right referent. In this example, there are three possible ways of finishing B's utterance, indicated by *.

(14) A. Do you do any sports regularly?
B. Yes. In that sense, I am quite health-conscious. In summer, I play tennis a lot. I am a member of a local tennis club. In winter, I go skiing twice or three times, mainly to French Alps, but sometimes I go to some pretty Tirolian village for a change. In addition, I used to do aerobics classes a lot. Now I am getting more keen on Yoga classes.*

(i) * One of **the good effects** is that you can relax more easily.
(ii) One of **the good effects** is that you can spend more time outdoors.
(iii) **The fee** for one lesson was too expensive.

The preferred interpretation for (i) might be that one of the good effects of Yoga classes is that you can relax more easily; the preferred interpretation for (ii) might be that one of the good effects of doing sports is that you can more time outdoors; that for (iii) is that the fee for one aerobics class was too expensive. What can Sanford & Garrod say about these examples? This time, let us suppose that A changes scenarios each time she hears a different sport: the first scenario may be a 'playing tennis' scenario, followed by a 'skiing' scenario, a 'having aerobics classes' scenario and finally by a 'having Yoga classes' scenario. When A reaches the end of the penultimate sentence marked by * , she should then have the 'Yoga classes' scenario currently activated. When the bridging reference 'the good effects' comes, there may be a slot for 'the effects' in the scenario. If so, the reference will

be understood along these lines, as a case of primary processing. However, the same account fails to explain (ii) and (iii). The preferred interpretation of (ii) requires either that all the scenarios used during B's utterance should be retrieved at once or that those scenarios should be kept activated while the 'Yoga classes' scenario is currently activated. Neither of these explanations is considered in Sanford & Garrod's account. As for (iii), similar problems to those in example (13) seem to arise.

Finally, I would like to consider examples of type (c), where bridging reference is used to refer to something which may not be represented in the current scenario:

(15) Sorry, I couldn't get here on time. **The traffic** was awful and it was nearly impossible to get into **the car park.**

(16) I assume Japanese society is very stable. **The divorce rate** is very low.

(17) A: Shall we go?
B: **The windows** are still open.

(18) A: What time is it?
B: **The milkman** has just come.

(19) A: Did your ski trip go well?
B: **The camera** didn't work properly.

(20) A: Can you give me a lift?
B: **The Japanese rice wine** made me quite drunk, I am sorry.

(21) A: I finished all my homework. Can I play my new computer game now, mummy?
B: I see your textbooks are still in the bag and **the telly** has been on quite a while. So, I don't believe you. Finish your homework first.

The first two examples are uttered by one person and the rest involve conversation between two people. Let me start with the first two. Example (15) amd (16) seem to me perfectly natural, and it is unlikely that the hearer will have difficulty in assigning a referent to bridging references such as 'the traffic', 'the car park' and 'the divorce rate'. However, it is impossible to tell whether a slot for 'traffic', 'car park' or 'divorce rate' was already in the hearer's implicit focus. According to Sanford & Garrod, unless the hearer is given an explicit linguistic clue, as in the

case of (4) and (9), he cannot select a specific enough scenario in advance, and therefore, it is more likely that for cases like (15) and (16), Sanford & Garrod would say that the hearer has to resort to secondary processing. This is far more effort-comsuming than primary processing, which is always preferred and is used to interpret the bridging reference in examples (4) and (9). But then, why do examples (15) and (16) seem so natural? Even if there was no slot for 'traffic', 'car park' and 'divorce rate' in the hearer's mind, still the utterances seem to cause him no difficulty in interpretation and assignment of reference. There must be some other method for assigning reference, one which is not affected by whether there is a pre-existing slot for the referent or not.

Examples (17) to (21) are all in 'question-answer' form. Let me repeat that Sanford & Garrod assume that their scenario-based account can explain reference assignment in spoken discourse or conversation (see Sanford & Garrod 1981:p212). However, it fails to deal with cases such as (17) to (21), where the referent may not be found in the currently activated scenario. In none of the above cases does B's answer to A's question seem to be direct. So perhaps, it takes more time for A to interpret B's answer than when the answer is more direct: e.g., for (17), (19), (20) and (21), either 'yes' or 'no', and for (18), say, 'a quarter past eleven'. The point I would like to make is that according to Sanford & Garrod, these cases should not involve primary processing, as the referent cannot be found in the currently activated scenario; therefore, the hearer has to resort to secondary processing; but the trouble is that the second sentence cannot be regarded as the beginning of a new topic either. Therefore, it seems that Sanford & Garrod cannot handle these cases.

I can think of some reasons why Sanford & Garrod cannot handle these cases. One is that they treat primary processing as the norm and secondary processing as a sort of deviation from it. (Recall their pragmatic assumption that contexts should be given in advance). Because secondary processing is not essential to their account, they do not offer a full explanation of how it goes: in other words, they do not explain how an appropriate referent can be selected when the search domain is the whole knowledge-base. Here is what they say about secondary processing:

> ..... secondary analysis must be seen as more complex and hence likely to impose a greater load on the processing system, with subsequent effects on overall comprehension time. As soon as the size of the unit of analysis goes up or the domain of memory search is de-restricted, some executive processing control must be necessary and it is no longer possible to carry out the sort of simple automatic search associated with what we have described as primary analysis (Garrod & Sanford 1983:p294).

This quotation suggests that Sanford & Garrod are not too sure what the appropriate 'executive processing control' might be. Because of this, their scenario-based account does not offer a pragmatic criterion for reference assignment.

Sperber & Wilson, on the other hand, propose that the hearer's expectation of optimal relevance is a crucial pragmatic factor: it enables him to select appropriate contexts from his knowledge base and from observation of the physical environment, or to form new assumptions if necessary, which eventually leads him to an interpretation consistent with the principle of relevance. In their framework, reference assignment is one of the sub-processes needed to achieve such an interpretation, and there is no need to set up any other criterion particularly for it. In fact, in this framework, it is possible to treat secondary processing as the norm, with the primary processing being a mere special case of it.

Let me explain. As examples (15)-(21) show, in conversation, where the contexts used for interpretation are restricted to those which are easily accessible to participants, referring to something not explicitly mentioned in previous discourse is a common practice. The fact that we are capable of identifying the referents of the bridging references shown in these examples suggests that we are far better at selecting appropriate contexts from the whole knowledge base than Sanford & Garrod assume (c.f. Singer, 1979). I do agree that much conceptual information is stored in a situation-based way, which makes utterance interpretation easier when one particular chunk of stored information is the only context needed. This does not mean, however, that what is called a 'scenario', 'script' or 'frame' always yields an adequate context for reaching the intended interpretation. Often, it is necessary for a hearer to extend or revise his original scenario, or to combine several different scenarios, even if that particular extension, revision, or combination is totally new to him and may not happen again. Hence, I conclude that primary processing, the type of processing in which one currently activated scenario is the only necessary context, as in examples (4) and (9) above, is a special case. It is one of the cases where the referent is most easily accessible. Secondary processing, on the other hand, may require more complex procedures, in which one currently activated scenario is merely a part of the necessary context. What is crucial is that in both cases, the basic machanism of reference assignment is the same: reference is assigned in such a way as to obtain an interpretation consistent with the principle of relevance. In the next section, I will discuss the details of this claim.

## 4 A relevance-theoretic account of bridging reference

### 4.1 The principle of relevance

The fundamental assumption in Sperber & Wilson's relevance theory is 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. This idea is formulated as the 'principle of relevance'

> PRINCIPLE OF RELEVANCE
> Every act of inferential communication communicates the presumption of its own optimal relevance.

Relevance is defined in terms of contextual effects and processing effort. According to Sperber & Wilson, newly processed information is relevant to the hearer if it interacts in a certain way with his existing assumptions about the world. The results of the interaction are called 'contextual effects'. Contextual effects are of three types: 1. the new information may combine with existing assumptions to yield contextual implications: 2. the new information may strengthen existing assumptions; 3. the new information may contradict and eliminate existing assumptions. The greater the contextual effects, and the smaller the processing effort needed to derive them, the greater the relevance will be.

Utterances create expectation of relevance, but 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 achieves 'optimal relevance' which 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 no unjustifiable effort in obtaining those effects.

Sperber & Wilson note 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 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.

### 4.2 Context and search for relevance

As I mentioned in the last section, Sperber & Wilson's basic assumption is that in interpreting an utterance, the individual automatically aims at optimal relevance. In order to achieve optimal relevance, he will try to pick out, from whatever sources, contexts in which to process the utterance so that it gives adequate contextual effects for no unjustifiable processing effort in a way the speaker might manifestly have foreseen.

This idea is different from the more widely accepted view that the context is fixed before the interpretation process starts. The simplest version of such a view is that the context for the comprehension of a given utterance is the set of assumptions explicitly expressed by preceding utterances in the same dialogue or discourse. However, this view is obviously too strong (see Sperber & Wilson 1986, pp132-137). Consider the following conversation:

(22) Peter: Jane didn't come to the seminar today.
John: Agassi was playing the match this afternoon.

The question here is how Peter is going to interpret John's utterance. Suppose both Peter and John know that Jane is a great fan of Andre Agassi and that she will never miss any match he plays. The most natural interpretation of John's utterance is as an explanation for Jane's absence from the seminar. Relevance theory can offer an account of how this is possible, and I will discuss that later in this section. On the view that the context is the set of assumptions explicitly expressed by preceding utterances, however, the proposition expressed by Peter's utterance should be the only context in which John's utterance is interpreted. Clearly, John's utterance will yield no contextual effects when the proposition it expresses is combined with the one expressed by Peter's utterance, unless the assumptions 'Jane is a great fan of Andre Agassi' and 'Jane will never miss any match Agassi plays'

are retrieved from Peter's encyclopaedic knowledge and used as additional information. Thus, the idea that the context for utterance interpreatation is simply the proposition expressed by the preceding utterance is too restrictive.

Another possible view is that the context for comprehension consists not only of the assumption explicitly expressed in the preceding utterance or discourse, but also of information associated with concepts connected to explicitly mentioned concepts by general knowledge. This is the view shared by, for example, Sanford & Garrod's 'scenario' account, Minsky's 'frame' account, and Schank's 'script' account. On this view, the context for the conversation in (22) may contain not only the explicitly expressed information, but also encyclopaedic knowledge about the seminar, and so on.

Suppose Sanford & Garrod are right, and Peter's utterance is associated in his mind with a 'skipping a seminar' scenario with Jane as a main actor. Then which concepts (slots) are most likely to be activated in his implicit focus immediately after his utterance? Probably, the main activity in a seminar, those who attended the seminar, and various activities one can do when one skips a seminar, etc.. But is there a slot for 'Agassi' in Peter's implicit focus at this point? It seems there is no definite answer to that. Recall that Garrod & Sanford do not offer any criteria for deciding which slots there are in a hearer's implicit focus. So Sanford & Garrod's solution to this dilemma is that if there IS a slot for 'Agassi' in Peter's 'skipping a seminar' scenario, John's utterance can be easily interpreted with little processing effort, WITHIN THE SAME SCENARIO; and if, alternatively, there IS NOT a slot for 'Agassi', Peter has to CHANGE his scenario to accommodate it.

Let us suppose that there is no slot for 'Agassi' in Peter's implicit focus in his 'skipping a seminar' scenario. Garrod & Sanford's account predicts that the 'skipping a seminar' scenario is changed to a 'playing a tennis match' scenario with Agassi as a main actor, in which slots for items such as 'tennis courts', 'opponent', 'umpire' 'ace', etc. may be typically included. The trouble with this prediction is that it should then be quite possible for Peter to interpret John's utterance as beginning a new subject of conversation, completely unrelated to Peter's own utterance. In other words, on this account, there are two totally unrelated scenarios in Peter's mind. If this picture is right, then there is no way for Peter to interpret John's utterance as an explanation for Jane's absence from the seminar, which I suppose is the most natural interpretation. Since Garrod & Sanford do not offer answers to such questions as: a) what happens to scenarios previously used after a new scenario is retrieved? and b) can several scenarios be somehow combined? the picture in which the two scenarios remain unrelated is as far as I can get.

Relevance theory offers a different solution. Within this framework, it is often necessary that the context should be EXTENDED in search for optimal relevance. Extending the context is different from changing a scenario into some other scenario, in the following ways: 1. the sources of assumptions are not restricted to explicitly expressed information; 2. the choice of appropriate assumptions is based on the criterion of consistency with the principle of relevance; 3. the full set of assumptions (context) required for comprehension can be extremely idiosyncratic, i.e. can be something which does not fit any existing 'scenario', but is drawn from several sources.

Thus, for the example (22), a relevance-theoretic account might go like this. On hearing John's utterance, Peter, in his search for optimal relevance, starts picking up necessary assumptions from whichever sources are most accessible, with the initial context being information associated with his own utterance, 'Jane didn't come to the seminar today'. John's utterance can achieve relevance either by (a) yielding contextual implications when combined with information derived from Peter's utterance, (b) strengthening existing assumptions, e.g. 'Jane didn't come to the seminar today', or (c) contradicting and eliminating existing assumptions. Intuitively, John's utterance should be interpreted as an explanation for Jane's absence: it therefore answers an implicit 'why' question ('why didn't Jane come to the seminar?'). This answer can be derived as a contextual implication of John's utterance in a context containing such assumptions as 'Jane is a great fan of Agassi', 'If there is a match in which Agassi plays, she will never miss it', 'In order to watch Agassi's match, she may skip a seminar' and so on.

Notice that these assumptions cannot be deduced from explicitly expressed information alone. Nor can they be retrieved purely from a pre-fixed 'skipping a seminar' scenario. Moreover, the criterion of consistency with the principle of relevance enables a listener to make new assumptions if necessary. Suppose Peter knew that Jane was a great fan of Agassi but didn't know that she is so mad about him that she is prepared to skip the seminar to see him. Still, a some such line of assumptions needs to be accessed in order to achieve an optimally relevant interpretation of John's utterance. If assumptions are retrieved only from a pre-fixed scenario, as Garrod & Sanford assume, in such a situation Peter will never be able to retrieve assumptions such as 'Jane will never miss a match of Agassi's match' and 'In order to watch a match of his, she is prepared to skip a seminar', even though these are new assumptions he is required to make to understand the utterance. By contrast, given the immediate context, 'Jane didn't come to the seminar today' and given the criterion of consistency with the principle of relevance, the assumption 'Jane is a great fan of Agassi' is enough for Peter to make further assumptions about HOW great a fan she must be.

Furthermore, within relevance theory, this crucial assumption 'Jane is a great fan of Agassi' may be instantly retrieved from Peter's long-term memory in the search for relevance. I will deal with the way in which various types of assumptions are accessed within the framework of Relevance theory in the next section. Meanwhile, let me point out that according to Garrod & Sanford's account, this process will be extremely effort-consuming, or even impossible, since within their framework, a scenario must be identified before a hearer starts processing incoming information, except in the case of topic change. In order to process John's utterance properly within Garrod & Sanford's framework, what Peter needs are not only the 'skipping a seminar' scenario and the 'playing a tennis match' scenario, but also a scenario which contains these two scenarios as subparts: say, for instance, a 'being a great fan of a tennis player' scenario. If this scenario is identified by Peter before John's utterance, Garrod & Sanford's explanation will do, since within this scenario, both Agassi's tennis match and Jane's skipping a seminar can have matching slots. Since Garrod & Sanford do not say anything about the possibility of retrieving a new scenario to integrate existing scenarios by using existing scenarios as prior contexts, which I suppose is a plausible hypothesis, I assume that within their framework, it is necessary for a scenario to be chosen prior to processing the incoming utterance as long as the global topic of discourse stays the same. However, their story is too simple, because contexts are not always fixed in advance, even when the global topic of conversation does not change. Example (22) is a case in point. Rather, as is often the case, in order to achieve adequate contextual effects for minimal processing effort, a speaker may omit information which the hearer can supply for himself. For example, knowing that Peter knows that Jane is a great fan of Agassi, John is unlikely to say, 'Jane is a great fan of Agassi and she won't miss any match of his. And he was playing this afternoon'. The reason is that to process this longer utterance needs more time and effort than would be required by the actual utterance in (22), which for that reason is the optimally relevant one.

Thus, what we need is an account of verbal communication which explains a) how previously unknown contextual assumptions are accessed, and b) by what criterion they are selected. In this section, I have discussed mainly b), in order to give a rough idea of how contexts can be accommodated in relevance theory. In the next section, I will illustrate how such assumptions are accessed, by using the examples of bridging reference given in section 3.3.

### 4.3 A relevance-theoretic solution to Sanford & Garrod's problem

**4.3.1 Basic assumptions.** Let me first explain that what assumptions can be made within relevance theory about units such as scenarios/scripts/frames, since differences in assumptions about the nature of scenarios/scripts/frames will inevitably affect our explanation of bridging reference.

The first assumption is about the way concepts are activated. Relevance theory assumes that each concept has three associated entries; logical, encyclopaedic and linguistic (see Sperber & Wilson 1986, pp85-93). The logical entry consists of a set of deductive rules which apply to assumptions containing that concept. The encyclopaedic entry contains information about the extension and/or denotation of the concept: the objects, events and/or properties which instantiate it. The lexical entry contains information about the natural-language lexical item used to express it. Since what matters here with regard to the scenario-based account is the encyclopaedic entry, I will talk exclusively about it. The encyclopaedic entry of a concept consists of an organised set of propositions, each containing further concepts. So for example, the encyclopaedic entry for concept 'DOG' may have propositions such as 'DOGS CHASE CATS', ' A PIT BULL IS A DANGEROUS DOG', 'CHOMSKY OWNS A DOG', etc. The crucial point here is that other concepts which appear in these propositions will be activated through activation of the propositions in which they appear. Thus, the concept 'CAT' will be activated through the proposition 'DOGS CHASE CATS'.

Notice that this is quite different from Sanford & Garrod's assumption about concept activation. To compare the two approaches, it will be convenient to interpret Sanford & Garrod's notion of implicit focus in terms of an activation account, following Sharkey & Mitchell (1985). On this approach, implicit focus can be seen as containing concepts which are connected to explicitly mentioned concepts, and are more weakly activated through the stronger activation of explicitly mentioned concepts. Along similar lines to Sharkey & Mitchell (ibid.) and Walker & Yekovich (1987)'s model, Sanford & Garrod seem to share the most popular view about concepts: concepts are connected to each other directly via a network, with no propositions necessary intervening in between. For example, the concept 'DOG' is connected with 'CAT' directly, regardless of whether the two are constituent of a proposition such as 'DOGS CHASE CATS'.

In the relevance theoretic framework, encyclopaedic knowledge may contain scenarios, but may also more idiosyncratic information. Moreover, it is accessible not only from situation-based addresses such as scenarios, but from the encyclopaedic entry of other types of concept, including proper names. Thus, for example in (7),

(7) James and Anita had a holiday in Cannes last month.

not only information stored under the heading of 'having a holiday in Cannes', but also concepts activated through the encyclopaedic entries of 'John' and 'Anita' are accessible. Apart from the difference in how one concept activates others, there is also a difference in the way concepts are activated. Relevance theory assumes that the activation of concepts is graded (c.f. Dosher & Corbett, 1982; Walker & Yekovich, 1987). Some concepts which are easily accessible for reasons such as frequency of use and recency of use can be seen as strongly activated. Sanford & Garrod, by contrast, seem to assume that the content of implicit focus is either activated to threshhold level or not at all activated, though they assume different degree of activation of concepts in explicit focus.

The second assumption made within relevance theory about scenarios/scripts/frames has to do with their retrieval. In relevance theory, it is assumed that more than one scenario can be activated simultaneously, and that the deactivation of scenarios is gradual (c.f. Bower, Black & Turner, 1979; Sharkey & Mitchell, 1985). Thus, for example, in the case of (22),

(22) Peter: Jane didn't come to the seminar today.
John: Agassi was playing the match this afternoon.

the 'skipping a seminar' scenario activated by Peter's utterance is still available for interpreting John's utterance, even though, according to Sanford & Garrod, John's utterance should apparently be regarded as a change of topic and hence requiring a change of scenario as well as deactivation of the previous scenario.

The third assumption is about when a bridging inference is made. It may be useful here to look at the general discussion concerning instrumental inferences offered by psychologists, since instrumental inferences are a major kind of bridging inferences. In general, as McKoon & Ratcliff (1981,p672) propose, there are two extreme opposing views on instrumental inferences: first, that instrumental inferences are rarely made because they are rarely needed to produce a connected text representation; second, that instrumental inferences are always made because the schemata used to interpret incoming text have slots for instruments and those slots are automatically filled, either by an instrument provided in the text or by default values. Needless to say, Sanford & Garrod assume the latter. According to the scenario-based account, bridging inference in the case of primary processing is made on-line and is thus not time consuming.

But this assumption causes a problem: as Singer (1980) noted: although inferences are often necessary for comprehension, the number of inferences that could be drawn for a particular sentence is potentially quite large, and this does not

seem psychologically plausible. Relevance theory tends to share this view, since making unnecessary inferences seems to be a waste of effort. Thus, I would like to claim that bridging inferences are made when necessary, after a hearer encounters a bridging reference. This claim is supported by several psychological experiments, including Corbet & Dosher (1978), whose comment is the following: 'subjects do not routinely draw highly likely inferences if those inferences are not needed for comprehension' (p489). Then the next question is, in what cases are bridging inferences needed? Concerning this point, Lucas, Tanenhaus & Carlson (1990, p617) suggest that 'presumably, limits on processing capacity will restrict the number of actual inferences to some small subset of those possible, and the inferences that would contribute to the coherence of the discourse would have priority'. I would like to modify Lucas et al.'s suggestion and to propose the following: the inferences that would contribute to the optimal relevance of the utterance would have priority. The related crucial question is: when does a hearer actually start making bridging inferences. Here, I assume that as soon as enough evidence to make an appropriate inference is given, the hearer starts doing so, but it is more likely at the end of an utterance.

**4.3.2 Explanation.** Here I would like to give a relevance-theoretic account of the examples shown in 3.3. on the basis of the assumptions mentioned above. Let me start with the examples (12) and (13), where the hearer has to choose the right referent among several candidate referents:

(12) A. How long have you and John been together?
B. Well, about two months. I used to see a Japanese guy, but I stopped seeing him and started going out with John after Easter. The **conversation** was less boring.

(13) A. How long have you and John been together?
B. Well, about two months. I used to see a Japanese guy, but I stopped seeing him and started going out with John after Easter. The **conversation** was too boring.

In relevance theory, reference assignment is construed as part of an overall process of utterance interpretation whose goal is to recognise what propositions and propositional attitudes the speaker intends 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. Notice here that in relevance theory, several candidates can be simultaneously tested in a hearer's mind, since there is no principled limit to the number of scenarios activated there.

As Wilson (1992) proposes, often, as with examples (12) and (13), 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. In the case of (12), A may interpret the last sentence of B's utterance as both a description of the result of her changing boyfriend, and an explanation for why she changed on condition that she understands 'the conversation' as conversation with John. As a result, 'the conversation' in the sentence should be interpreted as that with John. In (13), she can take B's remark as an explanation for why she stopped seeing a Japanese guy, on condition that she interprets 'the conversation' as conversation with the Japanese guy.

Notice that in order to get the overall interpretation of utterances, the hearer has to wait till the very end, with the phrases 'too boring' and 'less boring', even if concepts for both referents start getting activated after the hearer encounters the phrase 'the conversation'. According to Sanford & Garrod, this type of processing is secondary processing which is time-consuming because of the extra effort needed to make a choice outside the limit of one scenario. However, as I mentioned above, with the principle of relevance, it is possible to assume that we are far better at selecting appropriate contexts from the whole knowledge base than Sanford & Garrod believe. Hence, I expect little difference between the time needed to process (12) and (13), and that needed to process (23), where the hearer does not have to make a choice (i.e. a case of primary processing):

(23) I couldn't stand my ex-boyfriend. **The conversation** was too boring.

Let us return not to (14), where there is more than one current scenario and the hearer must choose the right scenario and the right referent:

(14) A. Do you do any sports regularly?
B. Yes. In that sense, I am quite health-conscious. In summer, I play tennis a lot. I am a member of a local tennis club. In winter, I go skiing twice or three times, mainly to the French Alps, but sometimes I go to some pretty Tirolian village for a change. In addition, I used

to do aerobics classes a lot. Now I am getting more keen on Yoga classes.*

(i) * One of **the good effects** is that you can relax more easeily.
(ii) One of **the good effects** is that you can spend more time outdoors.
(iii) **The fee** for one lesson was too expensive.

Let me repeat that the preferred interpretation for (i) may be that one of the good effects of Yoga classes is that you can relax more easily; that the preferred interpretation for (ii) may be that one of the good effects of doing sports is that you can spend more time outdoors; that the preferred interpretation for (iii) is that the fee for one aerobics lesson was too expensive.

In relevance theory, there is no problem in handling several scenarios simultaneously. Thus, there is no need to choose the right scenario before choosing the right reference: all the candidiate referents may be tested in parallel for their contribution to the overall interpretation of the utterance. Therefore, the problems which Sanford & Garrod have to face, shown in section 3.3., will not be problems for us.

The procedure needed to choose the right referent for these examples in relevance theory can be illustrated as follows. For (i), hearing the phrase 'the good effects', concepts such as 'SPORT' 'TENNIS', 'SKI', 'AEROBICS CLASSES' and 'YOGA CLASSES' may get weakly activated. And after hearing the whole sentence, the most plausible candidate (at least to me), 'YOGA LESSONS' is the most strongly activated, through activation of a proposition in its encyclopaedic entry, namely, 'A YOGA LESSON TEACHES ONE HOW TO RELAX'. Here, the concept 'RELAX' can be connected with the concept 'YOGA CLASSES'. For (ii), along similar lines, the concept 'SPORT' may be most strongly activated through activation of a proposition in its encylopaedic entry, namely, 'MANY SPORTS ARE PLAYED OUTDOORS'. For (iii), after hearing the phrase 'the fee', most probably the concepts of 'AEROBICS CLASSES' and 'YOGA CLASSES' get weakly activated, and the final choice is made along similar lines to example (13).

Finally, let's look at example (15)-(21), where bridging reference is used to refer to something which may not be represented in the current scenario:

(15) Sorry I couldn't get here on time. **The traffic** was awful and it was nearly impossible to get into **the car park.**

(16) I assume Japanese society is very stable. **The divorce rate** is very low.

(17) A: Shall we go?
B: **The windows** are still open.

(18) A: What time is it?
B: **The milkman** has just come.

(19) A: Did your ski trip go well?
B: **The camera** didn't work properly.

(20) A: Can you give me a lift?
B: **The Japanese rice wine** made me quite drunk, I am sorry.

(21) A: I finished all my homework. Can I play my new computer game now, mummy?
B: I see your textbooks are still in the bag and **the telly** has been on quite a while. So I don't believe you. Finish your homework first.

According to the scenario-based account, in order to assign reference in these examples, the hearer has to resort to secondary processing, since there is no slot for the bridging references in the current focus. Recall, however, that Sanford & Garrod cannot offer any method for assigning reference efficiently when one has to resort to secondary processing. Relevance theory offers such a method, based on its criterion of consistency with the principle of relevance. Let me show how utterances such as (15) and (16) can be explained in this framework. In the case of (15) and (16), for the second part of the utterance to be optimally relevant, it must in normal circumstances be seen as giving some explanation for the event discussed in the first part. From this perspective, it is not difficult to activate an appropriate context, and to use this to assign a referent to each bridging reference. Notice, here, that whether the concepts 'TRAFFIC', 'CAR PARK' and 'DIVORCE RATE' were activated in some way before the second part of utterance is not the final criterion for success in reference assignment. As long as the overall interpretation is consistent with the principle of relevance, even if the concept was not activated previously, the extra effort required should not be significant, despite what Sanford & Garrod seem to suggest.

The rest of the examples above can be explained along similar lines. They are all in 'question-answer' form; therefore, the speaker A in each example has a more or less definite expectation of how B's answer might be optimally relevant, which guides him toward an appropriate interpretation. In other words, in each of the examples (17)-(21), an optimally relevant reply for A is an answer of some sort to his question. Notice that in all these cases, B's answer is more or less indirect,

so that A has to extend the context in looking for an appropriate interpretation. For example, in (18), A is asking the time, and B is not giving a direct answer such as 'a quarter past seven' for some reason. Suppose that the conversation took place one morning in winter, when it was completely dark, and therefore B could not read the clock. Instead, having heard the noise which B was sure that the milkman made, B was able to give the information that 'the milkman has just come.' Since A has a strong expectation that B will answer her question, this leads her to treat this utterance as an answer. This expectation then enables her to extend the context to include information such as 'the milkman usually comes around seven o'clock', which enables her to conclude that 'it is after seven o'clock', which is, of course, relevant information to her. And for B, this utterance is consistent with the principle of relevance, assuming that A was unable to provide a more accurate answer.

Relevance theory can also offer an explanation of how the indirect answers in these examples can be consistent with the principle of relevance, in spite of the extra processing effort which they require. By giving these indirect answers, the speaker is offering not only a positive or negative answer, which can be easily inferred, but also a reason why she is giving this answer. Thus, in example (17), the response 'the window are still open' implies a negative answer to the question 'Shall we go?', given assumptions such as 'windows should be closed before one leaves the house' and 'if windows are open, one cannot leave the house'. Even if the effort required to interpet this response is larger than that needed to interpret the direct answer, 'no', these assumptions are easily accessible, and the difference in processing effort should not be so significant. Moreover, the contextual effects achieved by the indirect answer are obviously greater. Hence, these indirect answers are optimally relevant, since the extra processing effort will be offset by the extra contextual effects.

What is important here is that in each of these examples, it is quite possible for A not to have already activated the concept needed to interpret the bridging reference in B's utterance, before she actually encounters it. According to Sanford & Garrod, if this is the case, A has to fail to assign reference first and then has to resort to secondary processing, in which the search domain is the whole knowledge base. Recall that in Sanford & Garrod's framework, there is no rule or principle to limit the possible candidate referents, except that the hearer has to change the scenario on the basis of the linguistic clues given in the second sentence. Accordingly, they do not offer an explanation of how an indirect answer such as B's utterance in examples (17)-(21) should be related to the question, since they assume that if the hearer does not have slots ready for the incoming linguistic information, this means that the topic of discourse has changed. Hence, according to Sanford & Garrod's theory, it is quite possible for A to fail to identify the right

referent among several candidates due to failure to select an appropriate scenario, or to relate several scenarios, when the relevance of the incoming information is discovered in several steps.

## 5 Final remark

In the last section, I have sketched some basic assumptions about concept organization and context retrieval, which are quite different from Sanford & Garrod's. I hope I have shown that at least as far as bridging reference is concerned, these assumptions are more plausible than Sanford & Garrod's. To conclude, I would like to emphasise that in the framework of relevance theory, such invariant units as 'scenarios' or 'scripts' are not the only available heading for information storage and context retrieval, since there are contexts which do not fit any tailored scenario. Instead, in this framework, the basic unit of activation is the individual concept and its entries, with the criterion of consistency with the principle of relevance being the principle governing the retreival process.

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