Character Status as a Constraint on Inference: some aspects of the cognitive processes underlying written language interpretation.

Michael Jonathon Clegg

Department of Psychology
University of Glasgow.

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ProQuest LLC.
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106 – 1346

Abstract

The scope of recent experimental work on reader inference has been defined by the debate between proponents of minimalism and constructionism. Constructionists (Glenberg and Mathew, 1992; Graesser and Kreuz, 1993) have argued that readers routinely make inferences; combining textual input with general knowledge to construct a mental model analogue of the situation described in the text. Minimalists (McKoon and Ratcliff, 1992) have counter-claimed that readers are highly constrained in the inferential work they attempt. In this thesis an alternative approach is attempted, postulating that the structure of the text itself will encourage and control inferencing. Specifically, it is demonstrated that the marking of a main character in narrative determines how readers interpret certain types of background information. This is termed *the main character attribution effect* and is initially demonstrated for *psychological atmosphere* background statements (Garrod and Sanford, 1988). In a series of experiments using question-answering, self-paced reading, and eye-tracking techniques I demonstrate the robustness of this effect and detail its time course. In further on and off-line studies I consider the generality of the effect with regard to other types of background statement and to the ordering of background and characterhood information. From these experiments I conclude that the background statement itself acts as a bottom-up cue for attributional inference, the locus of which is then controlled by the main character. This is incompatible with the minimalist position.

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Declaration

I declare that this thesis is my own work carried out under normal terms of supervision.

I had this idea about juxtaposing particle, wave, string; noun, verb, sentence; phoneme, morpheme, word. "Wire it all up to synaptic function. Plug all the bastards in to the double helix. Put it on at the Traverse."

From Tom Leonard, *The Present Tense*

This thesis is dedicated to Wang Dan.

Chapter 1
Introduction: Discourse Processing

If we take a sentence from a story in English and then randomly reorder the words in it, the chances are we will come up with something that makes no sense, and something which we intuitively recognise as not being a sentence of English; that is, something ungrammatical. Take the following example. The original sentence (1a) comes from Conrad's *The Secret Agent*. The randomised version (1b) was produced by numbering each of the seven words, then placing these in the order given by a random number table (the sequence was 2,3,1,5,7,4,6.)

(1a) Its face indicated ten minutes to nine.
(1b) Face indicated its minutes nine ten to.

If, in contrast, we take a paragraph from a story and reorder the sentences within it, we may find certain oddities, but, with a little ingenuity, the product should be interpretable and not obviously ill formed. The paragraph containing example (1a), given as (2a) below, itself has seven sentences. If these are reordered following the same random sequence used before, we get the jerky, but interpretable (2b).

(2a) Nothing moved in the parlour till Mrs Verloc raised her head slowly and looked at the clock with inquiring mistrust. She had become aware of a ticking sound in the room. It grew upon her ear, while she remembered clearly that the clock on the wall was silent, had no audible tick. What did it mean by beginning to tick so loudly all of a

sudden? Its face indicated ten minutes to nine. Mrs Verloc cared nothing for time, and the ticking went on. She concluded it could not be the clock, and her sullen gaze moved along the walls, wavered, and became vague, while she strained her hearing to locate the sound.

(2b) She had become aware of a ticking sound in the room. It grew upon her ear, while she remembered clearly that the clock on the wall was silent, had no audible tick. Nothing moved in the parlour till Mrs Verloc raised her head slowly and looked at the clock with inquiring mistrust. Its face indicated ten minutes to nine. She concluded it could not be the clock, and her sullen gaze moved along the walls, wavered, and became vague, while she strained her hearing to locate the sound. What did it mean by beginning to tick so loudly all of a sudden? Mrs Verloc cared nothing for time, and the ticking went on.

It is clear from such a demonstration that there are rules (the grammar) which determine the order of words in an English sentence, and that as users of the language we know these rules - they are in our minds. Given sufficient time and methodological sophistication it should be possible for psycholinguistic researchers investigating grammar to specify the mental rules we use in producing and interpreting sentences. Equally, it is clear from our demonstration that the domain of such rules is limited to the sentence: sentence units themselves can appear in any order within a larger discourse.

Does our mind's knowledge of language, therefore, extend only to specifying what we are to do with words to make up sentences? If this were to be the case then we would expect our interpretation of multi-sentence texts to be simply a concatenation of individual

sentences; but that is not the case. If we try and remember any text we have read, what comes to mind is not a series of sentences, but some kind of summary (for experimental demonstrations of this see, for example, Johnson-Laird and Stevenson, 1970; Keenan et al, 1977; Pichert and Anderson, 1977: Sachs, 1967; 1974). Moreover, this summary is built from the recognition that the sentences of the text refer to the same objects. For instance, reading

(3) The nasty student spat at the teacher. The lazy boy had no morals.

leads us to understand that an unpleasant, lazy, young, male student with no morals spat at the teacher. To use the term summary is, perhaps, misleading: our understanding of text may well expand the informational content of the individual sentences. If we read,

(4) Tom took a shine to Mary. Three months later she was pregnant.

then we are likely to come away with the belief that Tom is the father of Mary's baby, even though this is not stated explicitly. So, the mental processes that lead to our understanding of text seem more complicated than simply concatenating sentences: the actual language of a text represents a particular situation, reading the text results in a further, mental, representation of that situation, but these two representations are not identical. Moreover, given that much of the core meaning of passages is shared between readers - it is hard to imagine a reader not understanding *the nasty student* and *the lazy boy* as referring to the same individual in the above example - it would seem that there are some general mental principles that

control these processes, even if these are not as deterministic as the rules of grammar.

Discourse psycholinguists have identified a number of phenomena which are exhibited across readers, and from which we can theorise about the processes of building mental representations during reading. For instance, Dooling and Lachman (1971) show how a title can aid comprehension processes, and conclude that readers need an indication of what background knowledge they should bring to interpretation. Thorndyke (1977) shows how in recall readers are unable to distinguish what they have read from certain implications of what they have read, and concludes that readers represent inferences going beyond the explicit content of the text. Haviland and Clark (1974) show how gaps in descriptions lead to increased reading times, and conclude that readers make inferences to integrate new information with the existing context. O'Brien and Myers (1985) show how unexpected statements increase reading time, but also increase memory for text, and conclude that these too cause difficulties in integrating the text into a coherent representation. In this thesis I aim to detail a further, little researched phenomenon, *the main character attribution effect*, and to consider how explanations of this relate to existing theories of discourse processing, particularly of inference. The phenomenon was first identified by Garrod and Sanford (1988). They noticed that certain descriptive sentences in a narrative, whilst not explicitly assigned to the perception of any specific character, are nonetheless interpreted in relation to one character rather than others. For instance, take passage (5):

(5) At the Restaurant
Juliet entered the restaurant. There was a table in the corner. The waiter took the order. Things seemed to go well that night.

Although there are two characters introduced in the first three sentences of the story, the information in the final sentence seems to apply to just one. Whilst we would happily answer yes to the question, *Did things seem to go well for Juliet that night?*; the alternative *Did things seem to go well for the waiter?* prompts a sense that we lack the information to say. It seems that we make an inference attributing this information to the main character in the narrative, but make no such inference to other characters.

In Part 2 of this thesis I offer experimental evidence to back up this intuition. I also attempt to discover the mechanisms underlying the effect, looking at its time course, what kinds of descriptive sentence can be assigned in this way, and whether character and background information need to be introduced in a particular order for assignment to occur. In Part 1 I investigate the concept of a main character (Chapter 4), and review existing theories of inference, which must accommodate what this particular effect suggests about inferential processing (Chapters 2 and 3). As a prelude to this, I introduce the concept of inference in the following section.

1.1. Inference

It is a commonplace that what a reader understands from a text far exceeds the literal meaning of the individual, constituent sentences. That is, comprehension involves relating the meaning of sentences to

one another, and to our general (non-linguistic) knowledge; a computational process termed *inference* (McKoon and Ratcliff, 1992: 440; Rayner and Pollatsek, 1989: 264). The importance of inference is most obvious in cases where the literal meaning of a text fragment is non-sensical or indeterminate, but interpretation is intuitively easy. For example, within the sentences we must interpret metaphors (from the quotidian, *the potentially explosive question of Eastern Slavonia*, to the poetic, *Life's but a walking shadow*[1],) while at the discoursal level we must make *bridging inferences* (to relate sentences lacking explicit connection, *Six o'clock on the opening night of The Letter at the Lyric Hammersmith. Joanna Lumley is preparing to walk on stage and pump six bullets into her lover. The bar is beginning to buzz.*) and resolve ambiguous pronouns, *The US Attorney said yesterday Mr Iguchi faces up to 30 years in prison if convicted. There is no evidence that he benefited personally from his deals and it is expected he will plead not guilty.*

McKoon and Ratcliff (1992: 440) give a definition of the concept which neatly captures its accepted sense,

> inference is defined as any piece of information that is not explicitly stated in a text. This definition includes relatively simple inferences as well as complex, elaborative inferences and inferences that add new concepts to a text as well as those that connect pieces of the text. For example, by this definition it would be an inference to encode the relation between a pronoun and its referent or to encode two instances of the same word as referring to the same concept. It would also be an inference to compute 2 as the referent of *the number that is four less than the product of three times two* or to combine the clues of a mystery novel to give the murderer.

Not everything in this definition is transparent or consistent. For instance it is not straightforward to determine what information *is* explicitly stated in a text. This is particularly true with linkages between sentences. Forming these will often demand the use of general knowledge to determine underspecified connections, but this is not always the case. For instance, take an example where there is an explicit causal connection between two sentences in a story, whatever the distance between them (so, say, a story might begin *The Princess desired to rescue the Knight in shining armour* and end after many adventures, *Thus the Princess secured her goal of rescuing the knight.*) It is not clear that encoding this representation adds information to the text. Similarly with unambiguous pronouns (*Mikey was delighted it was Friday afternoon. He had a great weekend planned out*): the connection is overtly marked in the language. However, I shall follow McKoon and Ratcliff's definition and take as an example of inference (1) any clear addition of information to the text, (2) any connection formed between separate sentences of text, and (3) the process of checking that the situation described is consistent with our knowledge of the world.

Inference is a far more ubiquitous process in interpretation than the illustrative examples given above may imply. As readers of a sentence such as *Bosnia complained of being pressured into compromising with war criminals and despots*, we not only need to make use of our non-linguistic knowledge to determine that the referent of *war criminals and despots* is the political leaders of the Bosnian Serbs, but in addition are likely to make complex judgements about the accuracy and legitimacy of the foreign minister's claim.

Indeed, in principle there is no limitation on the inferences that may be made on the basis of a text: there is no *a priori* reason why, if readers start combining existing knowledge with text content, they should stop at any particular point. For literary texts the ability to support a plurality of interesting interpretations is a sign of worth. However, for cognitive psychologists this raises obvious problems of computational complexity: given the limited nature of human processing resources, some of the available inferences will be made by a particular reader, but the remainder will not. What is it in the text, and/ or the mind that determines this process of selection?

Such considerations have motivated a distinction between two types of inference: *necessary inferences*, such as bridging inferences and reference resolution, which are claimed to be determinate processes and without which the reader will lack a coherent interpretation of the text; and *elaborative inferences* which give rise to diversity in interpretation (see Keenan et al, 1990; McKoon and Ratcliff, 1990). However, this taxonomy is open to criticism (Sanford, 1990, and Vonk and Noordman, 1990). First, the concept of what is necessary for comprehension itself demands some independent assessment of what constitutes comprehension of a text. This is a complex assessment to make, and it seems unlikely that there is a fixed measure applicable across texts. For instance, we can understand *Joanna Lumley is preparing to walk on stage. There she will pump six bullets into her lover*, simply by determining that *she* and *her* in the second sentence refer to the same referent as *Joanna Lumley* in the first. However, we would not want to characterise this as comprehending the passage. Second, what begins as an elaborative inference may end as a necessary one. If we read, *Fred was driving down to London*, then

we may elaboratively infer that Fred is driving a car. If the sentence is followed by, *He hoped the car would make it*, then determining the reference of the definite noun phrase *the car* makes this a necessary inference. Third, the process sometimes termed coherence checking - ensuring that what is described is consistent with our understanding of the world - seems to be a ubiquitous process. We will notice an implausibility between sentences[2] even if explicit linking through a repeated noun phrase means no bridging inference is necessary - *Maxine bought a book about vegetarian cookery. The book was by Wordsworth, the great Romantic poet.* To notice such anomalous cases we must be engaged in a similar inferential mapping to general knowledge with sentences that are plausible, even though in such cases inferencing is not necessary for a coherent representation.

Given the weakness of a typology such as the necessary/ elaborative distinction, it seems productive, in considering the computational puzzle of text-based inference, to examine instead the aspects of a text which encourage or discourage inferences of any kind. Given the importance of inferencing to interpretation, a large part of the task of an author will be to structure the text so as to encourage readers to make all and only those inferences desired. Over the course of the next two chapters I shall elaborate on current theoretical debates about inference, and pursue the argument, adumbrated here, that a fruitful approach would be to consider how rhetorical aspects of text act as controllers of inference. In particular I shall suggest that character status is one such device that is available. This establishes the context for my discussion, in Chapter 4, of the concept of main characterhood, and the empirical work in Part 2 which manipulates character status .

Part 1
The Main Character Attribution Effect: Theoretical Issues

Chapter 2
Theories of Inference: Minimalism and Constructionism

2.1. Minimalism: definition

The *minimalist* hypothesis, advanced in detail by McKoon and Ratcliff (1992), proposes that only a tightly constrained subset of the inferences that are made available by a text are automatically constructed during reading. Those that are made roughly correspond to the *necessary* inferences described earlier (the points of correspondence are expanded below); those that are excluded are inferences involving searches of general knowledge to fill in details of the description. The central claim is that readers, "do not automatically construct inferences *to fully represent the situation described by a text*" (McKoon and Ratcliff, 1992: 440; my italics). The hypothesis allows for two circumstances that do license inference by readers. First, there are those inferences which "establish locally coherent representations of the parts of a text that are processed concurrently" (the *necessary* inferences). Second, there are "those that rely on information that is quickly and easily available" (McKoon and Ratcliff, 1992: 440), this information coming from both "well-known information from [a reader's] general knowledge and explicit information from the text being read", where this textual information "may be in short-term memory or it may be easily retrievable from the long-term memory representation of the text that is under construction" (McKoon and Ratcliff, 1992: 441). In the next section I shall give a brief summary of data presented by McKoon and Ratcliff demonstrating the construction of inferences only under these

minimal conditions. In (2.3.) I note and elaborate some theoretical criticisms of the minimalist proposal, and in (2.4.) review experimental evidence for non-minimal inference.

2.2. Empirical support for minimalism

McKoon and Ratcliff's first concern is to demonstrate that the minimal inferences predicted are indeed constructed during reading. The need to maintain local coherence predicts that inferences linking anaphors and their referents will be made during reading. In support of this they report an experiment (McKoon and Ratcliff, 1980) using materials such as the following, (1), where there is a link between the anaphor, *criminal*, and the antecedent, *burglar*. Alternatives are presented inside {}.

(1) A burglar surveyed the garage set back from the street. Several milk bottles were piled at the curb. The banker and her husband were on vacation. {The criminal/ A cat} slipped away from the streetlamp.

They found that if the text contained the anaphor-antecedent pair (e.g. *criminal* - *burglar*) then, in a word recognition test following reading, mention of the antecedent from the first sentence (*burglar*) acted as a prime for words in the last sentence which are co-arguments with the anaphor (e.g. *streetlamp*). This was indexed by faster response times relative to recognition of the same co-argument in story versions without the anaphoric link, i.e. when a cat slips away. The authors conclude that there has been an encoding of connections through anaphoric inferences.

Following the minimalist position other plausible candidates for inference will not, in fact, occur during reading . For instance some researchers have claimed that inferences are made which connect statements setting out a character's goals at the beginning of a narrative to their outcome (in success or frustration) at the conclusion (Suh and Trabasso, 1989; Trabasso and Suh, 1993). These are global inferences, occurring even if each adjoining sentence in the passage coheres with its immediate discourse context, both in terms of reference and of the developing causal structure. McKoon and Ratcliff present data from a number of studies in which evidence for such global inferences about causal structure could not be detected. For instance, a priming study was carried out with stories of about 600 words, each with a nested causal structure such that fulfilment of various subgoals allowed a final resolution of an overall goal. After reading a pair of such passages, subjects were presented with test sentences which they were required to verify as being true or false of the stories read. Some of these related to the goals and outcomes of the narratives, and were arranged to make up prime-target pairs. It was assumed that if inferences relating goals to outcomes were made during reading, then the resulting link in the representation would lead to priming of the outcome sentence by the goal. In the experiment an outcome target was preceded by one of four options, either the corresponding goal (which was separated from the outcome by several sentences in the story,) a sentence adjacent to the goal but not related to it in content, a sentence near to the outcome, or a sentence from the alternative story, a control condition. Responses to the outcome target were significantly slower in the control condition, and fastest when preceded by the prime near to the target. Most importantly, there was no difference in

response times between the goal prime and the sentence-near-to-goal prime, indicating that no global inference was encoded.

In a further test of causal inferences, the authors contrasted cases of global causal incoherence with those of local causal incoherence, the latter being one of the triggering conditions for minimal inference. An example of the former is given below, (2). The idea is that a global goal is established (the need to workout an injury), but that when this is frustrated (by the failure to find a tennis partner) the characters resulting action is inconsistent with it (watching videos won't workout the injury). However, it is intended that this action is consistent with the local context (watching videos of your serve coherently follows failing to find a tennis partner).

(2) Curtis spied a tennis court in the park. His arm was healing from an injury and needed a workout before the big match. So he needed an opponent. Curtis waved to a friend to join him. Curtis' friend did not want to be Curtis's opponent. So Curtis decided to go home and study videotapes of his serve instead. Curtis ran happily along the path.

The authors suggest that if global causal text structures are constructed during reading then - relative to a control passage where the goal is not frustrated and the text moves on - responses to a recognition test word relating to the global goal (*workout*) will be facilitated as the inconsistency will keep it in attention[3]. In contrast, following the minimalist hypothesis, there will be no attempt to use inferences to construct such global structures, the inconsistency will not be noticed, and there will be no advantage to the testword.

The locally inconsistent passages established a global goal (e.g. trying to lose weight), which was then frustrated (by the failure to find a usable bike to exercise on). The characters resulting action was then inconsistent with this local context (buying low fat food won't find a bike) but is consistent with the global goal of losing weight.

(3) Diane wanted to lose some weight. She thought she should lose at least 20 pounds. Diane thought cycling might help her lose some weight. She went to the garage to find her bike. Diane's bike was broken and she couldn't afford a new one. So she went to the grocery store to buy grapefruit and yogurt. It took several years, but Diane finally reached her goal.

Hence, the authors claim, under both minimal and global inference hypotheses the global information should be recruited here, as it is necessary for an inference to re-establish local causal coherence. Recognition of a global goal test word (*weight*) should be facilitated following such passages, compared to control versions without the inconsistency.

The data reported supports the minimalist predictions. For the globally inconsistent cases there is a non-significant tendency for longer response times to the recognition probe as compared to the control condition. This is the reverse direction to that predicted if a global causal inference is realised. For the consistent cases there is a significant advantage in response times to the probe, as against the control condition, indicating the utilisation of global information in maintaining local coherence. However, I would note here that these materials, at least as indicated by the example given, seem problematic. For instance, in the global inconsistent example above

the sentence which introduces the goal of exercising the injured arm also mentions an imminent "big match". If the goal of preparing for this match is established, then Curtis's watching tapes of his serve becomes globally consistent. Without some measurement of what inferences readers will make if strategic inferences are encouraged, for instance via talk-aloud protocols, it becomes difficult to determine what does or does not occur during reading[4].

McKoon and Ratcliff also reject the idea that readers will make elaborative inferences, that is add likely but unspecified details to their representation of the situation described in the discourse (unless, of course, this is necessary for local coherence or uses only easily available information). They cite as evidence experiments in which subjects read passages describing events with a highly predictable conclusion, for instance a story describing an actress' fall from a 14th story roof, leading to the prediction that the unfortunate thespian would die (McKoon and Ratcliff, 1986, 1989a, 1989b). They reasoned that if such predictable inferences were indeed drawn, and added to reader's discourse representations, then after reading the passage subjects presented with a recognition test word describing the expected situation (*dead*) would have difficulty in correctly rejecting the word as one not seen in the passage. However, in the recognition error data they found no evidence for such a difficulty.

2.3. Conceptual problems with minimalism

Below I review some existing empirical evidence which is claimed to show readers engaging in non-minimal inference. First, however, I want to suggest some problems with minimalism as a theoretical

concept; these range from a lack of clarity, to an inadequacy in explaining linguistic and cognitive facts.

2.3.1. Circularity in the concept of easily available information

Critics of minimalism have drawn attention to the dangers of circularity in allowing dependence on "information that is quickly and easily available" to be a licensing condition for inference (Garnham, 1992; Keenan, 1993). This follows from the absence of independent evidence that can be used to determine the accessibility of knowledge. Without this it is possible to claim that, for any inference demonstrated to be made during reading, the relevant supporting information must be readily available, whilst for any inference not made, the information is hidden. This elasticity in the condition makes the theory as a whole unfalsifiable.

2.3.2. Contradiction in defining automatic inference

It will have been noticed in the initial discussion of minimalism that the domain of the hypothesis is limited to *automatic* inferences. This label is used to establish a contrast with *strategic* inferences. That is, the hypothesis holds only for reading in "the absence of specific, goal-directed strategic processes" (McKoon and Ratcliff, 1992: 441). When there are such intentions on the part of a reader then other, more effortful, inferences may also be made. McKoon and Ratcliff acknowledge that the restricted situation is a atypical of normal reading, but claim the hypothesis retains value since minimal inferences will provide the basis for the other, strategically driven, inferences in other reading situations. Unfortunately, these definitions become muddled. The automatic/ strategic contrast

masks the fact that four concepts are being discussed here: there is goalless reading, which is taken to result in minimal inferences, and there is strategic reading, which is taken to result in strategic inferences. Once this contrast has been made, problems in the definition of automaticity become apparent. It is assumed that automatic inferences are quick and computationally cheap, whilst strategic inferences are *relatively* effortful ("[in] situations where a reader adopts special strategies, some strategic inferences may be easy to construct, perhaps *nearly* as easy as minimal inferences" (*Ibid.*: 440; my italics.) Further, there is no definition of strategic reading that allows a given reading situation to be typed as such, beyond the presence of effortful strategic inferences. However, it is no more than an assumption that minimal inference alone is automatic and effortless. If the reality is that there are easy strategic inferences, then it is not clear how minimal inference could be separated from these.

This difficulty in definition leads on to a further lack of clarity with regard to automaticity and local coherence[5]. As noted McKoon and Ratcliff allow for two types of automatic inference: "those based on easily available information and those required for local coherence". However, there is a contradiction between the definitions of automaticity and the requirements of local coherence. In discussing automatic inferences, the authors make an appeal to an intuitive distinction: "Some inferences seem to be made automatically, without awareness. Others seem to involve conscious, problem-solving types of processing" (*Ibid.*: 441). Elsewhere automaticity is again elided with readily available general knowledge, "[the] automatic inferences that are the focus of the article are assumed to be supported by

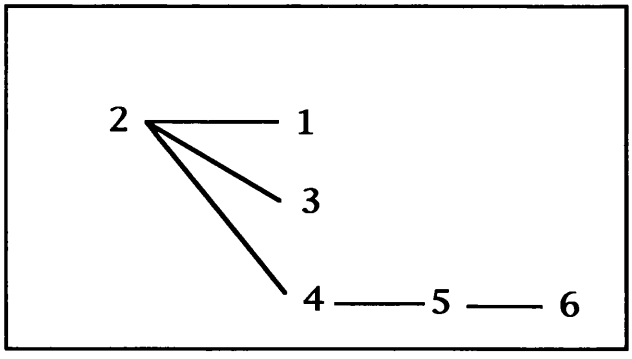
information that is quickly and easily available" (*Ibid.*: 441). Automatic inferences are thus easy and quick, "they are constructed in the first few hundred milliseconds of processing" (*Ibid.*: 441). However, while the inferences supporting local coherence may well be supported by such information, it is stated that this may not be the case: "Only when neither explicit short-term memory information nor general knowledge leads to a coherent local representation of a text are other processes, perhaps strategic, problem-solving types of processes, engaged to provide local coherence" (*Ibid.*: 441). Similarly, "inferences are constructed during reading to the extent that the information on which they depend is readily available. If the required information is not readily available, then an inference will not be constructed (unless the text is not locally coherent)" (*Ibid.*: 442). If minimal inferences support local cohesion, and minimal inferences are automatic, then automaticity cannot be equated with readily available information. Clarity can be restored if we note two different senses of automatic. Minimal inferences, including those that support local coherence, are automatic in that they will, as a matter of course[6], be made by a reader. However, those coherence preserving inferences that require conscious problem-solving are not automatic in the technical psychological sense of being fast, free from conscious awareness, and low in their demands on cognitive resources (Schneider and Shiffrin, 1977; Singer, 1993). Since McKoon and Ratcliff's experimental work involves manipulations of local coherence, and, as described above, is seen to demonstrate the use of global information when local coherence fails, I shall assume that they do intend such local coherence preserving inferences to fall under the term automatic, minimal inference.

2.3.3. Defining coherence and the ubiquity of inference

The notion of local coherence itself needs some kind of definition: what about a discourse allows readers to bind incoming sentences into a representation of the whole, and when will this construction process be judged to have hit a problem? McKoon and Ratcliff adopt Kintsch and van Dijk's (1978) propositional model of text processing and its mental representation. In this model the sentences of a discourse are taken to express underlying propositions, and the first stage of comprehension involves retrieving these. For instance, the statement, *The mausoleum that enshrined the czar overlooked the square* is parsed into two propositions, ENSHRINED MAUSOLEUM CZAR and OVERLOOKED MAUSOLEUM SQUARE. The particular processes that conduct this parsing operation are not specified in the model. The next stage in comprehension is to link the output propositions to form a structured *text base*. This structure is formed through patterns of coreference; i.e. by linking those propositions that are about the same things or events. In the propositional notation this means connecting propositions with shared arguments. For instance, in the above example the two propositions will be linked due to the shared argument, MAUSOLEUM. At the discourse level, the shared arguments of the propositional representation realise the anaphoric links expressed in the text itself, through pronouns, other pro-forms and definite noun phrases. Thus, if the above example continued, *It was the finest of the square's architectural masterpieces.* we would have the following list of propositions[7]:

Proposition number	Proposition
1	(ENSHRINED, MAUSOLEUM, CZAR)
2	(OVERLOOKED, MAUSOLEUM, SQUARE)
3	(MAUSOLEUM, 4)
4	(SQUARE, MASTERPIECE)
5	(FINEST, MASTERPIECE)
6	(ARCHITECTURAL, MASTERPIECE)

These give the following *coherence graph* for the text base, where numbers represent the listed propositions, and lines the linkages formed by argument overlap. Note how the anaphora in the second sentence is represented through links from its proposition to proposition (2) from sentence one:



However, McKoon and Ratcliff acknowledge that such anaphoric referential links are not in themselves sufficient to guarantee coherence[8]. A passage may have a perfect series of such links, but as readers we would not describe it as coherent. McKoon and Ratcliff quote Keenan et al's (1984) example, *Tom Jones plans to go to the dentist. A plane flew over Tom Jones.* In the light of this observation, the authors propose causality as a further contributor to local coherence. It will be recalled that in one of the experiments described above a break in the chain of causal relations between

adjacent sentences is seen to result in an inference utilising global information. If we return to the example material, the weight loss story, we can see that referential relations are preserved across the key sentences, through pronominal reference to the protagonist: *Diane's bike was broken and she couldn't afford a new one. So she went to the grocery store to buy grapefruit and yogurt.*

However, this recognition of the role of causality points to a more general issue. For a text to be coherent, it is not sufficient for there to be an internal structure. It also needs to be coherent with our (as readers) understanding of how the world is, that is with our general knowledge: hence we find a problem with the *Tom Jones* text, above. Thus a nonsensical sentence, say *Tasteless spicy emotions wake sonorously*, can receive a linguistic interpretation and, in a very restricted sense, a semantic one (i.e. we can establish propositional meaning - who did what to whom and how - and hence answer questions such as *How did the emotions wake? What did the emotions do? What flavour were the tasteless emotions?*) but we would not want to say that we have comprehended the sentence, because it is incoherent in relation to our knowledge of the world. Any discourse interpretation thus involves mapping the linguistic information into our existing knowledge. It is construction of the resulting level of representation that we call comprehension or interpretation, and it is at this level that we must define coherence.

It will be recalled that we defined inference as the process through which information becomes present in a reader's mental representation of a text, but is not explicitly stated in the text itself. Given, then, that interpretation and coherence are the product of

mapping linguistic information into general knowledge, we can expect inference to be ubiquitous, occurring whenever the content of the resultant representation exceeds the linguistic information alone. That this is the case is apparent from instances of ambiguity. English, like other natural languages, frequently fails to provide sufficient information to make a single interpretation, even at the propositional level, but readers readily do so by adding other knowledge in an inferential process. For instance, consider the following example of lexical ambiguity:

(4) Tracey's fingernails were a mess. She went to the shop and bought a file.

(5) Tracey's papers were a mess. She went to the shop and bought a file.

The final sentences in (4) and (5) are identical in terms of their tokens, but we interpret them differently. This follows from our general knowledge about what is appropriate, in the light of the information in the first sentence. In other words, the linguistic representation is ambiguous, but our mental representation is not: an inference has been made. It is clear that this inference is necessary for local coherence, and, therefore, might seem to fit nicely within the minimalist framework. However, this is to miss the point. This inference is not made because a point of local incoherence has been detected; rather it is integral to establishing an initial interpretation. Note that in contrast to inferences repairing gaps in local cohesion, such as bridging inferences, establishing the reference of an ambiguous noun in a determining context takes no processing effort (Duffy et al, 1988; Rayner and Duffy, 1986, 1987). As suggested,

mapping new information into general knowledge is a ubiquitous process.

Sanford and Moxey (1995) illustrate differing interpretations due to ambiguity in a preposition; the example also emphasises how coherence between sentences results from an integration of interpretations, not simply some kind of co-reference. In the short texts below (6) is perfectly acceptable, while (7) is incoherent, and readily detected as such.

(6) Fred put the book on the table. Then he rested his mug of coffee on the book.

(7) Fred put the wallpaper on the wall. Then he rested his mug of coffee on the wallpaper.

The first sentences in (6) and (7) differ only in the content of the noun phrase complements of the verb (*book* and *table* against *wallpaper* and *wall*;) their logical structure is identical. Their interpretation, however, uses our knowledge of the situations described. We know that in the context of walls and wallpaper *on* will mean *vertically against* (note this isn't true in the context of a pasting table and wallpaper;) while for books and tables *on* means (roughly) *above and resting on.* So, again, general knowledge plays an important role in establishing the first interpretation. The information in the second sentences will be mapped into this interpretation of the first. We know that the vertically hung wallpaper cannot support a mug, and hence the passage is incoherent.

As a further example of the way interpretation and coherence result from mapping linguistic information into general knowledge, with inference as a fundamental part of the process, compare the following syllogisms[9]. The first may seem unexceptionable:

(8) Ralph is an elephant.
Elephants have tusks.
Therefore Ralph has tusks.

However, in the underlying logical form of the syllogism,

(9) A is a B.
B's have C.
Therefore A has C.

the conclusion is not valid. This is evident if we look at another English manifestation of the same structure:

(10) Ralph is an elephant.
Elephants have several large reserves across Africa and Asia.
Therefore Ralph has several large reserves across Africa and Asia.

or perhaps more naturally (I have replaced *have* with *own*, but the underlying sense of possession is identical):

(11) Jeremiah is a mason.
Masons own large tracts of Lanarkshire.
Therefore Jeremiah owns large tracts of Lanarkshire.

Here the invalidity of the syllogism is apparent. The contrast arises from the fact that, in English, several words expressing possession collapse the logically distinct senses of individual and collective ownership. Which of these is understood depends on mapping of the linguistic information to general knowledge: we know that elephants individually posses tusks and so interpret *Elephants have tusks* in this sense.

What McKoon and Ratcliff (1992) mean by coherence is not clear. In their experimental items coherence and incoherence, both global and local, are manipulated through breaks in co-referential chains or causal structures. Inferencing becomes a supplementary task, initiated when connections between propositions break down. A role for inference in the initial interpretation of sentences, or a consideration of coherence as integrating interpreted sentences in a way consistent with general knowledge, is not apparent. Note, for instance, how in the weight loss example cited earlier, (3), the complex set of inferences needed to determine that *So she went to the grocery store to buy grapefruit and yogurt* is consistent with the global goal of losing weight is assumed. In their theoretical discussion, the authors do attempt a broad definition of coherence, implying a broad role for inference in establishing this. Following the *Tom Jones* example they state, "we assume that a set of two or three sentences is locally coherent if it makes sense on its own or in combination with easily available general knowledge" (*Ibid.*: 444). However, there is again a danger of circularity here: how is *makes sense* to be independently defined; does a text not make sense if it is coherent? Moreover the definition again appeals to the nebulous concept of easily available information. Do we assume that in the

examples given above the information needed for disambiguation in each case was easily available?

Consider another pair of syllogisms, (12) and (13), introduced by Garnham (1991):

(12) All of the French people are wine drinkers.
Some of the wine drinkers are gourmets.
Therefore some of the French people are gourmets.

Garnham suggests that people will find making a judgement about the validity of the argument difficult, and will be likely to determine that the conclusion is valid (that is, it is a necessary conclusion given the form of the premises, rather than just a possible one, as it clearly is.) This is not the judgement made with the paired example, which has an identical logical form. This makes the invalidity of the conclusion immediately apparent:

(13) All of the French people are wine drinkers.
Some of the wine drinkers are Italian.
Therefore some of the French people are Italian.

Garnham uses this pair to illustrate the use of the representativeness heuristic in human problem solving. In reading the premises people map the information given into their existing knowledge, and integrate the interpretations into each other. For the second example, (13), this emphasises the possibility that *the wine drinkers* may consist of two, separated, groups (since we know that in our world French people cannot also be Italian) and makes apparent the invalidity of the conclusion. This is not the case for the first example.

In other words, our representation of the second example will contain information absent from our representation of the first: an additional inference is constructed. However, it makes little sense to claim that information about French people, wine drinkers and gourmets is easily available in a way that information about French people, wine drinkers and Italians is not. Rather it is the content of the knowledge, into which the premises are mapped in both cases, which determines the final representation.

2.4. Evidence for non-minimal inference

There is a long history of experiments designed to demonstrate elaborative inferencing during reading (Bransford, Barclay and Franks, 1972; Potts, 1974; Sanford and Garrod, 1981). Sanford and Garrod formalise the notion of the background knowledge used to generate these inferences by invoking the concept of scenarios (Minsky, 1975; Schank and Abelson, 1977). The idea is that our knowledge includes abstract, generalised representations of everyday situations. So, for instance, the various bits of information we have about catching trains are organised into a whole that captures the organisation of the whole event. In reading about a situation we will map the described events into the corresponding stereotypic representation, filling out default slots with the specific details. We can also use this information in memory to help us understand the incoming description. For instance, we will assign entities introduced in the discourse to specific role slots in the scenario. Sanford and Garrod illustrate this with the short text,

(14) John was on his way to school last Friday.
He was really worried about the maths lesson.

The authors note that on reading this, most readers assume John to be a schoolboy. The passage is therefore considered odd if it continues,

(14') Last week he had been unable to control the class.

This was tested empirically by constructing a set of similar materials, and comparing reading times for the last sentence, where the character is given an unexpected role, with control versions, where this role has already been established (e.g. by replacing the first sentence with *John was not looking forward to teaching maths.*). As expected, the control targets showed less processing difficulty, indicated by faster reading times[10].

It seems that readers map the only mentioned character into the most prominent role slot found in the scenario that the text evokes (in this example a school scenario). General knowledge is thus being used to construct a representation which elaborates the information in the text. This raises the possibility, exploited in these examples, that the reader's discourse representation may be in conflict with information introduced later in the text, even though the text itself is internally consistent. The reading time results indicate that this non-minimal inference is made by readers during normal reading[11]. I return to Sanford and Garrod's explanatory framework in (3.3.2.).

Other evidence demonstrates elaborative inferencing by readers utilising less specific knowledge than scenarios. Gernsbacher and colleagues (Gernsbacher, Goldsmith and Robertson, 1992; Gernsbacher

and Robertson, 1992) have demonstrated how readers generate information about characters' emotional states on the basis of described situations. Readers read brief stories, such as (15), intended to imply a particular emotional state on the part of one character, but not stating this explicitly:

(15) Joe worked at the local 7-11 store, to get spending money while in school. One night, his best friend, Tom, came in to buy a soda. Joe needed to go back to the storage room for a second. While he was away, Tom noticed the cash register was open. From the open drawer Tom quickly took a ten dollar bill. Later that week, Tom learned that Joe had been fired from the 7-11 store because his cash had been low one night.

The hypothesis was that readers would make the inference that Tom felt guilty. To test this subjects read the passages in a sentence-by-sentence self-paced reading (SPR) paradigm, with an additional target statement coming at the end of the text. The target described the emotional state of the relevant character, and the emotion word used was manipulated so that it either matched or contradicted the implied state. Thus there were two versions of the target that followed our example passage: *It would be weeks before Tom's guilt would subside*, or, *It would be weeks before Tom's pride would subside*. As predicted the mismatching sentences had significantly longer reading times. Thus we can see two processes at work in comprehending the passages. Firstly, an elaborative inference about a character's emotional state, built from text information about events and background knowledge about likely consequences. Secondly, the mapping of the target sentence information into the representation of the already interpreted text[12]. Note that since any

given emotional state could be evoked by any number of specific situations - in contrast to the Sanford and Garrod stories which were tied to specific scenarios - it is not clear what "easily available information" would mean in this case.

The inferences demonstrated by Gernsbacher and colleagues relate to the protagonist of the narrative. The relation of character status and inferencing is at the core of the empirical section of this thesis, Part 2, and I return to it in (3.2) and (3.3) below.

2.5. Minimalism: conclusions

I have emphasised two problems with minimalism. First, due to the propositional representational system employed and the conception of inference as something additional to basic level interpretation, it fails to capture the continual mapping of incoming linguistic information into readers' existing knowledge, and hence the ubiquity of inference. Second, several researchers have provided strong empirical support for non-minimal inference, involving the elaboration of the roles and emotional states of characters in narratives.

2.6. Constructionism: definition

McKoon and Ratcliff (1992) place the minimalist hypothesis in explicit opposition to *constructionism.* According to these authors constructionist theories are characterised by the claim that "the mental representation of a text automatically specifies, in some complete way, the real-life situation described by the text. The

mental representations are labelled *mental models* or *situation models*.. ... The constructionist hypothesis is that readers automatically construct a full representation of the real-life situation described by the text" (McKoon and Ratcliff, 1992: 458) The result is a large amount of automatic inferencing to create these complete, life-like representations from the partial, linguistic representations of actual texts. However, this is a caricature of the constructionist position. As Garnham (1992) notes, the notion of a "life-like" representation is too vague to allow explicit predictions about what inferences will be needed to go from a given text to such a construct. Moreover, the concept of a "complete" representation is incoherent: there is no limit to the ways a scene can be elaborated, nor to the level of detail in which it can be described, so a complete description is not a finite entity.

What does constructionism claim? The founding statement of the position, by Bransford, Barclay and Franks (1972), stresses that comprehension involves building a representation of the situation described by the text, rather than a representation of the text itself (note the contrast with McKoon and Ratcliff.) The corollary of this is that comprehension involves combining information from across the text (i.e. maintaining global as well as local coherence,) as well as combining the information contained in the text itself with general world knowledge. This is not necessarily the case, but is likely for any given text: "in constructing this representation, information that is explicit in the text (almost always) has to be combined with relevant knowledge about the world from long term memory" (Garnham, 1992: 3.2). Graesser and Kreuz (1993) summarise their contemporary version of the constructionist tradition thus: "When a

reader constructs a situation model for a story ... the reader actively creates a microworld that is analogous to everyday experiences in the physical and social world. A key assumption is that a substantial number of knowledge-based inferences are needed to supply such a rich representation" (Graesser and Kreuz, 1993: 151). The extent of the analogical correspondence between mental model and real world is open to research, but Glenberg and Mathew (1992) are typical in claiming a limited correspondence, in which, for example, the number and spatial relation of actors and objects in the represented situation are preserved in the representation.

2.7. Empirical support for constructionism

The empirical support claimed by McKoon and Ratcliff to discount constructive inference is challenged along a number of lines. In addressing the issue of elaborative inferencing Glenberg and Mathew (1992) deny that a constructivist approach would lead to the inference *dead* in the actress story, described in (2.2.). A constructed model of the situation would simply place the falling star below the 14th story and on her way down. There is also a question over the methodology used in this experiment. Singer (1993b) points out that a single word is being used to probe a complex inference; there is no particular reason to expect priming of the mental lexical entry for this word. More serious methodological criticisms are made by Trabasso and Suh (1993; see also van den Broek and Lorch, 1993; Zwaan and Graesser, 1993) in relation to global causal inferences. They describe an experiment of their own in which character's goals are primed by causally related sentences, even across a large quantity of intervening text, and with local coherence preserved.

They suggest McKoon and Ratcliff's failure to obtain similar results stemmed from the fact that the causal links they probed were determined by the experimenter's intuitions, rather than pretesting with subjects or through an accurate application of Trabasso et al's (1989) procedures. They also note that McKoon and Ratcliff's argument rests on negative findings, which at the $p < .05$ confidence level have a 95% chance of success.

I have related positive evidence for non-minimal inference in section (2.4.) above: Sanford and Garrod (1981) and Gernsbacher and Robertson (1992) provide evidence for readers elaborating aspects of the situations described in a text by using information from their general knowledge of these situations. A more direct test of the analogical nature of constructed mental models is described by Glenberg et al (1987). They manipulated the spatial relations of objects described in a passage, with the aim of demonstrating that the manipulations were directly mirrored by changes in the structure of readers' representations. The experimental texts opened with the introduction of a main character, who was then retained in the foreground of readers' attention by repeated mention across the story. The principal conditions were formed by the second sentence which introduced an object in relation to the protagonist. For each passage there were two versions of this critical sentence: an *associated* version which attached the target object to the character, and a *dissociated.* version, in which the target object remained spatially separated from the character. Each story concluded with two filler sentences. In the following example, (16), the alternative critical sentences are given in curly brackets {}, the first realises the

associated condition, the second the dissociated, the target object here is *flower*:

(16) John was arranging a bouquet for the table. {He put the last flower in his buttonhole, then left the house to go shopping for groceries./ He put the last flower in the vase, then left the house to go shopping for groceries.} When he got to the store, he went to the produce section to pick up some broccoli. He then picked up some cheese to make a sauce for the vegetable.

The dependent variable was reaction time in an item recognition test; subjects registering whether or not they believed they had seen a particular word in the passage just read. For the experimental passages the test word was the target object (*flower*, above). The authors' prediction rests on previous findings that an item in the foreground of readers' attention is responded to quickly (Fletcher, 1981). They argue that if there is a direct correspondence between the spatial structure of the situation described and that of the reader's mental representation, then the maintenance of the protagonist in the foreground of attention will lead to the relative foregrounding of the physically proximate object in the associated condition, as against the distant object in the dissociated condition. This is not predicted by theories in which readers retain a propositional representation of the text, such as minimalism, as the propositional links between foregrounded character and object are identical in each case. Testing after the first filler sentence (to allow the loss of activation accruing to the target at its first mention) gave results in line with the constructionist prediction: response times were significantly faster to the associated target object. In a follow up study it was found that the associated object was also more

accessible to later pronominal reference[13]. Glenberg et al conclude that the reader's representation of a text does indeed reflect the spatial structure of the event described, and that this effectively encodes certain inferences, for instance that the flower is still proximate to John in the store.

2.8. Explanatory inadequacies of constructionism

In discussing minimalism I noted how its conception of inferential processing fails to account for the work needed to deal with ambiguity. A constructionist approach to these same examples, however, does predict the need for inferential interpretation. This follows from the view that a reader's aim will be to construct a model of the situation described. For instance, considering example (17),

(17) Fred put the book on the table. Then he rested his mug of coffee on the book.

if a reader is to construct a model with a token for the book correctly placed on a token for the table, then *on* in the first sentence must be correctly interpreted using knowledge about books and tables. However, predicting this outcome says nothing about the actual inferential interpretation. The structure of mental models representation gives an explains of certain inferences. For instance, given an analogical spatial representation, the two premises (1) a is to the left of b, and (2) b is to the left of c, will lead to a model in which a is to the left of c, effectively encoding this transitive inference (Glenberg and Mathew, 1992; Johnson-Laird, 1983). Similarly in a representation which relates tokens for John and the

flower in his buttonhole, if John goes to the store then so will the flower. However, such situational models have nothing to say about the inferential processes necessary to their own construction, as in the ambiguous examples given. Thus, while constructionism emphasises the role of general knowledge in interpretation, it is similar to minimalism in ignoring the role of mapping incoming linguistic information into general knowledge in basic interpretation. A similar lacunae exists with regard to the partiality of the proposed models (asserted by Garnham (1992), see (2.6.).) It is not clear how, given a specific text, it can be determined which portions of the situation described will be represented in the reader's model, and at what level of detail.

The situation models ascribed to readers are organised by the real world structure of the situation described in the text: these are microworlds analogous to everyday experiences in the physical and social world (Graesser and Kreuz, 1993). But this ignores another source of structure for readers' representations, the rhetorical structure of the text itself. As Garnham (1992) notes, see above, a complete description of a situation is an impossibility: there is no limit to the ways a scene can be elaborated, to the different possible emphases and perspectives, or to the level of detail that can be given. At the sentential level the possibility of different rhetorical emphases is apparent in the choice between different syntactic forms, active (a), passive (b), cleft (c) and (d) etc:

(18) (a) Angus comforted the frightened cat.
(b) The frightened cat was comforted by Angus.
(c) It was Angus that comforted the frightened cat.
(d) It was the frightened cat that Angus comforted

The selection of different syntactic forms is determined by the desire to focus readers attention on one particular aspect of the situation (Brown and Yule, 1983), that is to affect their representation. This is equally true of decisions about how to represent a situation made at the discourse level. So, for instance, in a narrative involving two characters, which of these is focused, say by naming[14], will have a major effect on our interpretation of the situation. This is intuitively clear in the following example, taken from Sanford, Moar and Garrod (1988) where identical situations receive a different interpretation due to contrasting focus:

(19) Masie entered the restaurant and sat down. The waiter wearily limped over and took her order.

(19') The customer entered the restaurant and sat down. Alphonso wearily limped over and took her order.

Thus it is not the situation described that alone determines the structure of a reader's representation, the manner of description is also effective. Which elements in a description are focused will play a role in determining which inferences are made and where, and will help control the particular background knowledge a reader accesses. I discuss this further in (3.2.) and (3.3.); the effect of character status on inferencing is the central topic of the experimental work in Part 2 of this thesis.

2.9. Minimalism and Constructionism: conclusions

Minimalism, and to a lesser extent constructionism, attempt to define what inferences will be made and when, during reading. There is

considerable evidence that readers are able to make non-minimal inferences during normal reading, and, indeed, that analogical mental models are constructed. However, the minimalist account neither fully explains the inferential processes involved in constructing such a model, nor accounts for the impact of text structure on interpretation.

In the next chapter I move on from theories defining in absolute terms whether and when an inference is made, and instead consider ideas about what circumstances encourage (or discourage) readers to draw particular inferences from the vast set potentially available. Put another way, what contextual constraints affect inference making? In considering this, issues of text structure, and specifically character status, will become central.

Chapter 3
Constraints on Inference

In the first section of this chapter I consider constraints on inference coming from the reader. In (3.2) and (3.3) I turn to constraints based in the text, and introduce the notion of character status as an important controlling factor.

3.1. Constraints from readers: reader goals and general knowledge

Recently researchers have stressed the conditional nature of inference making, at least as it is dependent on reader differences. Several dimensions of such difference have been considered. Within the individual reader there are variations in motivation and purpose between different occasions. Between readers there are differences both in reading ability and in the content and structure of the long term memory store of general world knowledge.

McKoon and Ratcliff's (1992) original formulation of the minimalist position restricts its operation to specific circumstances for specific readers: "For different readers, minimalist processing with little strategic processing [i.e. non-minimal inference in the service of particular reading goals] will occur in different situations. For some readers, it might be a rare occurrence; for others, it might happen in such situations as reading a magazine on an airplane ... or reading texts in a psychology experiment. However, more often than not, readers do have specific goals, especially when learning new information from texts, and so they often engage in strategic

processes designed to achieve those goals." (McKoon and Ratcliff, 1992: 440). Variation in readers' purpose, and consequent depth of processing, has been suggested as a cause of McKoon and Ratcliff's failure to detect global inferences found by others. van den Broek et al (1993) note that, "Evidence for the minimalist position comes from studies that usually employ rapid presentation rates, require quick responses to criterial tasks, and often (though not always) use brief texts. As we have seen, these factors minimize the opportunities for inferential activity." (van den Broek et al, 1993: 176). They suggest that the minimalist and constructionist views describe different and legitimate aspects of the reading process (see also Singer, 1993a; 1993b; and Zwaan and van Oostendorp, 1993). Zwaan and Graesser (1993) are more critical of McKoon and Ratcliff's position. They doubt the possibility of reading without a goal, and suggest that the experiments performed by McKoon and Ratcliff encourage shallow processing, i.e. the exact wording and surface form, since this is sufficient to perform the tasks set. Zwaan and Graesser suggest that, since "the type of inferences readers generate are a function of the reader's goal" (Zwaan and Graesser, 1993: 3), productive research into inference generation is dependent on developing a taxonomy of reading goals. To this end they suggest three broad categories: reading to explore the stimulus; reading for information; and reading for entertainment.

Developing van den Broek et al's comments on the effect of experimental procedures on the likelihood of reader inference, Long and Golding (1993) tested for causal inferences under relatively demanding time constraints. Narratives were presented one word at a time, each word appearing for just 200 ms with a 50 ms interval

between words Test probes, designed to detect whether a description of an action provoked an inference as to the cause of that action, appeared 50 ms after the disappearance of the final word of the sentence. In addition, following presentation of all 9 test narratives, readers were given a brief comprehension test. As performance on the comprehension test varied widely, in analysis subjects were divided into two groups, high versus low comprehenders. The data indicated that elaborative causal inferences were generated, even under these conditions, but, strikingly, only by the high comprehenders. The authors note that this could result from the on-line generation of inferences causing better comprehension performances. However it also seems likely that individual differences, such as reading speed, working-memory span or general verbal ability are reflected in the comprehension scores - low scorers responded more slowly to all test words than high scorers, not just the experimental items relating to causal inference. Thus the results suggest that cognitive and verbal differences between readers affect the generation of inference; a conclusion in line with that of Just and Carpenter (1992), Singer (1993b), and Whitney, Ritchie, and Clark (1991).

As well as such specific cognitive abilities, the structure and content of a particular reader's knowledge will also play a role in controlling their inferential processes. General knowledge is, after all, an input into the process. Noordman and Vonk (1992) have illustrated the difference between readers with different knowledge bases using *because* sentences. They note that a sentence with the structure *x because y* states that y is the cause of x. If the reader is unaware of this causal relation between y and x, then they will be forced to

accept it on trust. Only a reader with knowledge of these concepts will be able to make an inference confirming (or disconfirming) the causal relation claimed. That readers with the relevant knowledge do indeed make this inference was confirmed empirically by showing specialist texts, on economics, to both experts and non-experts in the domain. In one condition the texts included a sentence prior to the *because* statement which primed the information necessary to make the inference, in the alternative condition this was absent. The results showed that for experts the priming led to a faster reading time on the *because y* clause, indicating that the relevant knowledge is used to make an inference, this being more readily accessed following the prime. There is no such difference for non-experts, since the information is not there to be primed.

As I stated earlier, and as these examples have demonstrated, researchers are taking seriously the control of inferencing by contextual factors, at least as far as these involve reader differences. However, some see this as pointing to a fundamental difficulty in inferencing research, and this is a view with which I concur. For instance, Perfetti (1993) notes that if we acknowledge that inference is dependent on non-linguistic information (whether that be general knowledge, or some representation of a reader's purpose in reading a text, likely to be highly complex) then we are involved with central processes[15]. With this, our ability to make a computational explanation, or make sense of empirical data, is put in jeopardy (Fodor, 1983). Inferences made using the resources of the central processor - that is most every-day, common-sense reasoning, as well as discourse interpretation - have available a huge and chaotically structured body of knowledge, any part of which might be used as a

premise. As Perfetti notes, whilst syntactic processing (and, he argues, certain minimal inferences) involves specific symbols triggering specific processes over a limited domain of knowledge, with elaborative inferencing there is no symbolic trigger (a fall from a high building can be expressed in an indeterminate number of ways) and an indeterminate quantity of applicable knowledge leading to an infinity of possible conclusions Moreover, since our everyday reasoning concerns what is plausible or likely, rather than what is necessarily the case, such inferences are unlikely to be logically valid and so cannot be modelled by any standard computational theory (Chater and Oaksford, 1993; Pickering and Chater, 1995.).

The nature of the knowledge and processes involved in everyday inference have implications for their study. Where our shared human cognitive architecture[16] gives rise to regularities in behaviour, there we have a limited and specifiable domain amenable to the computational approach of cognitive psychology. This is true of the language module and resulting syntactic behaviour. However, other aspects of our mental organisation and activity, for instance our goals in reading a text or the structure of our general world knowledge, are structured by personal and social factors. There will be great variability between and within individuals, and no principled way of specifying the knowledge used in any particular operation. The resulting behaviour will be best explained by disciplines based either on the individual interpretation of experience (e.g. certain approaches to literary studies,) or, where there are regularities across a social or cultural group, sociology or social psychology. Noordman and Vonk (1992) have made an appeal to a social category with their expert/

non-expert distinction, but this is a very broad distinction which will not shed much light on the detail of inferential processing. Zwaan and Graesser's (1993) proposal for a taxonomy of reading goals appears a vain project given the absence of obvious distinctions in any data on which categories can be based. It runs straight into the problem recognised by Fodor (1983) that central processes are bad candidates for scientific study.

3.2 Constraints in the text: attention, focus and rhetoric

Are there any other, more productive, approaches to the study of inference? Looking at reader's knowledge and intentions is only one type of contextual constraint on interpretation. We can approach the issue from the opposite direction: that is, how can the way an author structures a text control the inferential process during reading, and hence a reader's final mental representation?

Garrod (1995) suggests a distinction between the *topic* of an inference, which he describes as typically the entity that the inference relates to and is about, and its *content*, the actual information inferred. The question thus arises as to what determines the inference topic. Garrod notes that in any narrative certain characters and objects will be more important than others. In psychological terms these will be the *focus* of readers' *attention*. Thus it is a plausible hypothesis that focused characters will be the topics of inference. Evidence that this is the case comes from investigations into partial processing by readers. Erickson and Mattson (1981) reported a phenomenon they termed the *Moses Illusion*. Faced with the question,

(1) How many animals of each sort did Moses put on the ark.

many readers gave the answer two, seeming not to notice that Moses does not feature in the story of the flood. However, if the anomalous item is focused then detection rates are much higher: readers make use of their general knowledge when processing the focused entity, it is the topic of inference. Hence in a verification study by Bredart and Modolo (1988) few subjects noticed the anomaly in the declarative sentence,

(2) Moses put two of each kind of animal on the Ark.

but detection rates were much higher if a cleft focused the anomalous item:

(3) It was Moses who put two of each kind of animal on the ark.

Related evidence comes from Barton and Sanford (1993). These researchers asked subjects a question containing an anomaly:

(4) When an aircraft crashes, where should the survivors be buried?

Faced with this question only 26% of subjects noticed the anomaly[17]. In other words, the majority of readers did not draw the simple inference that survivors should not be buried at all[18]. However, as Garrod (1995) notes, if we alter the wording to bring this referent, *survivors*, into focus, then we find a striking increase in the visibility

of the anomaly: *Imagine that there is a plane crash with many survivors. Where should they be buried?.* Thus focusing has again turned this item into a topic of inference.

However, we have only pushed the question one stage further back, if focusing determines the topic of inference, what then determines focus? Garrod correctly insists that focus is dynamic, not fixed across a text: in a narrative, as scenes change and events unfold, readers attention will move between objects and characters. Attention is itself a complex concept. It may be partially characterised in cognitive terms: thus, for instance, working memory has been shown to have a limited size, so attention will of necessity be selective (Baddeley, Thompson and Buchanan, 1975). On the other hand, a particular reader's uses of her limited attention will also be influenced by non-cognitive factors, such as her purposes in reading, her interests and her general knowledge - factors that I claimed were profoundly troubling for the attempt to study inference content. However, I suggest that these factors interact with a further, crucial, determinant of where attention is focused: the rhetorical devices used in the text. We should remember that texts do not have a uniform structure, the author will draw attention to those aspects she or he considers important, giving what might be termed a rhetorical structure. Note that it is a change in the rhetorical structure, via a resulting shift in focus, which leads to the improved visibility of the anomaly with the Barton and Sanford example. Using text structure to focus characters and objects is one way in which authors can control readers' inferential processes via the structure of the text.

A suggestive example relating to elaborative inference is included in Sanford (1990; also Sanford and Garrod, 1994). In a text about a thrown vase a plausible inference is that the vase is broken. However, in the passage,

(5) Unable to control his anger, the husband threw the delicate porcelain vase against the wall.

the topicalising adverbial phrase fronting the sentence draws attention to the husband's anger, rather than the vase; this is what the sentence is about. We might suggest that this lack of attentional resources given to *the vase* will mean that the inference is not made. In contrast a structure that brings attention to the throwing of the vase, by placing it in a second, conjoined sentence, and dropping the initial adverbial (while in Sanford's example the verb is also changed to one with more violent connotations,)

(6) The husband had been unable to control his anger, and he hurled the extremely delicate and very valuable antique porcelain vase at the brick wall.

seems likely to encourage readers to make the inference. Empirical backing for this intuition is given by Majid (ms.) and by Thompson (ms.).

In summary, I suggest that aspects of the text itself will play a central role in controlling inference, and hence understanding.

3.3. Character and the control of representation and inference

Can we begin to characterise with more specificity some of the aspects of a text's rhetorical structure which control inferential

processes? Garrod and Sanford (1988) suggest that one very important factor is the deployment of a focused *Thematic Subject*, or *Main Character*[19]to act as the topic of inference. Indeed, they suggest that the distinction of a main character (MC) from other, subsidiary, characters is a universal feature of narrative which results from a need for a focused entity to act as inferential topic (see (4.5.) for further discussion of this idea.) That is, since the computational resources available to the reader are limited, a considerate discourse will foreground a key character around whom they can be deployed. I describe this hypothesis and its motivations in section (3.3.2.). However, first I shall introduce other evidence for the importance of main character in discourse processing.

3.3.1. Albrecht and O'Brien's character-specific, non-minimal inference

Both Gernsbacher's emotional inferences and Sanford and Garrod's role assignments (both described in (2.4.)) elaborate the representation of particular characters. The interaction of character and interpretation has been explicitly addressed in other recent experimental literature, with the suggestion that main characters in narrative discourse are used to organise the reader's mental representation, and, consequently, play a role in controlling what inferences are made. Several studies have demonstrated that readers' keep track of the spatial location of the MC, even if this means integrating information from separated parts of a passage (Morrow, Bower and Greenspan, 1989; Morrow, Greenspan and Bower, 1987; O'Brien and Albrecht, 1992). Albrecht and O'Brien (1993) examined whether this was also true for the attitudes and beliefs ascribed to, or implied of, a protagonist. They report a study

designed to show, in contradiction of the minimalist hypothesis, that readers do routinely check and establish global, as well as local, coherence, at least as regards the attitudes and actions of main characters.

The passages used began with the introduction of a main character, then went on to elaborate some personal characteristic of this character (for instance, their taste in food). Several sentences then followed which developed the narrative, with the main character central to it, but which made no reference to the characteristic described earlier; in other words, this information was allowed to drop out of short term memory so it could not be easily available to readers[20]. Towards the end of the story came a target sentence which described the MC engaging in some action. Three versions of each passage were constructed, each describing a different characteristic for the MC. One of these was consistent with, one inconsistent with, and one unrelated to the target action sentence. An example is given below; the three alternatives are shown in curly brackets and the target in italics, two sentences within the introduction and three concluding the passage have been omitted.

(7) Today, Mary was meeting a friend for lunch. [...] This was Mary's favourite restaurant because it had

{fantastic junk food. Mary enjoyed anything that was quick and easy to fix. In fact, she ate at McDonalds at least three times a week. Mary never worried about her diet and saw no reason to eat nutritious foods.}

{fantastic health food. Mary, a health nut, had been a strict vegetarian for ten years. Her favorite food was cauliflower.

Mary was so serious about her diet that she refused to eat anything which was fried or cooked in grease.}

{a nice quiet atmosphere. Mary frequently ate at the restaurant and had recommended it to all of her friends. She especially liked the cute tables and the country style table cloths on them. It made her feel right at home.}

After about ten minutes, Mary's friend arrived. It had been a few months since they had seen each other. Because of this they had a lot to talk about and chatted for over a half hour. Finally, Mary signalled the waiter to come take their orders. Mary checked the menu one more time. She had a hard time deciding what to have for lunch. *Mary ordered a cheese burger and fries.* She handed the menu back to the waiter. [...]

Reading times (taken from the target and the following sentence) showed as significantly longer following an inconsistent characteristic description, with neutral and consistent versions giving similar times. The result suggests that readers are integrating their interpretations of incoming text with their existing discourse representation; in particular, relating information about the main character, even if this is not co-incident in short-term memory. Moreover, this character representation is integrated with general knowledge, so that a description that is incoherent given our knowledge of the world, causes processing difficulties. This conclusion was supported by two further sets of data. The first showed better recall of ideas, from the characteristic description and the target sentence, in the inconsistent versions, indicating that reprocessing has indeed occurred here. The second (Myers, O'Brien, Albrecht and Mason, 1994) tested for the availability of the characteristic information immediately after it was presented, after the backgrounding section but prior to the target,

and after the target sentence. It was found to be easily available in the first and last cases, but not after the intervening material; providing converging evidence that integration of the target sentence occurs at a global level.

Although Albrecht and O'Brien have not manipulated character status within the design, the concept of main characterhood is central to their explanation of both this result, their earlier studies involving characters' spatial locations (O'Brien and Albrecht, 1992), and, indeed, of Gernsbacher et al's findings on characters' emotional states. They suggest that readers of a narrative "attempt to construct a single coherent mental model around the main character" and for this purpose have access to global textual information, and will engage in non-minimal inference[21] (Albrecht and O'Brien, 1993). This is, they note, consistent with discourse processing models based on mappings between different memory components (Garrod and Sanford, 1988; 1990; Glenberg and Langston, 1992; Sanford and Garrod, 1981). These do not require that all explicit and implicit information about the main character is actively maintained in the readers attention, rather a token representing the character is maintained, along with pointers to additional information no longer active. Whether this information is retrieved at any given point depends on its degree of activation, and the extent to which incoming information overlaps, and hence reactivates, it; but all such information is in principle available.

This theory was tested in a subsequent study (Myers, O'Brien, Albrecht and Mason, 1994). Here similar passages were used, but the backgrounding section was altered so as to remove the protagonist

from the reader's attention, not just his or her characteristic feature. Following this manipulation there was still an effect of inconsistency on reading times (that is, if the characters action contradicted the given characteristic) but it did not emerge until the sentence following the inconsistent target. The authors suggest that this delay results from the need for an extra processing operation in the mapping models. Before characteristic information can be accessed, the original MC must be brought back into the focus of the reader's attention. This will bring with it pointers to information in long-term memory, allowing access to this information - including descriptions of characteristics - and hence leading to the delayed effect of inconsistency.

How does consideration of the role of character in inference relate to the two theories of inference and representation introduced earlier, minimalism and constructionism? Clearly the results described are a problem for minimalist accounts. Sanford and Garrod, Gernsbacher and colleagues, and Albrecht and O'Brien all demonstrate readers making non-minimal inference. Moreover, the theoretical explanation for these results advocated by Albrecht and O'Brien is incompatible with the minimalist hypothesis. Their claim is that as readers we attempt to construct a coherent mental model around the MC: this is a global factor controlling interpretation and inference, quite separate from local referential or causal frameworks. Does this incompatibility with minimalism mean a close fit with constructionism? Another set of results invoked by Albrecht and O'Brien are those from Glenberg et al (1987), outlined in my section on constructionism, see (2.7.). These, Albrecht and O'Brien claim, show readers constructing a representation around the main

character. In this case that representation includes information about physically dependent objects, such as button-hole flowers. However, Glenberg et al do not invoke a notion of main character, and while the results are compatible with Albrecht and O'Brien's position, it is not clear how this would fit with their own explanation, which is in terms of a constructed situation model. The implication of the character-specific theory is that such full representations will not be constructed around secondary characters in a passage. However, since Glenberg et al's situation models are simply analogues of the situation described, they will take no account of a rhetorical contrast such as that between main and secondary character. As noted earlier (2.8.) the constructionist account is limited by its failure to take account of the multiple ways of representing the same situation, and the role played in determining readers' comprehension by the structure of the text itself. For a mental models based theory to be compatible with Albrecht and O'Brien's suggestions, it will be necessary to acknowledge that the model must be structured by more than just the physical reality of the situation described.

3.3.2. Sanford and Garrod's mapping model

Sanford and Garrod's (1981; Garrod and Sanford, 1988, 1990) explanatory hypothesis, as cited by Albrecht and O'Brien, is premised on a mental model approach (in that it sees characters and objects mentioned in the text as having corresponding tokens in the mental representation) but also takes account of human cognitive limitations and of the focusing of characters through text structure. They propose that there are two, operationally distinct, components of memory necessary for comprehension. *Explicit focus* contains the entity tokens. The main character token is marked as in focus, and

hence is the default assignment for anaphoric resolution (see Chapter 4). *Implicit focus* is that subset of general knowledge activated by the text currently under comprehension; this will be in the form of a scenario (see (2.4.). The activities of characters will be mapped into role slots in the active scenario in implicit memory, as illustrated by (14) and (14') in (2.4.). Thus the two memory partitions together form the reader's representation of the text. Note how such a mapping account gives precision to the explanation of how early inferential processing deals with the ambiguities in examples (6) to (11) of (2.3.3.). For instance, a wallpapering scenario will contain role slots for wallpaper and wall, plus a specification that the former is vertically against the later. Reading a text about wallpapering, such as (7) will result in the mapping of specific instances of wallpaper and wall into the default role slots, and hence encode the information about the relative position of the specific instances.

Garrod and Sanford (1988) note that a given scenario can often be inflected in different ways, depending on the perspective taken on it. For instance, a situation of economic exchange can be seen from the perspective of the buyer or the seller. This will effect the specific structure and content of the scenario instantiated in implicit memory, even down to the role slots made available. So, for instance, (8) reads well, as the restaurant scenario evoked from a restaurant manager's perspective includes a slot for the kitchen staff to which the definite NP in the last sentence can be mapped.

(8) The Restaurant Manager
Lucien, a restaurant manager, was having a terrible day. He was due at the restaurant at twelve thirty, but he got

stuck in traffic. When he finally arrived at one, the three kitchen assistants were all drunk.

In contrast (9), identical but for the title and occupation of the protagonist, presents intuitive difficulty at the final sentence. Since the restaurant scenario for a customer does not include slots for kitchen staff, implicit focus does not provide an antecedent referent for the definite NP.

(9) A Business Lunch

Lucien, an account manager, was having a terrible day. He was due at the restaurant at twelve thirty, but he got stuck in traffic. When he finally arrived at one, the three kitchen assistants were all drunk.

Garrod and Sanford suggest that the particular inflection of the scenario evoked is dependent on the main character. This will "control the exact form of background knowledge which is brought into focus" (Garrod and Sanford, 1988: 533), other entities in the scene will be mapped into this MC controlled scenario. Hence if example (9) is changed to introduce a restaurant manager, but the MC remains a customer (say by replacing the last sentence with, *When he finally arrived at one, the restaurant manager offered him a seat. The three kitchen assistants were all drunk.*) then the difficulty remains: the restaurant manager does not introduce any role slots into implicit focus as a secondary character.

One aspect of the main character's control of inference is thus through determination of what aspects of general knowledge are accessible. I return to several of the issues raised here, such as the

definition of the MC, and the relation of the MC to perspective, in Chapter 4, and especially (4.4). However, note that this inferential control is over the content of inference. In (3.3) I suggested another inferential control function for the MC: acting as the topic of inference, and hence determining which inferences are made and where. In the following section I provide empirical evidence for this function by examining experimental work presented in Garrod and Sanford (1988). This explicitly manipulated character status to determine its effect on inference. This work provides the immediate context for the empirical investigation of character status and its effect of inference in Part 2 of this thesis.

3.3.3. Main character as the topic of attributional inference

The experiments reported by Garrod and Sanford (1988) involve a particular type of inference which the authors suggest is commonly associated with narratives. The inference concerns the interpretation of what they term a *psychological atmosphere statement.* In the following example the key statement is italicised:

(10) Lunch at the Cafeteria
Alistair hung up his coat and picked a tray. The waitress smiled as she poured the coffee. *The atmosphere was hot and sticky.*

The final sentence is an apparently neutral remark describing the context, or *atmosphere*, in which the scene described occurs. Garrod and Sanford, however, note that such a statement has some special properties. Firstly, the predicate expresses an essentially subjective judgement, since the properties ascribed to the situation - heat, stickiness - are measured by subjective criteria. Hence the use of the

epithet *psychological* for this type of statement. In addition, there is no overtly expressed agent to act as experiencer for the predicate. Under the combination of these factors, the sentence seems to require the invocation of some other experiencer to make sense. We might, therefore, expect an inference to be made by readers attributing the judgement to some agency. Garrod and Sanford's data shows that this is the case, but in addition that this inference is targeted: attribution is made to the Thematic Subject (or Main Character) in preference to other characters in the narrative. That is, there is a *main character attribution effect.*

Results from two experiments converge on this conclusion. The first (performed by Sanford and Al-Ahmar) was an off-line judgement task. Subjects were presented with passages, such as (10) above, in which the introduction of an MC (named) and a subsidiary character (role described)[22] is followed by an atmosphere statement. Reading was from a VDU under sentence-by-sentence self-paced reading conditions. At the end of each passage readers were asked questions, including a question about the perception of the atmosphere statement. This referred to either the MC or the subsidiary character, for example a subject might see either (a) or (b):

(a) Did Alistair find the atmosphere was hot and sticky?
(b) Did the waitress find the atmosphere was hot and sticky?

Subjects had the option to answer *Yes*, *No* or *Don't Know* via three labelled buttons. The prediction was for significantly more affirmative answers when the question referred to a perception by the MC, such as (a), than when reference was to the other character.

This was confirmed with nearly 90% *Yes* answers to the MC questions falling to 50% for the others.

The implication is that the making and direction of an attributive inference is controlled by the MC. However, the authors note that the occurrence of any inference here might be task dependent - occurring when needed to answer the question, rather than during initial interpretation of the text. A second experiment was designed aimed at detecting the consequences of making an inference during reading.

The materials followed the pattern of the earlier example, but had the addition of a final target sentence, which described some action that is a natural response to the atmosphere mentioned (e.g. mopping your brow if it is hot and sticky.) The agent of this action was either the thematic subject (i.e., the MC) or the subsidiary character. This is illustrated below, where the target sentence is italicised, and options are in curly brackets.

(11) Lunch at the Cafeteria

Alistair hung up his coat and picked a tray. The waitress smiled as she poured the coffee. {The atmosphere was hot and sticky.} {He took/ She offered} the cup. {*He/ She*} *mopped* {*his/ her*} *brow.*

Note how the atmosphere statement and target sentence are separated by a filler sentence, designed to ensure that whichever character was the subject of the target was also the last mentioned, and hence available for anaphoric reference.

If, following the results of the previous study, an inference is made attributing perception of the atmosphere, in this case the heat and stickiness, to the MC, then we would expect no difficulty with the target if it refers to this named character. The existing discourse representation supports the new information about the action. However, if reference is to the secondary character and, as suggested, no attribution of the perception has been made in this case, then we would expect some delay on the target as an additional bridging inference is made to add the information that the waitress found things hot and sticky. To test this baseline conditions were included in the experiment. In these the atmosphere sentence was left out of the passage (hence it is bracketed as optional above) and so a bridging inference would be necessary *whoever* is the agent of the target. The principal prediction was thus that the inclusion of the atmosphere statement would lead to faster reading times on the target if this referred to the MC, but that there would be no such improvement when reference was to the alternative character.

The prediction was confirmed. Inclusion of the atmosphere statement led to a 171 ms fall in reading times to the target when this referred to the MC (1650 ms against 1379 ms); while for the secondary character conditions the drop was only 27 ms (1430 ms against 1463 ms). This gave a highly significant interaction.

However, this result is not entirely straightforward, being amenable to two interpretations. In the first, the presence of the MC is taken to cue an attributional inference, which assigns the perception of the atmosphere information exclusively to this character. This follows from the result of the earlier question-answering experiment. An

alternative, however, is that the attributional inference occurs downstream of the atmosphere statement itself, being cued by the need to integrate the target. If this is the case then readers may only make such an effort, to relate new information to the existing discourse representation, if the new information is relevant to the main character. Thus when the target has the secondary character as agent there is simply no attempt to find causes for the action (say of mopping the brow) so the presence or absence of supporting information becomes irrelevant[23]. This is leant some support by the relatively quick times to the secondary character targets, relative to the MC baseline, in both conditions.

In the empirical sections of the thesis I address this issue and relate evidence which, along with the question-answering data, favours the first interpretation. That is, the main character attribution effect emerges during reading. However, it is clear that under either of these explanations the pattern of interpretative inferences is a function of the distinction of an MC.

The question arises as to how this main character attribution phenomenon relates to the minimalism controversy. Such attributional inferences are not necessary to maintain local coherence (one of the two conditions for inference proposed by McKoon and Ratcliff, see (2.1.). Some atmosphere statements may lack explicit argument overlap with the preceding text - this is true in the case of *The atmosphere was hot and sticky* above; however, in these cases there is a definite NP, *The atmosphere*, indicating a coherence link with an antecedent noun, *the cafeteria*, as a direct route to re-establishing coherence. There is certainly no need to posit the

atmosphere information as the perception of a character. Encoding this fact adds extra information to the representation, and thus may be seen as elaborative. However, this does not mean the main character attribution effect explicitly contradicts minimalism, since the inferences involved may be licensed by the second factor in the theory: readily available information. If the reader's mental representation of the MC, along with general world knowledge to the effect that human agents can be perceivers of atmospheres, is information "quickly and easily available", then the effect is accommodated by the theory. As noted in (2.2.1.) this hedge within the theory makes it difficult to falsify.

In investigating the mechanisms underlying the main character attribution phenomenon in Part 2 of this thesis I shall expand on the implications for minimalism and its alternatives. Here, however, I would emphasise that while the effect reported by Garrod and Sanford does not select between the minimalist or constructionist hypotheses, its central finding, that an MC acts as a locus of inference, is simply not accounted for by either of these theories. They both lack any conception of rhetorical aspects of a text affecting a reader's interpretation.

In conclusion, it is apparent that the inferential processing that occurs in interpretation is dependent on where a reader's attention is focused, and one key element in focusing is the distinction of a focused character, or as Garrod and Sanford describe it, a Thematic Subject. In the following Chapter I consider the theoretical validity of these concepts, and look at the cues in a text which indicate the focused status of a character. In Part 2 I develop the empirical

investigation of attributional inference, considering its time course, whether it extends to sentences other that psychological atmosphere statements, and whether it is dependent on a particular ordering of character status and situation descriptive information.

Chapter 4
Main Character as a Psychological Category

Garrod and Sanford (1988) suggest, and demonstrate, the importance of a focused character as a controller of inference. They term this entity the Thematic Subject (TS). However, this immediately throws up a further question: how do we define the category of thematic subjecthood. Garrod and Sanford suggest extending a description of sentence topic, as "what the sentence is about", to the larger domain of a discourse segment. This is effective as a working characterisation - dependent on demonstrating that readers treat a particular character as TS in any given case - but risks circularity: the topic of inference is the character the text is about, but what is this if not the character about whom readers make inferences? Nor does it tell us much about the status of Thematic Characterhood, either as an object in the mental representation and processing of text, or as an explanatory concept in theories of this processing.

A number of existing theoretical approaches to issues in discourse and discourse processing involve marking one character in the mental representation as of particular importance. For instance, some theories of text structure identify a topic entity ; theories of causal networks employ the notion of a main protagonist, whose goal anchors the causal chain; ideas about perspective identify a particular character as the point of view from which events are described; while focus theories of anaphora resolution postulate a focused entity, likely to be the antecedent for any incoming pronouns. A number of questions are raised. In dealing with the same passage, do these

different theoretical systems identify the same entity as the marked character? Do all, or any, of these marked characters coincide with the topic of inference. If so, is the new concept redundant? Garrod and Sanford's conception of the TS is certainly more general than being solely the topic of inference: it is also the preferred pronominal antecedent, and performs other processing functions (see (4.3.5.)). Is this broader concept valid?

In order not to prejudge these issues, I shall continue to use the term Main Character (MC), but with the restricted sense of that entity which controls, at the least, attributive inference; other functions of the MC can only be added as they are demonstrated. I use capitals to signify that this refers to a single entity in the discourse representation. The status of the MC, its independence, psychological validity and explanatory value, is the subject of this chapter. Note that I shall continue to use the term Thematic Subject, TS, as defined by Garrod and Sanford. As a more general term, this claims for the particular marked character not only the inferential control function of the MC, but also some additional processing attributes. I explore the relation of these two concepts in (4.3.4.) and (4.3.5.).

I begin by looking at the existing theories which invoke a notion of a marked character, mentioned above. I accept the identity of the MC with the preferred antecedent of pronominal reference. However, I note differences with linguistic theories of a topic of discourse, and with the concept of a causal protagonist; I also reject the broader notion of the Thematic Subject. I conclude by considering the definition of Main Character, and the cues which indicate salience to a reader; considering whether the elision of main characterhood and

naming, made in the experiments described by Garrod and Sanford, is a general rule, or whether these two factors should be separated

4.1. Main Character and the topic of discourse

I am suggesting that an important factor in controlling the inferential interpretation of texts is the way the text itself directs readers' attention. Put in another way, the text contains signals to its own structure, and successful reading means identifying these and reacting to them appropriately. Given this emphasis on text structure, we might expect relevant concepts to come from the linguistic tradition of discourse analysis. Certainly, within discourse analysis a number of concepts have been described to capture the sense that certain parts of a text receive more emphasis than others: foreground, theme, and topic, for instance. These have also been elaborated in ways which stress the importance of a main, or thematic, character as a component of the structure. However, I would suggest that these theories do not capture in full what I would want to describe by main characterhood. In particular, their linguistic origin means that definitions are often intuitive, and, crucially, takes emphasis away from considering the processing consequences of identifying such entities

Attempts to characterise a *topic* in discourse linguistics seem to be driven by two intentions: first, to capture the intuitive sense that a text has some definable point; and second, because such a notion seems essential to defining other important concepts in the study of discourse, such as relevance and coherence (Brown and Yule, 1983: 68). In reviewing this literature, Brown and Yule discuss ideas of a

theme as a way into the broader notion of topic. They emphasise the formal origins of the term theme, as identifying the left most constituent[24] in a sentence (Halliday, 1967). Though this is an objective, linguistic definition, they still consider theme as attempting to capture a psychological fact: that - as any verbal material will always reach its recipient in a linear order - the left most constituent represents a point of departure, the context against which the rest of the sentence is interpreted. Thus, while the propositional content of, *John kissed Mary.* and *Mary was kissed by John* is identical, the two word orders suggest interpretations which put different emphases on the event.

From this basis, the concept of theme has been broadened to larger segments of text, such as paragraphs, and to the text as a whole[25]. At the level both of paragraph and text an initial sentence will provide the context for what follows However, as Brown and Yule note, there is little consensus on a common definition for the theme of a discourse, certainly the formal definition (as the left most constituent) is lost. They describe one proposal, originating with Katz (1980), to the effect that the theme is the common subject of the sentences in the discourse; but this seems an oddly prescriptive conception, describing only a small subset of texts. Other authors have used the term not to refer to a linguistic constituent, but directly to its referent (Brown and Yule, 1983: 135; Perfetti and Goldman, 1974). As Brown and Yule (1983: 135) suggest, this usage leads naturally to an interpretation of theme as meaning main character: "The discourse process of thematisation referred to by Perfetti and Goldman then leads to the *foregrounding* of a referent, as described in Chafe (1972), whereby a particular referent is

established in the foreground of consciousness while other discourse referents remain in the background." Again, there is a strong psychological element to this definition, with its appeal to the notion of the "foreground of consciousness" Such mental foregrounding is seen as having a further, linguistic, consequence, in that it allows the foregrounded referent to be referred to by a variety of different formal expressions. Thus if *Dr Jones* is thematised, further reference can take the form of *the doctor*, *the surgeon* or *he*. The relation of ideas of a Main Character, "the foreground of consciousness", and linguistic reference are discussed in section (4.3.), below.

Given the terminological confusion, Brown and Yule themselves assert the usefulness of defining a *topic entity*, though they also discuss this as *the topic entity/ main character* (Brown and Yule, 1983: 138). They divorce this from any formal requirements that the topic entity needs to be always the left most entity, as in the formal definition of theme, or the subject of the sentences in the discourse, as in Katz' description. They also distinguish it from the looser notion of topic in general - roughly, what is being talked about - used in much discourse linguistics. They claim it is a narrower and more precisely specifiable notion, identifying a specific referent. However, it is still not clear what determines the topic entity. The example given is an obituary, with the topic entity clearly signalled by a naming title; but this is a very restricted type of text. Neither is the explanatory purpose of defining this concept clear, beyond the general assertions, noted above, that it is important in considering ideas of relevance and coherence. However, the concept is never mentioned in Brown and Yule's own chapter on coherence.

Theoretical work in discourse linguistics thus seems consonant with my own hypothesis in stressing that text has structure, and that the distinction of a marked character is important in this. There are some hints at aspects of text structure important in signalling marked characterhood (early mention, sentence subjecthood) and suggestions about the effects of this character on the rest of the discourse (allowing anaphoric reference). However, this work is limited by the scope of the linguistic tradition. It makes appeal to psychological facts, but there is no investigation of the psychological properties or consequences of the presence of a marked character in a reader's mental representation.

A slightly different conception of topic does receive psychological investigation in Clifton and Ferreira's (1987) study. This is discussed in section (4.3.2.) below.

4.2. Main Character and causal chains

While discussing theories of inference in Chapter 2 I introduced theories of causal inference. These claim that inferences are made to connect the statements that set out a character's goals to the statements expressing their outcome. Such theories of inference are dependent on theories of text structure which can independently identify the relevant statements and their links. This has been developed in causal chain analyses of text structure (Myers, 1990; Trabasso and Sperry, 1985; Trabasso and van den Broek, 1985). Causal links are identified by applying a test of necessity to potential pairs: if event A had not occurred, then, in the circumstances of the story, event B would not have occurred. Causal chains are derived

from the resulting pairs: the goal which initiates the story and its eventual attainment or frustration provide a frame, while events which have causes or consequences leading from the opening to the closing are in the causal chain. Events lacking causes, or not on a path to the closing event, are dead-ends.

I have already discussed controversy over the reality of inferences constructing such a causal structure during reading. Less controversial is that the independently defined structures do provide good predictors of readers' judgements of importance (Trabasso and Sperry, 1985) and of recall: information on the causal chain is more likely to be recalled than other information (Trabasso and van den Broek, 1985). In addition, the speed of recall for a piece of information increases with the number of causal connections to it (O'Brien and Myers, 1987).

What is important for the present discussion is the relation between goals and character status. Goals will of necessity be the goals of some agent, but by stressing an overarching goal frame, with an initiating cause and final conclusion, one character is seen as having particular status. Indeed several researchers in causal structure and inference talk in terms of a *protagonist*: the initiating condition for the story is "the protagonist's goal(s)" (Trabasso and Sperry, 1985: 605; Trabasso and van den Broek, 1985: 618); "[An] implicit assumption of several causal reasoning models is that readers adopt the goals of a narrative's protagonist during text comprehension" (Albrecht et al, 1995: 364). However, there is a problem of primacy here. Does the protagonist gain its status through carrying the initiating goal, or does the protagonist's status place this character's

goals at the heart of the causal structure? If the latter is the case it may be that the proposed causal inferences can be reconceived as MC controlled inferences.

In the example passages considered this issue is invisible since the causal protagonist - i.e., the character whose goal initiates the story - is also clearly the focused character (using Garrod and Sanford's operational definition as the person who the story is about.) However, it is not difficult to conceive of a discourse in which this is not the case.

(1) Babysitting

> It was a boiling hot day in London. The young boy was thirsty and cried mightily. Jane knew she would have to get him a drink, but there was nothing in the house. She went to the shopping arcade, but it was closed. Luckily she remembered the newsagent in the station. There she bought a can of lemonade, with which the boy was satisfied.

Following the test proposed by Trabasso and his colleagues, the young boy's thirst is the initiating condition on which the rest of the story depends, with the last clause providing satisfaction of the goal. Hence, the young boy is the protagonist. However, using Garrod and Sanford's definition, then, on my intuitions, this is Jane (cues for her status are naming, repeated mention, agency, the biasing title, reporting of her mental states.) Thus it is apparent that following Trabasso's analysis the causal structure has primacy in determining the protagonist, rather than vice versa. It might be argued that we forget about the boy's thirst, meaning no causal inference is made to connect the information in the final clause to the initiating condition

of his thirst, and instead Jane's search for a drink becomes the frame of the causal structure. In this case it is character status which is determining who is the causal protagonist; this seems plausible, but cannot be accounted for by Trabasso's procedure for determining the causal chain. (Note that I demonstrate the separation of the causal protagonist and the pronominal focus in section (4.3.5.), below)

The causal protagonist, as defined by Trabasso and colleagues, is not identical to the focused character (whether we call that the TS or MC). It may be, however, that this definition does not accurately capture the causal reasoning performed by readers, exactly because it fails to take account of the role of the MC. With this as the locus of inference, readers will make inferences around it, including completing causal connections, that will not be made of other characters. While I have shown that being the causal protagonist does not determine the MC, it also remains possible that, if a character's goals initiate an important aspect of a story, then this will contribute to its status - this is a plausible cue for determining "who the text is about". The factors determining MC status are discussed in (4.5.) below.

4.3. Focus and pronoun resolution

On its own a pronoun[26] is descriptively empty, though in English the form gives some restricted information, about number and gender (*he* versus *she* versus *they*.) In discourse a pronoun gains reference by pointing to an entity within the discourse representation, introduced by some other, usually preceding, referring expression. Before turning to the question of how one particular entity is chosen from amongst those previously mentioned, I shall discuss briefly the

use of this psychological characterisation, in terms of the pronoun pointing to an entity in the discourse representation, rather than a linguistic description, with pointing to the preceding text. This has important implications for the nature of main characterhood.

4.3.1 The Psychological nature of focused character

We can imagine the following text as part of the instructions in a recipe: *Crush a clove of garlic. Next, add it to the pan.* What does the pronoun *it* refer to in the second sentence? It might be proposed that it refers back to the linguistic item, *a clove of garlic*[27]. We could indicate this by adding indices to the two phrases: *Crush a clove of garlic*$_i$. *Next, add it*$_i$ *to the pan.* However, what is added to the pan is not a garlic clove, the referent of this noun phrase, but a crushed clove of garlic, the product of the process described by the first sentence. Thus the pronoun is pointing not to the words of the linguistic phrase, but to an element in the reader's evolving mental representation of the scene described. The same fact underlies a slightly different phenomenon, illustrated in the following short text (adapted from Sidner, 1986: 363): *I ate a huge red tomato. They can be very tasty.* There are no linguistic elements that could be antecedents for the plural anaphor, *they*, yet the text seems acceptable. This is explicable if we conceive of the NP *huge red tomato* as introducing an element into the reader's mental representation which contains the information

Tomato:
- class: tomatoes
- number: one
- colour: red
- properties: huge

This mental schema includes the information *class: tomatoes*, which can serve as an antecedent for the plural pronoun, *they*. The status of pronominal antecedents as elements in an interpretative mental model is confirmed in an experimental study by Clifton and Ferreira (1987). Subjects read texts including a target sentence with a plural pronoun. This referred back to two singular elements that either formed a plural linguistic constituent (through conjunction, *Samantha and David*) or had no linguistic relation. They found that the lack of a plural linguistic antecedent had no detrimental effect on interpretation, as indexed by reading times.

Can this characterisation of pronominal antecedents as mental entities be extended to focused characters? I suggest this is definitely the case. To begin with, it is not clear how the status of the MC would be indicated in a purely linguistic representation, in the way antecedence was represented by co-indexing. Moreover, as illustrated for the pronominal antecedent in the case of the *huge red tomato*, the MC (or in this case Main Object) allows access to rich semantic information. Consider the following examples:

(2) The actress loved to live dangerously. She fell from the 14th storey window.

(3) The vase was immensely valuable. It fell from the 14th storey window.

If we assume that the actress and the vase are the respective MCs and that (2) produces the inference, the actress is dead, and (3), that the vase is broken, then the difference in the content of inference resulting from identical predicates must depend on information - about animacy - contained in the representation of the MC. On the

basis of this evidence I propose main characterhood is a description of a mental rather than a linguistic phenomenon.

4.3.2 Structure based models of pronominal focus

As a process anaphoric resolution poses a complex problem, how is the identity of the antecedent determined from amongst the entities previously mentioned. For instance, in this example, adapted from Sidner (1986: 373) number and gender information underdetermines resolution :

(4) Sandy came across a bull whilst walking her dog one day.
She saw how he threw back his great menacing horns.

This example nicely illustrates that the additional source of information called upon is semantic: the pronoun is resolved to the entity representing the bull because it is implausible for a domestic dog to throw back great menacing horns. This procedure has been formalised in computational models incorporating notions of chains of inference (Hobbs, 1977). An inferential chain is built to link some known property of the pronoun with a preceding phrase, which is taken as the antecedent. In the example, the second sentence contains the information that the referent of the pronoun *he* has menacing horns. From our world knowledge we know that bulls have horns and maybe threatening, we can thus infer these properties of the particular bull mentioned in the first sentence. This completes the inferential chain, with the antecedent of *he* located as the referent of *a bull.*

However, such a system is very inefficient. The discourse context of the second sentence contains two entities that, on the grounds of

number and gender, are possible antecedents. If *dog* were considered first, a large quantity of inferential effort might be expended before this were rejected. Other situations could involve a larger set of potential antecedents, and a more complex inferential chain. For instance, the following example, (5), introduces four syntactically possible antecedents for the pronoun in the second sentence, in a longer discourse the number could be a lot more:

(5) Jane asked her sister's friend Susan to her party, but Susan's mother forbade her to go. In the end she sneaked out anyway and had a great time.

The system of inferential chaining needs to be complemented by some additional procedure which will determine the most effective order in which the potential co-referents should be considered. The computational approach taken has been to define *focus systems* as heuristics that control the order of search. These use information available from the discourse context to rank representational entities in order of the probability that they will serve as antecedents for any incoming pronouns (the information used may be purely structural or involve content, depending on the system, I discuss this below). In particular, one entity is identified as the primary candidate for antecedence, often described as the focused entity, or pronominal focus.

Note that this entity will be the locus of inferences to check its plausibility as the pronoun's antecedent (this plausibility check will be the final arbiter of the relation, if it fails the entity will be rejected and the next candidate on the list tested.) There are thus strong grounds for seeing it as identical with the entity identified in my

earlier concept of the topic of inference, or Main Character. If this is not the case we will need to posit two systems operating during interpretation, one selecting a primary candidate for inferences to establish reference, and another controlling other inference, such as the attributional inferences described by Garrod and Sanford. I Explore this issue in the rest of this section; considering the input information and computational processes of various focus systems, and the validity of their output.

A simple system could simply order entities in terms of recency, with the most recently mentioned as the focus (Hobbs, 1976). However, most systems devised by computational linguists use more complex algorithms, taking as input the linguistic form of each incoming sentence as they cycle through a text. The claim that this information is sufficient for determining focus is explicitly made by Sidner (1986: 372) : "the choice of expected focus has been shown to depend upon the grammatical relations in a sentence" (though note Sidner includes thematic roles as a part of "grammatical relations"). Sidner's own model consists of three distinct processes. The first applies to the opening sentence of a passage and attempts to establish a focus on the basis of reliable indicators (e.g. there insertion sentences, *There was a dog*, clefts, *It was the Italian waiter who*) or failing this uses the verb theme as a default. Other entities introduced in the sentence are placed in an ordered list of potential foci. The second process is the pronoun interpreter. This uses the established focus and potential foci to control the inferential processes of pronoun resolution: any pronouns are tested against syntactically possible entities in the order specified. Thirdly, completing the model, is the mechanism for updating the state of focus. If an anaphor in the

sentence just read takes as antecedent the item already in focus, then this is maintained and the input list of potential foci dropped. If, however, an anaphor co-specifies with one of the potential foci then this becomes the focus and everything else in the input is dropped. The potential focus list which accompanies the retained/ new focus as the input context for the following sentence is made up of any other entities mentioned in the current sentence. This has an internal order according to the following preference list:

1. The theme of the verb.
2. All other NPs in thematic positions, excluding the agent position (the NP which is the actual focus is also excluded from this list).
3. The main VP of the sentence.

The process is cyclic, after the opening statement of a text, stages one and two are performed for each incoming sentence.

That a pronominal focus derived by this model can be shown to be the locus of referential inferencing is illustrated with the following example discourse:

(6) (6.1) James turned to take a look in the desk drawer. (6.2) He wanted to use his favourite pen. (6.3) He had used it for all his best work. (6.4) Unfortunately, however, it was broken.

In the third sentence (6.3) the potential focus item, *his favourite pen*, is confirmed as the actual focus through being co-specified by the pronoun *it* (*his desk drawer* being rejected during inferencing as a possible object form being used for *all his best work*.) This establishes the focus context for the interpretation of (6.4), where the predicate *was broken* could be equally applied to pen or drawer and

give a plausible discourse. However, it is intuitively apparent that the pronoun co-specifies with *my favourite pen*, the focused item. If the intended referent is the drawer, this must be specified with a full NP: (6.4') *Unfortunately, however, the drawer was broken.* In both the earlier examples, about Sandy's walk and Jane's party, the algorithm specifies as the focus the correct potential antecedent. Without such a control mechanism there would be no reason to select these as the first candidates, and considerable inferential effort would be wasted. Moreover, with the focus model providing a hypothesised antecedent there is no need for inferencing to do more than check that this referent does not lead to a contradiction; without such a hypothesis a more definite inferential chain would have to be built.

Computational pronominal focus procedures such as Sidner's are heuristic: they aim to produce a best-guess as to which entity will be the antecedent of incoming pronouns. This is not a rule governed domain, and so no procedure will always be correct in its predictions. This is not in conflict with the proposal that the focused entity in the pronoun resolution system is also the inferential focus. This, too, is a preference exhibited by the discourse interpreting mechanism on the basis of the discourse context, and further information may force inferences to be made about a subsidiary character. For instance, take the following discourse:

(7) John was perusing the paper. He read about the actress's fall from the 14th story. The funeral was scheduled for next Tuesday.

Here local coherence between the second and third sentences demands making the inference that the secondary character, the actress, has died from her fall.

However, I would suggest that Sidner is over-confident in stating that grammatical relations alone are sufficient information to accurately specify the pronominal focus. Indeed, this would be unlikely. Structural linguistics has taken the sentence as its upper-bound since this is the largest domain within which the notion of well-formedness can be given a precise characterisation, and hence the largest domain in which formal rules of generation (or analysis) will capture the data (Horrocks, 1987). Discourse is a domain which displays regularities of form, rather than rules (see Chapter 1; also Brown and Yule, 1983). Hence for a discourse phenomenon, including inter-sentential anaphora, any attempt to capture data using a system of rules operating over grammatical categories will not be effective for all cases. The problems are apparent if Sidner's proposals are compared with others, also based on grammatical information. There are clear contradictions in the predictions made by different systems, indicating that this information is insufficient to determine focus. For instance, Sidner proposed that the thematic position given the lowest priority in the potential focus list is that of the agent[28]. This is justified by the following example, where the pronoun in the second sentence is associated with the theme of the first, though the agent is syntactically and semantically acceptable:

(8) A group at HXN developed a high speed technical chip packer. The press gave it rave reviews.

However, it is easy to think of exceptions to this rule where exactly the reverse occurs:

(9) Mary raced Susan to the gate. Running always made her happy.

(10) The road parallels the railway as far as Birmingham. The bridges that cross it are mostly made of brick.

Moreover, in the *centring* model of computational focus proposed by Grosz and her associates (Grosz, Joshi and Weinstein, 1986, Grosz, Weinstein and Joshi, 1995) the agent is taken as being the focused entity itself[29]. The evidence cited is the discourse (I have shortened the example,)

(11) Susan just gave Betsy a wonderful bottle of wine. She told her it was quite rare. Wine collecting is her main hobby.

The pronoun in the final sentence is taken to refer to Susan, despite Betsy being equally plausible on syntactic grounds. Hence the focus context against which this sentence is interpreted must rank Susan highest, even though in the preceding sentence this referent - specified by *She* - is in the agent position, and Betsy is both in the theme position and pronominalised[30]. This contradiction between the output of computational models, in terms of the character specified as focus, indicates that grammatical information alone is insufficient for an accurate prediction.

Some psycholinguistic treatments have also appealed to structural facts to determine pronominal focus. Clifton and Ferreira (1987) challenged the theory that the recency of an antecedent could explain the relative ease of pronoun resolution. They suggested deeper

processing issues were at stake, and that distance itself only caused difficulty if the antecedent had been lost from active memory, that is had ceased to be the "topic of the discourse". To test this hypothesis they constructed materials that could realise a focused or non-focused antecedent condition. The following examples of their passages have the target sentence italicised, the first passage (12) realises the antecedent-as-topic condition, the second (12') the antecedent-out-of-topic:

(12) Weddings can be very emotional experiences for everyone involved. The cigar smoking caterer was obviously on the verge of tears, and the others were pretty upset too. In fact, the organist, who was an old maid, looked across the room and sighed. */She was/ still looking/ for a husband./*

(12') Weddings can be very emotional experiences for everyone involved. The cigar smoking caterer was obviously on the verge of tears, having just noticed that the organist, who was an old maid, was holding hands with someone else. */She was/ still looking/ for a husband./*

Distance from antecedent to pronoun was also varied; this was achieved by swapping over the introduction of the two characters. Subjects read passages phrase-by-phrase, the divisions in the target sentence being illustrated by slashes (for the target sentence only) in the above example. It was found that, while the distance manipulation produced no effect, the antecedent-as-topic conditions were read significantly more quickly than their out-of-topic counterparts (in line with other phrase-by-phrase work the effect emerged in the region following the pronoun.) The hypothesis is supported.

However, Clifton and Ferreira raise further questions. The materials were composed using Ehrlich's (1983) definition of sentence topic. This appeals to the notion of "what a sentence is about", but attempts to define this in some specific, structural ways by reference to the functional linguistic tradition, which parses sentences into a topic (roughly, the person or thing about which something is said) and comment (the further statement made about this person) (Quirk et al, 1985: ch 18 and 19). Although this is distinguished from a simple notion of given and new information, the primary determinant of topichood is mention in the previous sentence in a marked position: hence in the above example the topic in the target is the subject of the sentence preceding it. Clifton and Ferreira noticed that within their antecedent-out-of-topic condition passages there were two types. In some, as above, the antecedent is subordinated within a complement clause of the gerundive verb, in others it is the direct object of that verb. In a post-hoc analysis these were separated out. The RT advantage for the antecedent-as-topic remained only in the comparison when the non-topic was also in a subordinated construction; when the non-topic was part of a matrix clause the two antecedents gave statistically identical results. Clifton and Ferreira conclude that topicality (on Ehrilch's definition) is not sufficient to explain the results; this is a linguistic category that has failed to explain what determines an entity remaining in active memory. They suggest as an alternative turning to Grosz's centring theory. They note that this would distinguish between the non-topic in the matrix clause and the non-topic in the subordinate clause versions of the antecedent-out-of-topic materials, in line with the difference in results. In the former case both topic and non-topic are Cfs, or forward looking centres, in the context for the target sentence, while

in the latter case, only the topic is in the Cf list. However, as I suggested above, there are problems with any such system based on grammatical relations.

4.3.3 Content and the determination of pronominal focus

My criticism of systems based on grammatical relations has been made in terms of the information used underdetermining the required output, and hence conflicting conclusions coming from different systems. However, there is also experimental evidence that other information is important in specifying pronominal focus. In particular, semantic information is utilised. Garvey, Caramazza and Yates (1976) show that with sentences such as:

(13) John blamed Bill because he spilt the coffee.
(14) John confided in Bill because he stole the money.

readers show a bias to select Bill as the antecedent of the pronoun in (13), but a bias towards John in (14). This is despite an identical grammatical (including thematic) structure between the two examples. The authors propose that these biases can be accounted for by what they term the implicit causality of the verbs used: this imputes the cause of an event or action to the subject or object of the verb, and predisposes readers to select that antecedent as the referent of incoming pronouns. In other words, a semantic feature is determining the focus context for interpreting the upcoming clause. Ehrlich (1980) explores further complexities in this situation. She shows that the conjunction used is also important in determining the antecedent selected. Thus with the following sentences:

(15) Steve blamed Frank because he spilt the coffee.
(16) Steve blamed Frank but he spilt the coffee.

readers show a bias to select Frank as the antecedent in (15), but opt for Steve in (16). Thus the meaning of the conjunction is a further input to specification of the pronominal focus.

A further set of data that indicates the need to consider semantic, as well as grammatical, issues in the determination of focus is presented by Anderson, Garrod and Sanford (1983). This relates to the mental persistence of the focused character. For any situation we have an expectation about its duration. Anderson et al constructed materials describing various situations, then introducing a time shift which was either within or without the expected duration of the event. In the latter case the time shift thus signals a new episode in the story. Following this time shift statement a question was asked, about either the main (that is focused) or subsidiary character. Naming versus role description was used to determine character status, as in the experiments described in (2.8.) and (3.3.3.); see (4.5.1.) for an explanation.

(17) In the Restaurant

The Browns were eating a meal in a restaurant. The waiter was hovering around the table. This restaurant was well known for its food. {Five hours/ Forty minutes} later the restaurant was empty. {They/ He} had enjoyed {eating/ serving} all the good food.

Were the Browns eating in a restaurant?

Did the waiter enjoy serving?

There was a substantial difference between question answering times, depending on whether these referred to main or subsidiary character. More interestingly there was also a significant interaction between character reference and time shift: while this variable did not effect responses to main character questions, response times for

subsidiary character questions were lengthened when the time difference marked a shift in episode. RTs were also taken for the final sentence, where pronominal reference is made to one or other character. Here the pattern of results was the same, but the interaction did not reach significance. The interpretation made by the authors is that secondary characters are represented in relation to a particular scenario, and that if the text signals that this is over then the representation of that entity is lost to active memory along with the rest of the scenario. Access to the information needed to answer a question about that character is thus harder. The main character, by contrast, remains in the focus of readers' attention. Again, note that such an effect on the state of focus is not predicted by structure-based systems such as those of Sidner and Grosz. Only a focus system sensitive to semantic information - the stated time shift and knowledge about the duration of events - could capture this effect.

The complexity of the focus system which results from its use of semantic information is apparent in the studies reported by Morrow (1985). As with any focus system, Morrow argues that the process of pronoun resolution is, in part at least, top-down: guided by the discourse representation already constructed by the reader. However, Morrow introduces a new element by suggesting that a key aspect of the discourse context is the representation of a character perspective. Several pieces of empirical evidence are presented to show how character perspective can affect pronoun resolution.

Morrow's first experiment uses an off-line judgement task to probe readers' preferences for the antecedent of a possessive pronoun. The

experimental conditions were formed by manipulating the sentence immediately preceding the pronoun, and hence the current state of the discourse representation. Morrow constructed passages introducing two characters interacting in some situation, but with one clearly marked as the principal protagonist (through frequency of mention, initial introduction, placing as grammatical subject, explicit use of his perspective). The penultimate (i.e. manipulated) sentence referred to the nonprotagonist, thus making this the last mentioned character prior to the critical pronoun. However, in addition, there were two versions of this sentence. It either continued with the established perspective of the protagonist, (a) below, or explicitly changed perspective to that of the nonprotagonist, (b).

(18) Paul caught the flu and was feeling pretty awful. He told his eldest son Ben to keep the house quiet. He got up from bed to the bathroom, irritated by the noise. Traffic was rushing by the house. The kids were arguing in the den.
(a) That noisy Ben was messing up the kitchen.
(b) Ben was wondering when his father would feel better as he ate in the kitchen.
The floor was cold on his feet.

Subjects were asked to identify the character represented by the possessive pronoun in the final sentence; i.e. answer the question *Whose feet are referred to?*[31]

In the type (a) passages, i.e. with a consistent perspective, subjects almost always selected the protagonist as antecedent. This preference was highly reliable. Thus character status within the narrative is again seen to affect pronoun resolution, overriding simple recency. However, the situation is more complicated with the

type (b) versions. The basic preference was reversed: subjects preferred the nonprotagonist as antecedent by a ratio of 0.64 to 0.34 (a small number of responses mentioning neither character). A difference which was, again, statistically reliable; although the nonprotagonist preference here is not as marked as that for the protagonist with the (a) versions.

Thus it seems that whilst protagonist status easily dominates recency in determining antecedence when this is congruent with perspective, if perspective (again a semantic factor) is switched to the nonprotagonist, then antecedent preference is also affected.

Morrow interprets these results by separating prominence, protagonist status and perspective. He suggests that assignment is driven by prominence, this is a psychological fact and equivalent to what I have termed pronominal focus. Prominence is itself determined by several factors, but prominent amongst these are protagonist status (itself seen as determined by a bundle of structural and semantic features) and perspective. Thus in the (a) versions, where protagonist status and perspective are maintained in congruence throughout, there is an unambiguous preference for the character so marked. In the (b) versions, subjects' selection of the nonprotagonist suggests "that readers took the nonprotagonist's perspective at that point, making him more prominent than the protagonist" (Morrow, 1985: 308). However, this pitting of perspective against protagonist status means the relative prominence of characters is less clearly differentiated than in the (a) versions, and hence the preference is weaker. I say more about perspective and Morrow's results in (4.4.2) below.

4.3.4 Pronominal focus and Main Character: the case for identity

Given the role of semantic information in determining pronominal focus, as illustrated in the preceding section, some researchers have employed intuitive, content driven, characterisations, in terms of who, or what, the text is about. For instance, Marslen-Wilson and colleagues (1982) conducted a study of referent and anaphor production in spoken discourse, and were able to account for most instances of pronominal reference using such a definition. Their subjects read a comic book story, and were then asked to outline the plot for a hearer. In analysing the referential forms produced, Marslen-Wilson et al assigned each usage to one of three hierarchical levels: the story as a whole, an episode within the story, or an event making up one of the episodes. They also considered whether reference was to a focused or non-focused antecedent at that level. As mentioned, focus was determined intuitively in terms of "who the central actor or actors are in an episode or event" (Marslen-Wilson et al, 1982: 347). Of 35 uses of a personal pronoun, 30 were at the event level, and 28 of these were to the focused antecedent. Thus this definition appears to capture successfully the preferred context of use for pronouns.

A related distributional study has been performed by Fox (1984), with an extensive survey of anaphor distribution, this time in written English narratives. From her corpus she has derived a broad principle for pronominalisation: a referent can be referred to using a pronoun until another character's goals and actions are introduced, unless those goals are interactive with the first character's, in which case pronominalisation can still be used. The implication is that if

there is a long gap between mentions of a referent - even if this includes reference to another character, so long as this is not assigned goals or actions - a pronominal anaphor is still likely. This is illustrated in the following two examples (italics are mine)[32]

(21) A girl stood before him [Stephen] in the midstream, alone and still, gazing out to sea. She seemed like one whom magic had changed into the likeness of a strange and beautiful seabird. ... But her long fair hair was girlish: and girlish, and touched with the wonder of mortal beauty, her face.
She was alone and still, gazing out to sea; and when she felt *his* presence and the worship of his eyes ... .(James Joyce, *A Portrait of the Artist as A Young Man*).

(22) But though she did not speak, Katherine had an uneasy sense that silence on her part was selfishness. It was selfish of her to continue, as she wished to do, a discussion of subjects not remotely connected with any human beings. She roused herself to consider their exact position upon the turbulent map of the emotions. Oh yes - it was a question whether Ralph Denham should live in the country and write a book; it was getting late; they must waste no more time; Cassandra arrived tonight for dinner; *she* flinched and roused herself ... .(Virginia Woolf, *Night and Day*)

Thus the conditions of pronominal reference are again seen as semantic (dependent on the expression of goals and actions,) and the controller of pronominal reference over an episode is defined in terms of who that episode is about.

It will be recalled that "what the text is about" is the operational definition that Garrod and Sanford (1988) give to their concept of the Thematic Subject. Indeed, these authors see the TS acting as pronominal focus, "the character who fills the role of Thematic

Subject is most prominent in the mind of the reader and hence a preferred candidate for any textual device which signals reference maintenance, such as a pronoun or null anaphor" (Garrod and Sanford, 1988: 525). Note, however, that the functions assigned to the TS go beyond being the preferred pronominal antecedent. In particular, this character is also the locus for non-referential inference (what I have called the Main Character in this chapter.) Thus, by subsuming these functions under the single notion of the TS, the authors assert that the same mental object performs both.

Are the pronominal focus and MC identical? There is an intuitive appeal to this. First, there is a parsimony to having referential and non-referential inference controlled by the same object. Second, the point expressed in Garrod and Sanford's definition of the TS, in the absence of more precise definitions both seem best characterised in identical terms as what the text is about. Strong empirical proof to back this intuition is difficult to obtain, as it is for any identity, since we would need to show that on no occasion is there a focused item in the pronoun resolution system which is not the MC (defined as the locus of non-referential inference), or an MC which is not the pronominal focus. The evidence available is softer, but creates a strong case. The strategy employed by Garrod and Sanford is to demonstrate that both functions can indeed be accounted for by a single entity (i.e. they confirm the hypothesis, rather than disconfirming the null hypothesis.) This single entity is the TS, defined as "what the text is about".

It will be recalled that at the end of Chapter 3 (3.3.3.) I reviewed evidence from Garrod and Sanford (1988) showing how a focused

character acts as the locus of attributional inference, at least for what were termed atmosphere statements. Focusing was manipulated by changing which character was named (this is discussed in (4.5.1.), below). In a second experiment reported in the paper (originally in Sanford, Moar and Garrod, 1988) the authors show that the same manipulation also controls the favoured pronominal antecedent. Materials were constructed to give four conditions. These resulted from the crossing of two variables: antecedent distance, the antecedent was either in the first or the second sentence of the passage; and antecedent type, the antecedent was either the focused or the non-focused character. In the following example, (19), curly brackets represent alternatives forming the four conditions (distance being manipulated through the gender of the target pronoun; type through naming versus role description).

(19) {Mr Bloggs/ The manager} was dictating a letter. {Claire/ The secretary} was taking shorthand. It was getting to be late in the afternoon. {He/ She} was feeling hungry.

Reading times for the target were statistically identical across the levels of the distance variable. However, the character type of the anaphor produced a marked, and highly significant, effect, with a mean RT of 2172 ms for the targets referring to the focused antecedent, as against 2461 ms for those with a non-focused referent. Note that none of the formal systems described earlier would predict this result. Neither the Sidner nor Grosz systems are sensitive to naming as a focusing device, while both depend on continued pronominal reference to keep an introduced entity in focus, so they would not predict an effect across the third sentence - in which neither character is referenced - here. Similarly, Ehrlich's notion of

topic is restricted to the level of the single sentence, there is no notion of a global topic, as needed here.

The experiment was repeated, but with full, definite NP referents used in the targets. These are not primarily anaphoric pointers to the discourse representation, in the way of pronouns, though they may, as here, co-refer with other items. In the above example the final line would be one of the following options,

(20) {Mr Bloggs/ Claire/ The manager/ The secretary} was feeling hungry.

Again distance had no effect, but in addition, there was no effect of character type. It seems that the RT difference in the pronoun case was due, not to some general advantage with references to named characters, but to the state of the focus system, which is accessed in the anaphoric search triggered by the pronoun. These results have been repeated in more recent work using eye-tracking (Garrod, Freudenthal and Boyle, 1994), where it has been shown that interpretation of a verb is delayed if its subject pronoun refers to a role described character. Again this difference did not emerge with full NP subjects.

Thus, manipulation of which character in a short passage is focused produces parallel effects on attributional inference and on pronoun resolution. It seems that the focused entity is indeed the same object for both these operations[33]. I discuss the relationship of naming to focus in (4.5.1.). In the following section I look at some of the other aspects of the TS, as conceived by Garrod and Sanford, and go on to

argue that we should not see a complete identity between this and the MC, i.e. the controller of referential and non-referential inference.

4.3.5 Main Character and Thematic Subject: The case against identity

As mentioned above, Garrod and Sanford (1988) include the inferential focus within the broader concept of Thematic Subjecthood. The distinction between a Thematic Subject and other participants in a narrative (and in a reader's representation of it) is seen as having a number of consequences for processing. Not only is the TS the locus of attributive inference and the preferred antecedent for anaphoric pronouns, its mental representation also shows a unique mental persistence across temporal shifts in the narrative, this is illustrated below. The TS can thus be seen as a link between the linguistic and the psychological: while determination of a TS is a function of the text and an aspect of its structure, the consequences are felt in its mental processing and representation. Garrod and Sanford note that from a psychological point of view text processing poses a number of problems for the organisation of limited cognitive resources, or, as they put it, of "memory management". If the discourse representation is to be coherent, then incoming material must be linked with two types of information in memory: the existing discourse context, and, as noted in Chapters 1 and 2, the reader's general world knowledge. Moreover, all this must be done with the limited resources of working memory. Garrod and Sanford see the establishment of a focused character as one way of organising this process. Attention is focused on important entities, ensuring that they are continually available to link with incoming information, while these control activation of a structured subset of general

knowledge (see (3.3.2.) above. The processing consequences of distinguishing a TS thus all stem "from the way the TS holds the focus of the reader's attention" (Garrod and Sanford, 1988: 521). My description of the MC as inferential focus, controlling the place of inferential effort and helping to select from the multiplicity of potential inferences those important for a full comprehension of the text, sits comfortably within this conception.

These psychological facts, Garrod and Sanford claim, themselves impact on text structure. Considerate texts will flag a focused character to guide the reader's attention. This cognitive constraint is thus seen as underlying what, they suggest, is a universal feature of narrative: "narratives throughout the world seem to be built around a small number of major participants with one being singled out to play a central role within any stretch of discourse"; this is the Thematic Subject (Garrod and Sanford, 1988: 520). The TS is thus seen as playing a structural role across the discourse, or at least some extensive fragment of it. The concept is linked to the idea of the causal protagonist, mentioned above, and to the descriptive notion of main character used in literary studies:

> In narrative discourse, continuity is typically achieved through the connected actions and plans of main characters, with secondary characters playing only a minor role. ... Normally, the motivations of main characters are of interest, and their actions are seen as significant in contrast to the general actions of minor characters. We might therefore expect that inferential activity related to the establishment of connections would be especially prominent in relation to main characters. If a main character is going to be more prominent in a narrative, then one might expect that character and his actions to be

> more available to reference, particularly pronominal reference. (Sanford and Garrod, 1994: 705).

Whilst I have noted the congruence of many of the factors motivating Garrod and Sanford's description of the TS and those leading to the conception of an MC as the locus of inference, for three, closely related reasons, I believe this full conception of Thematic Subjecthood is untenable; and for these reasons I argue that the idea of Main Character should be kept separate from it. The first relates to the size of discourse fragment within which an entity can be characterised as in focus; I suggest that the inferential/pronominal focus operates within a much more local domain than other aspects of the Thematic Subject, as characterised above. The second relates to the demonstration of an entity staying in focus across temporal shifts; I suggest that this character is not the same as the inferential focus. My third reason revolves around the notion of perspective. This is given full attention in (4.4.2.), below.

If we take the inferential focus to be identical with the pronominal focus, as Garrod and Sanford do, and as I have argued we should, then we must see its domain as highly restricted. The focused entity may well not be that which we would want to describe as the main protagonist for the narrative, the episode, or even the current paragraph, in the manner suggested by the above quotation from Sanford and Garrod (1994)[34]. The following argument is based on intuitions for constructed paragraphs, this is an area where further experimental research would be useful. For instance, take this single paragraph story:

(23) **John's Bad Day**

John had an awful day at his office, and he'd come to the restaurant to get a decent meal and forget his difficulties. As he ordered his food, John noted with pleasure the waiter's helpfulness. He pointed out a couple of house specialities and suggested a good value wine. What a pleasant change it all was.

The story is about John: this is signalled in the title, and enforced by first mention and naming. John is also the causal protagonist, see (4.2.) above: his bad day initiates the chain of events; at a broader descriptive level, the passage is about John's change of circumstances. Within this narrative, the waiter plays a supporting role, affecting John's mood. However, if we were to insert a new penultimate sentence beginning with an anaphoric pronoun, *he*, focus information does not clearly link this to John (the following verb would give disambiguating information, but something roughly equally plausible for both characters maintains the ambiguity: *He smiled cheerfully.*) I would suggest the pronominal focus at this point is, rather, the waiter (as Grosz's centering system - see (4.3.2.) - would predict, this entity having been pronominalised in the preceding sentence). Thus if it starts with a signal of topic continuation, such as *Moreover*, the preferred referent is the waiter: *Moreover, he smiled cheerfully.* As we would expect there is also an effect on the inferential topic. If we were to introduce an atmosphere statement in the penultimate sentence position, *The restaurant was warm and friendly*, the passage reads oddly. Up to this point only John's perspective on the scene has been introduced, this makes shifting to the waiter's perception odd, but he is the inferential focus here, and hence the preferred site of attribution (below I argue for a separation of perspective and inferential focus.) If the preceding sentence is replaced by one

maintaining focus on John, *He ordered a couple of house specialities along with a good value wine*, then a following atmosphere statement reads far more naturally.

It might be argued that the waiter is exactly who the text is about at this point, fulfilling my earlier definition of Thematic Subject. This I would accept as true, but it illustrates that this notion must be applied to a much more local level of text than that Sanford and Garrod appeal to in their characterisation of the principal character quoted above.

The inferential focus (i.e. MC) at the point of processing a particular clause, and the principal characters for a whole text, are categories at different levels of description. The former belongs in a cognitive explanation, the latter is primarily literary. This is not to say that main character in these terms may not have processing consequences: it seems plausible that when the TS is also the inferential focus then the inferences made are richer, but this needs empirical demonstration, and as I have argued these two entities are not identical[35].

Garrod and Sanford suggest that the marking of a Thematic Subject can be seen to explain three phenomena: pronominal antecedent preference, the locus of attributional inference, and the persistence of certain characters across temporal shifts. My second argument against this conception of Thematic Subjecthood is that the last of these effects needs a separate explanation to the former two. I have noted that in the following example,

(24) **John's Bad Day**

John had an awful day at his office, and he'd come to the restaurant to get a decent meal and forget his difficulties. As he ordered his food, John noted with pleasure the waiter's helpfulness. He pointed out a couple of house specialities and suggested a good value wine. Moreover, he

the pronoun *he* in the penultimate sentence prefers the waiter as antecedent. However, if we introduce a time shift:

(25) **John's Bad Day**

John had an awful day at his office, and he'd come to the restaurant to get a decent meal and forget his difficulties. As he ordered his food, John noted with pleasure the waiter's helpfulness. He pointed out a couple of house specialities and suggested a good value wine. Moreover, the next day he

then the preference switches to John. In other words, the pronominal focus is not identical with the main character, defined in terms of independence from temporal shift. This is also apparent in examples using topicalising syntactic constructions. If a character is introduced by a cleft, then it is the focused entity for incoming anaphoric reference (see the discussion of Sidner's system in (4.3.2.)):

(26) It was the Italian waiter that John found polite and helpful. He...

However, if a time shift is introduced the preference may be different:

(27) It was the Italian waiter that John found polite and helpful. The next day he...

I would suggest that in these examples the scenario dependent character, the waiter, is focused, but that time shifting information

acts as a trigger to reinstate a previously focused entity, the scenario independent character. In cueing a shift in focus the time adverbial phrases are acting much like full NP referents, or the conjunctions (*but, because*) discussed above. Again, this is not to deny a special status to the Thematic Subject, here as identified by continuity across temporal shift, but it is to challenge it's identity with the pronominal and inferential focus, the MC.

4.4. Main Character and perspective

There is one further effect of the Thematic Subject on interpretation mentioned in Garrod and Sanford's discussion. This is that the marked character determines the perspective taken on the events described; that is, they are seen from this character's point of view: "We suggest that key entities influence ... the perspective which is taken in the representation (Garrod and Sanford, 1988: 532); "there is evidence that the main character's perspective is used to describe other characters and parts of the narrative" [36](Sanford and Garrod, 1994: 706). It is suggested that this control of perspective is the underlying cause of the attributional inference effect discussed above (3.3.3.):

> [The TS] will be the individual with respect to which the text is interpreted, the person the text is judged to be about. Hence, it is reasonable that the TS should attract the kind of attributional inferences discussed in relation to the experiment reported above. Perceived states of the world of the kind described by "psychological atmosphere statements" will be construed by the reader as relevant to the goals and problems facing the TS, and so are interpreted through the "eyes" of the TS rather than

through those of any other character. (Garrod and Sanford, 1988: 513)

4.4.1. Main Character and strong perspective: the case against identity

Before exploring the relationship between perspective and main character, in the psychological sense as the focus of inference, it is worth pausing to consider the nature of perspective, which is itself a complex concept covering a range of possible meanings. This is a subtlety that psycholinguistic treatments have ignored, leading to illegitimate generalisations about perspective in general, based on evidence from specific technical uses of the term. There are two points that I believe are important here. First, applied to discourse the term is metaphoric: the literal meaning is of a spatial point of observation, hence Garrod and Sanford's hedged use of "'eyes'" above. Secondly, when applied to any kind of representation it can be approached from both a technical and a sociological, as well as cognitive, angle. The technical aspect is more apparent in visual representation, notably the development of a set of techniques allowing the move from iconicity to depth in western visual art in the Renaissance. But the same is true of representation in text. Here the creation of a perspective, as the term is usually applied to literature to mean the character through whose senses events are perceived, rests on a battery of techniques (organisation of the deictic system, tense and aspect; deployment of questions and explanations, etc.) that emerged with the free indirect style of the nineteenth century and reached its apotheosis in the stream of consciousness of Joyce or Woolf (Banfield, 1982; Ehrlich, 1990; Leech and Short, 1981). Indeed, as Banfield notes, the conjunction of past tense narration with the "Now-in-the-past" of character perspective (itself resulting from the

conjunction of past tense with present time deictic - *Now she was done for!*) results in sentences that are "unspeakable" outside of narrative fiction. In an older narrative we may want to say that the concentration on the interests and goals of a particular character leads to the reader taking his or her perspective, as with Fielding's *Tom Jones*, for instance, but if we compare this with a narrative adopting some of the techniques of free indirect style the difference is clear. These two examples are taken from *Tom Jones* and Jane Austen's *Emma* respectively.

(28) To confess the truth, Jones was less pleased with this last epistle, than he had been with the former, as he was prevented by it from complying with the earnest entreaties of Mr. Nightingale, with whom he had now contracted much intimacy and friendship. These entreaties were to go with that young gentleman and his company to a new play, which was to be acted that evening, and which a very large party had agreed to damn, from some dislike they had taken to the author, who was a friend to one of Mr. Nightingale's acquaintance. And this sort of fun, our hero, we are ashamed to confess, would willingly have preferred to the above kind of appointment; but his honour got the better of his inclination. (*Tom Jones*)

(29) How was she to bear the change? It was true that her friend was going only half a mile from them; but Emma was aware that great must be the difference between a Mrs. Weston, only half a mile from them, and a Miss Taylor in the house; and with all her advantages, natural and domestic, she was now in great danger of suffering from intellectual solitude. She dearly loved her father, but he was no companion for her. He could not meet her in conversation rational or playful. (*Emma*)

It is a difference resting on the use of specific linguistic devices, and which is normally conceived in terms of the emergence of a way, and desire, for rendering character perspective. For the purposes of my argument I term this *strong perspective.*

As with any technology, the use of these visual and written styles was not merely the product of their invention, but the outcome of social and ideological factors that made their use attractive (Banfield, 1982) - and hence their abandonment in much modern visual, and, to some extent, literary, art. My main point here, however, is that strong perspective is not an inherent aspect of narrative, but demands a specific technology and embodies a particular ideological choice.

In contrast, there has been a tendency for psycholinguists to see perspective as a unitary phenomenon, and as a natural and inevitable part of any written (or at least narrative) text. To an extent this is apparent in the quotations from Garrod and Sanford above (if a TS is a universal factor in narrative and the TS determines perspective, then perspective is a universal feature of narrative); and in describing events as "interpreted through the "eyes" of the TS" they do seem to be using perspective in its traditional sense. Heather Stark is more bald in her claims that perspective permeates throughout narrative text, "any description in natural language is always a description from a particular perspective point, or point of view. (...) Every new piece of information that is added to the described world of the narrative implies that there was an agent there who could have perceived or known or thought of what is being added to the narrated situation ... It is primarily by identifying

ourselves with the aims and states of characters that we are drawn into the vicarious experience that a narrative conveys". (Stark, ms.). The construction of a mental representation that encodes perspectival information is thus seen as key part of a reader's process of interpretation: "Readers do not just establish referential links between discourse contributions: the reader mentally simulates the experiences of characters" (Stark, 1987: A108). Stark is correct in these assertions: it is indeed necessary that any new information implies a knowing or perceiving agent. She is also careful to acknowledge the separation of the overall narrator of a passage (sometimes termed the implied author) and the perspective of a particular character from which individual events are viewed (hence we can reasonably discuss the narrator of *A Disaffection's* attitude to Patrick Doyle, even though we would want to say that events are perceived from his perspective). What I would emphasise from my discussion above, however, is that there is no inevitability in the type of strong perspective that we are used to from modern and nineteenth century novels. Indeed, in this restricted, but prevalent, sense (Banfield, 1982; Ehrlich, 1990; Leech and Short, 1981) there is no connection between perspective and the psychological notion of a focused character. In the case of a pre-nineteenth century text such as *Tom Jones* there is an unambiguous candidate for "who the text is about", and this character will often fill the role of the MC, for instance being the preferred pronominal antecedent, but, as noted, this character does not hold the perspective in this strong sense.

4.4.2 Main Character and weak perspective: the case against identity

Garrod and Sanford's discussion elides two different uses of the term perspective. Whilst the earlier quotation invokes a general idea of situations being perceived through the eyes of a particular character, they also define a more specialised sense of the word, relating to their use of the concept of *scenarios*. It will be recalled from (3.3.2.) that, to explain readers' access to a limited set of relevant background knowledge, it is suggested that texts cue particular scenarios held in long term memory. However, for any general scenario there are likely to be many specific instances which represent the situation from different perspectives. For instance, an incidence of economic exchange can be represented from the perspective of the buyer or seller. The technical sense of perspective defined by Garrod and Sanford is thus the character who controls the particular schema evoked. Their claim is that this is the marked character they define as the TS. For clarity I will call this *weak perspective*.

However, as I indicated above, while the idea of a scenario controlling character, the TS, gives a valuable explanation of certain phenomena, I suggest that this is independent of the Main Character as controller of inference. This argument can be illustrated if we look back at example (23) above, repeated here:

(23) **John's Bad Day**

John had an awful day at his office, and he'd come to the restaurant to get a decent meal and forget his difficulties. As he ordered his food, John noted with pleasure the waiter's helpfulness. He pointed out a couple of house

specialities and suggested a good value wine. What a pleasant change it all was.

I argued earlier that the MC at the end of the penultimate sentence is the waiter, though the TS is John. As Garrod and Sanford's argument suggests, John also provides the perspective from which the restaurant scenario is seen - this is explicit in this character being the agent of a verb of cognition, *noted*. Moreover, the fact that this entity is reinstated as focus following a shift in scenario, indicated by a time gap, *The next day ...*, demonstrates the link between TS and scenario. At this point in the passage the MC and the controller of weak perspective are different entities.

Again, examples with syntactic topicalisation can be used to make the same point. In,

(30) John thought that it was the young Italian waiter that Mary fancied. He...

The MC at the beginning of the second sentence is, intuitively, the waiter, but the controller of perspective, indexed by being agent of the verb *thought* is John.

Linguistic and literary studies of perspective provide further evidence for this separation. Ehrlich (1990) uses the work of Virginia Woolf to show how an explicitly marked perspective can be continued across the following sentences by referential and tense links between them. Ehrlich's examples show instances in which the holder of perspective considers another character, for several sentences, marking this character as the MC. In the following example from *To the Lighthouse*, Andrew's perspective is explicitly

signalled in the opening sentence, along with the object of his thoughts, Minta. This perspective and object are maintained over the following sentences of the extract, until at its conclusion Andrew, still holding the perspective, turns his attention to the immediately surrounding situation. I suggest that Minta is firmly established as the MC during the middle sentences: the pronouns are unambiguous and so offer no test, but note that this would be the result of applying a system such as Grosz's centring theory.

(30) Minta, Andrew observed, was rather a good walker. She wore more sensible clothes than most women. She wore very short skirts and black knickerbockers. She would jump straight into a stream and flounder across. He liked her rashness, but he saw that it would not do - she would kill herself in some idiotic way one of these days. She seemed to be afraid of nothing - except bulls. At the mere sight of a bull in a field she would throw up her arms and fly screaming, which was the very thing to enrage a bull of course. But she did not mind owning up to it in the least; one must admit that. She knew she was an awful coward about bulls, she said. She thought she must have been tossed by a bull in her perambulator when she was a baby. She didn't seem to mind what she said or did. Suddenly now she pitched down on the edge of the cliff and began to sing some song about

Damn your eyes, damn your eyes.

They all had to join in and sing the chorus, and shout out together:

Damn your eyes, damn your eyes,

but it would be fatal to let the tide come in and cover up all the good hunting grounds before they got on the beach. (*To the Lighthouse*; quoted Ehrlich, 1990: 95).

As a second example consider this passage from *Mrs Dalloway*:

(31) She said she loved Bach. So did Hutton. That was the bond between them, and Hutton (a very bad poet) felt that Mrs Dalloway was far the best of the great ladies who took an interest in art. It was odd how strict she was. About music she was purely impersonal. She was rather a prig. But how charming to look at! She made her house so nice, if it weren't for her Professors. (*Mrs Dalloway*, quoted Ehrlich, 1990: 100).

Some empirical evidence for the separation of perspective from MC is reported by Morrow (1985). I introduced this work above in discussing pronoun resolution, where perspective was seen as one factor determining pronominal focus. Note that as a factor influencing focus, perspective was therefore seen as separate from it. This gains empirical support from a second experiment reported in the paper.

In this experiment Morrow independently varied the protagonist status of characters and the narrative status of their actions, that is as either foreground or background events. Again materials began with several sentences in which two characters were introduced, with one marked as the protagonist (through frequency of mention, initial introduction, placing as grammatical subject, and explicit use of his perspective.)[37] The penultimate sentence of the narrative described two events, one of these was foregrounded (expressed in the main clause of the sentence using perfective aspect,) the other backgrounded (expressed in the subordinate clause and with imperfective aspect.) The sentence was described as congruent if the foregrounded clause described the action of the protagonist and the backgrounded clause that of the nonprotagonist, and incongruent if vice versa. For each narrative there were four versions of the

penultimate sentence, created by crossing congruency with order: that is the foregrounded clause could be either first or second. The final sentence of each narrative contained a subject pronoun which could refer to either character on grounds of gender and number. Thus one material was as follows (3 sentences are removed from the introductory narrative):

(32) Tom thought his friend Harry looked worried about something. (...) Tom thought his friend needed some distraction, so he took him to a fair. (...) Tom was beginning to feel a little irritated so he said he wanted to do something fun. They decided to split up for a while.
(a) While Harry was going into the Hall, Tom walked toward the ferris wheel.
(b) Tom walked toward the ferris wheel while Harry was going into the Hall.
(c) While Tom was going into the hall, Harry walked toward the ferris wheel.
(d) Harry walked toward the ferris wheel, while Tom was going into the hall.
He saw a friend and said hello.

After reading each passage subjects were asked to make a judgement about the reference of the pronoun in the concluding sentence. In addition they made a confidence rating of their judgement on a 1 to 5 scale (where 5 was extremely confident). After reading all the passages subjects were requested to go back, and for each of the critical penultimate sentences indicate which (if any) character's perspective they had used to interpret it.

Means for each of the four conditions were calculated over the judgement scale responses, assigning a positive value if the protagonist had been selected and a negative if the nonprotagonist

(so +5 meant a reader was certain reference was to the protagonist, -5 meant a reader was certain reference was to the nonprotagonist.) Event status had a clear impact on antecedent choice. Where this was congruent with character status there was a clear preference for the protagonist, (a) versions had a mean score of 4.08, (b) 3.08. Where character and event status were contradictory the choice was less clear: (c) -1.98, (d) 0.25. Here recency does seem to play a part, but only when discourse factors fail to unambiguously cue a single antecedent.

Of central relevance to my argument here is the relation of these pronoun resolution results to the data on assumed perspective. This was scored by dividing the number of readers choosing the protagonist's perspective by the total number making a perspective choice (over 79% in each condition.) There was a significant tendency to indicate that the protagonist's perspective had been used in all conditions: (a) 1.00; (b) 0.93; (c) 0.88; (d) 0.82. Thus even in the incongruent versions, where readers were just as or more likely to resolve the pronoun to the nonprotagonist as the protagonist, readers still indicated that they used the protagonist's perspective in interpreting the critical penultimate sentence. It appears that participation in a foreground event can make a nonprotagonist the more prominent character, i.e. focused, but does not induce a change in readers' assumed perspective. The conclusion is that the entity in focus, the MC, and that controlling perspective need not be identical.

I would conclude this section by emphasising two points. First, that when discussing perspective in texts we should be careful to distinguish the strong version of this concept, common in everyday

and in literary usage, from more general concepts of a main character, and technical definitions, such as Garrod and Sanford's controller of scenario. Second, that under either definition, the holder of perspective and the MC (where the MC is the inferential and pronominal focus) are not necessarily the same entity, even though they frequently do coincide, and perspective plays a role in determining focus. At the beginning of this section I quoted Garrod and Sanford's claim that the preferential attribution of atmosphere statements to Thematic Subjects is a result of their holding perspective: "Perceived states of the world of the kind described by 'psychological atmosphere statements' will be construed by the reader as relevant to the goals and problems facing the TS, and so are interpreted through the 'eyes' of the TS rather than through those of any other character." (Garrod and Sanford, 1988: 513). From the evidence presented here it seems more accurate to consider the attribution effect independently from any notion of perspective: the preferential attribution occurs because the MC is the preferred locus of inference.

4.5. Defining and determining focused character

I feel that, through comparison of the concept of a Main Character with apparently related ideas in other theories, some progress has been made in elucidating the nature of this mental entity. I have shown that the term depicts the same entity as theories of pronominal focus, not surprisingly since pronoun resolution is itself a process of referential inference. I have also shown that the entity referred to with this term is not identical to the concept of the linguistic focus, the causal protagonist, or the Thematic Subject;

though in any given text fragment these may identify the same entity. These negative points make some contribution to defining what the MC is, but more importantly give a purpose to its definition beyond these existing theories.

The identity with pronominal focus gives indication of the difficulty of specifying the determinants of the MC, since research has demonstrated this to have a complex set of causes. In my discussion I have emphasised the importance of semantic factors in influencing focus. It is not surprising, though in no way necessary, that meaning should have an effect in determining focus, given that the resulting decision as to the locus of inference will itself affect interpretation. In this context I shall return to the idea of proper names as markers of salience, since this can itself be seen as the result of the semantic properties of naming.

4.5.1. Main Character and naming

Sanford, Moar and Garrod (1988) conducted an experiment in which they sought to evaluate the contribution of three potential cues to character status. These were order of mention (with the assumption that early mention would lead to primacy;) naming as against role description; and character status. The last of these refers to the observation that for any given scene (or scenario in the technical vocabulary introduced above) there will be a default main character whose point of view will be adopted; e.g. we will consider a visit to the cinema from the position of a visitor rather than an usher, and a visit to a restaurant from the position of a diner rather than a waiter. At an intuitive level the authors illustrate the impact of a proper

name over and above these alternative factors with the following example (this example was given as (19) in Chapter 3):

(33) Masie entered the restaurant and sat down.
The waiter wearily limped over and took her order.

(34) The customer entered the restaurant and sat down.
Alphonso wearily limped over and took her order.

Couplet (33) seems to centre on Masie, whilst (34) centres on Alphonso This is in spite of the identity in the roles played by these two characters in (33) and (34), and their different order of introduction.

To test this intuition about relative salience, the authors conducted a continuation study, designed to tap the relative accessibility of characters in readers' mental representations. Subjects were presented with passages constructed to realise 3 independent variables. These were, order of character introduction, name/role pattern, and character status (Principal or Secondary). Thus for any given material, e.g.,

(35) Claire was taking shorthand. The manager was dictating a letter.

there were 8 conditions to be presented in different experimental lists (the scenario status of characters was judged by the authors). These are illustrated in the table below. The task was to write a continuation sentence for each passage which developed its theme. The experimenters scored the number of unambiguous references to each character in the continuations.

Conditions used by Sanford, Moar and Garrod (1988)

	Characters		Name/role	Scenario
	first	second	pattern	status
1	Mr Bloggs	The secretary	Name-Role	P-S
2	Mr Bloggs	Claire	Name-Name	P-S
3	The manager	Claire	Role-Name	P-S
4	The manager	The secretary	Role-Role	P-S
5	The secretary	Mr Bloggs	Role-Name	S-P
6	Claire	Mr Bloggs	Name-Name	S-P
7	Claire	The manager	Name-Role	S-P
8	The secretary	The manager	Role-Role	S-P

The results showed no effects of order of mention or of character status: the levels of these variables had no effect on the mean number of mentions of each character. However, there was a clear, and significant, preference for named characters, when in combination with role described characters (rows 1,3,5,7, above). Collapsing over scenario status, the mean number of mentions were: for the Name-Role pattern, 4.78 against 2.32, respectively; and for the Role-Name pattern, 2.43 against 4.90 respectively.

The authors note that, if the prominence of the named character detected by the continuation results is mediated by its availability in working memory, i.e. via a focus system, then we would also expect these characters to be more accessible for anaphoric reference. An SPR experiment was carried out to test this hypothesis, this time varying two factors, naming versus role description, and order of introduction. This experiment is described in section 4.3.4 above.

Again, order was found to have no effect, but there was a significant difference between the naming conditions: sentences containing a pronominal anaphor were read more quickly when a named character, rather than a role described one, was the antecedent.

Sanford, Moar and Garrod conclude from there results that, since it can have such a direct effect on processing, the proper name is itself an important psychological category. They concede that naming could be simply one of several overt cues indicating the status of a character, and hence increasing its availability and accessibility; but prefer to see naming as having certain unique properties, and effects on the processor. They note that in an earlier experiment (Sanford and Garrod, 1981: 172) it was shown that marking a role described character through adjectival qualification was sufficient to increase its mention in continuations. However this increase in probability (from 0.209 to 0.236) was very small compared to the effect of naming. Further, it is suggested that the properties of proper names in processing are akin to their logical properties in a possible worlds semantics[38]. Kripke (1972) has suggested that proper names function to pick out the same individual across all possible worlds. If we treat the episodes of a discourse as worlds, then a proper named character will depict the same individual across the whole discourse, while role descriptions will have a fixed referent only within a given episode (so *John* will be JOHN across a narrative, while *the waiter* may be ALPHONSO at lunch time, and MICHAEL in the evening.) The evidence from Anderson, Garrod and Sanford (1983), described in (4.3.3.), above, and showing the mental persistence of named characters across episode shifts, is cited in support of this. A final piece of evidence for the difference in status of named and role

described characters comes from work on plural anaphora (the intuitions offered in Sanford, Moar and Garrod are given experimental backing in Sanford and Lockhart (1990.) If subjects are asked to write continuations for passages which introduce two characters then they will be more likely to use a plural referent (*they*) if the characters are both described in the same way, that is by name or by role description,

(36) Aileen and Steve ran into the cinema.
(37) The girl and the boy ran into the cinema.

rather than if the descriptions are mixed:

(38) The girl and Steve ran into the cinema.

Thus the processor seems to recognise these as distinct psychological categories.

What are the implications of the apparent importance, and psychological status, of naming for the conception of the MC? It will be recalled that I have argued for a separation of the MC from the TS. I suggest that we can accept that naming bestows on an entity a distinct property, that is persistence across episodes, which is central to Garrod and Sanford's conception of the TS. However, this property is not relevant to determination of the MC; and while naming is a very important cue to focus status (as demonstrated by Sanford, Moar and Garrod's continuation and SPR studies) it does not have any unique status here. In several examples above, e.g. those involving syntactic topicalisation, I have argued that a role described character is the MC. Sanford, Moar and Garrod note that their experimental texts are atypical of character-based narrative where, in the main,

there are many named characters, with the more important emerging through frequency of mention. They suggest that, in these circumstances, named characters are those who may have significance outside the scene in which they are introduced. As I suggested earlier, this is of little importance for the MC, which will be in a state of continuous flux, both within episodes and across the whole narrative. The relative importance of a character to the overall narrative may have some effect on the content of the inferences made, but will not affect the locus of inference at specific points.

4.5.2. Conclusion

In the introduction to this chapter I noted that a number of theoretical accounts of issues in discourse and discourse processing adopt the notion of a focused entity. These concepts include the *topic* in discourse linguistics; the *protagonist* in causal network theories; the *focus* in procedures for anaphora resolution; and also the notion of *thematic subjecthood* employed by Sanford and Garrod, and introduced in the preceding chapter. Given this proliferating terminology for apparently similar ideas, I posed the question as to whether these concepts were equivalent (and hence would identify the same entity as in focus in a particular passage,) and, in addition, whether they were equivalent to the minimum theoretical concept needed to explain the empirical data discussed in Chapter 3 - a focussed entity controlling the locus of (attributive) inference, this being what I termed the Main Character.

Taking each of these existing theories in turn, I can now summarise the answer to my questions

(1) Discourse linguistic approaches have employed a range of focus type terminology - topic, theme, and so on. However, none of these have been adequately defined due to the theoretical restriction of this tradition to the formal structures of texts themselves. Since focus is a mental phenomenon it cannot be captured in terms of such aspects of text structure. This means there is no clear way of determining the focus (or topic, or whatever) in a given passage and hence the question of equivalence with other theories becomes redundant.

(2) For Trabasso and his colleagues the notion of a protagonist emerges from their theory of causal structure. A story will begin with the setting of some goal for a character, and this represents the initiating condition for the narrative, which must be satisfied in its conclusion. The character concerned with establishing this causal structure is the protagonist. I have demonstrated, however, that the entity so marked as the protagonist need not be the same as the Thematic Subject (example (1) in 4.2.) or the pronominal focus (example (23) in 4.3.5.). The concept is defined in relation to this particular causal network theory, and, whilst raising some interesting general questions, is limited to it.

(3) I argue that the focused entity defined by systems for anaphora resolution is identical to the MC (as the locus of attributional inference). This has an intuitive appeal: there is a parsimony to having referential and non-referential inference controlled by the same object; and both can be operationally defined as "what the

discourse segment is about". Data presented by Garrod and Sanford (1988) gives empirical confirmation of this identity.

(4) What about the thematic subject? Sanford and Garrod (1988) define this as "what the discourse segment is about", but also make some specific claims about its role in processing. As well as being the locus of referential and non-referential inference, the thematic subject controls the perspective taken on a scene, and has a uniques mental persistence across temporal shifts in a narrative. There is indeed an entity which has these attributes, but as I demonstrate (with regard to temporal persistence in examples (24) to (27) in 4.3.5., and with regard to perspective in examples (23) and (30) to (31) in 4.4.2.) this is not the same entity as the MC. I would suggest that we see the domain of a particular MC as being very restricted, and that of the TS as being larger; thus there may be more than one MC within the domain of a given TS.

However, in terms of defining the MC we still have nothing better than the operational definition "what the discourse segment is about"; we know only that the relevant discourse segment may be smaller than the domain of a TS. This is potentially circular: the MC will provide the inferential focus, but there is no independent means of characterising an entity as the MC, apart from showing that it is the locus of inference. For the rest of this thesis I accept this limitation and adopt a pragmatic definition. Moreover, we have at least gained a reliable diagnostic: that is, that the preferred pronominal antecedent will also be the MC, the locus of non-referential inference, including attributional inference.

Morrow (1985) demonstrated how focus, or prominence in his own terms, results from the interaction of at least two factors: protagonist status, perspective and recency. I concur that it is correct to see multiple determinants of MC status, and would add naming to this list. Morrow's results also show how conflicting cues can lead to uncertainty about prominence. It is clear that we must see focus as in a continual state of flux, and as a continuous rather than an absolute factor: we will not necessarily have a single focused entity, but may rather have competing claimants with shifting, and sometimes equal, levels of prominence.

In Part 2 of this thesis I make an experimental investigation of the main character attribution effect, looking in detail at the mechanisms that result in the inferential attribution of background information to one character rather than another. This chapter has shown that character status is a complicated issue in its determinants and consequences, but I hope to have shown the usefulness of the MC concept, and also the importance of noting its restrictions. In the experimental work that follows I shall use short, simple narratives with just two characters, and use naming as the signal of main characterhood[39].

Part 2
The Main Character Attribution Effect: Experimental Evidence

Chapter 5
Off-Line Effects of Characterhood on Interpretation

In the following chapters I describe a set of experiments designed to replicate and extend the findings of Garrod and Sanford (1988). I begin in this chapter with studies using the question answering paradigm developed by these authors. This is an off-line technique in that it does not attempt to capture effects during discourse processing, instead probing their impact on the reader's final discourse representation.

In addition to confirming the basic replicability of the effect, these studies were designed to answer questions about the necessary conditions, (a) and (b), and its generality, (c) and (d).

(a) Is naming a strong signal of main characterhood; in particular, does primacy of introduction also affect character status, and hence the likelihood of attribution?

(b) Is the off-line effect contingent on the response alternatives offered? If subjects feel uncertainty about attribution to the secondary character, rather than their discourse representations clearly encoding one or other interpretation, then we would expect the inclusion of a *Don't Know* option to affect the data.

(c) Does the main character attribution effect generalise to other types of background sentence, or is it dependent on the particular

nature of psychological atmosphere statements? This is the central question of Off-Line 2 and 3.

(d) Does attribution only occur for incoming information when an MC is established, or does the effect hold when the MC is introduced following the atmosphere statement? This is addressed in Off-Line 4.

On-line techniques are discussed in later chapters, allowing exploration of the mechanisms underlying the effect, and the temporal unfolding of the processes.

5.1. Off-Line 1

Off-Line 1 is a simple replication of the question answering study reported by Garrod and Sanford (1988), designed to check the validity of their findings: the published results contain only approximate means, and no inferential statistics. To give strength to their general conclusions about the MC as a controller of inference a new set of materials was used. These followed the same format as the original experiment, as described in section (3.3.3.): an atmosphere statement was introduced into a context involving two characters, one of whom was marked as the MC by naming (see (4.5.1.)). After reading a passage subjects were asked whether either the MC or the secondary character (SC) perceived the atmosphere described. Previously it had been found that significantly more *yes* answers were given when the question asked about the MC's perception as against that of the SC. This was taken to confirm the hypothesis that the making of an attributive inference relating to the

atmosphere statement is controlled by the MC. I predicted that the same result would be found with these new materials.

5.1.1. Method

5.1.1.1. Materials and Design

All materials were of the same basic pattern. A title, introducing the scenario, was followed by a sentence introducing the MC. The status of this character was cued both by its being named and by being the first mentioned character[40]. The next sentence introduced the SC. This was referred to either by a role description, or a general descriptor, such as *A woman* or *The boy*. This was followed by the atmosphere statement. The sentence introducing the MC was thus separated from the atmosphere statement, and so any preference in attribution to the MC could not be explained by simple adjacency. The passage concluded with a filler sentence which mentioned neither of the preceding characters. This was an addition to the format used in the Garrod and Sanford experiment. It was included to improve readability, and to prevent any unusual processing occurring on the atmosphere statement due to its concluding the passage. An example passage is given below, the full set of materials are included as Appendix A:

(1) AT THE BANK
Rosemary completed a form closing her account. A clerk tapped in her details at his keyboard. The bank was uncomfortably stuffy. Another customer entered, trailing in noises from the street.

Each passage was accompanied by an experimental question asking about the perception of the context described in the atmosphere statement. This referred to either the MC or the SC, for example:

(A) Did Rosemary find the bank uncomfortably stuffy?
(B) Did the clerk find the bank uncomfortably stuffy?

This gave the two experimental conditions. Subjects had the option of responding *Yes*, *No* or *Don't Know* to each question. The dependent variable was the proportion of *Yes* answers given.

Each item was accompanied by a second, simple question about some other aspect of the text. These were included to try and ensure that readers paid attention to the whole of each passage, and did not simply adopt some special strategy based on answering the atmosphere questions. For half the items these were placed before the experimental question, and in half they followed it.

There were 40 experimental items to be presented in 2 conditions. Two presentation lists were constructed. Half the materials had the experimental question to the MC in the first list and to the SC in the second list. The other half reversed this, so each list had 20 MC and 20 SC questions. Subjects thus responded to materials in both conditions, giving a within subjects design. Each presentation list also contained 20 filler passages, these were identical across the lists. These were of the same length as the experimental items - title and 4 sentences - but varied the number of characters and their means of introduction. Like the experimental items, they were accompanied by two questions. These fillers were designed to make the pattern of

passages in the lists less predictable, and keep subjects attention. Within each list the fillers and each condition of experimental item were mixed randomly together.

5.1.1.2. Subjects and Procedure

The materials were presented to subjects in booklets. This contrasts with the earlier study by Sanford and Garrod where passages were read from a VDU using self-paced sentence-by-sentence presentation, and question answering data was recorded through button selection. The booklets contained 5 items on each page. In each booklet the pages were randomly ordered, giving a partially random order of item presentation.

Each question for each passage was accompanied by a grid offering the three response choices, *Yes*, *Don't Know*, *No*, in that order. Subjects were asked to ring their chosen answer. Subjects were instructed to answer as quickly as possible, and it was strongly emphasised that they should not look back over a passage in answering the accompanying questions.

Forty subjects participated in the experiment as unpaid volunteers. All were undergraduates in higher education institutes in the Glasgow area. Half the subjects saw one presentation list, and half the other.

5.1.2. Results

For each subject the number of *Yes* answers given in each condition was calculated, and similarly for the number of *Yes* answers in each condition for each item.

Calculating means across the by subject results gave the descriptive statistics shown in Table OL1.1. The mean gives the number of affirmative answers out of a possible maximum of 20, this is also expressed as a percentage. As predicted there were more *Yes* answers in response to the MC questions.

Table OL1.1 Question Reference: MC v SC

	Mean (as %)	St. Dev.	St. Err
MC Question	**12.6 (63%)**	2.89	.448
SC Question	**8.2 (41%)**	3.27	.516

The significance of this difference in means was determined using a one-tailed t-test. The difference proved to be highly significant: $t(39) = 6.168$, $p < .001$. A t-test was also performed on the by items results. Again this was highly significant: $t(39) = 4.849$, $p < .001$.

5.1.3 Discussion

The results followed the predicted pattern, confirming Garrod and Sanford's original hypothesis that the MC determines the pattern of attributional inference for an atmosphere statements, at least as indexed in an off-line experiment.

The difference between the means for conditions is, however, considerably smaller than that reported for the earlier experiment: 22% as against nearly 40%. This was primarily due to a lower score for MC questions: 63% rather than nearly 90%. Several possible explanations for this seem plausible. The experimental procedure

differed, questions being answered using paper and pencil rather than screen and button push. This may have encouraged subjects to take longer in making an answer; and possibly, therefore, answer more literally - for every experimental question the information given explicitly in the passage only licenses a *Don't Know* answer. Indeed, several subjects gave *Don't Know* answers to over 90% of the experimental questions, thus bringing down the total number of *Yes* answers. To explore this issue further the presence of a *Don't Know* option was systematically varied in the experiments reported immediately below. However, it may be simply that these materials were less strong, in particular the relative status of the MC may have been less clearly cued than in the earlier experiment.

Nonetheless the hypothesis has been confirmed and we can go on to pursue further aspects of the MC's function in processing.

5.2. Off-Line 2 and 3

The main concern of these experiments was to test the generality of the main character attribution effect. So far demonstration has been through atmosphere statements. These are defined semantically (see (3.3.3.)) in terms of the absence of a perceiving agent for an essentially subjective description in the psychological predicate. In other words, the statements' full interpretation seems to require an attribution. In the following experiments I investigate whether other types of context descriptive statements will show the same kind of attribution, and whether we will again see an attribution effect, i.e. preferential attribution to the MC.

The particular statements used I term *action statements.* These describe some action performed by a third party, rather than the protagonist, and hence like the atmosphere statements give background information for the story. In the following example this is italicised:

(2) SKIING
Jeff was about to tackle his first slope. The instructor followed behind. *Colourfully clad skiers sped by.* It was Christmas in two days.

The actions statements contrast with the atmosphere statements in having an overt agent; but also, while the scene described can be observed, they do not have the same need for subjective verification if they are to be semantically meaningful.

Off-line 2 and 3 again use the question-answering paradigm but include materials based around action statements. Off-Line 2 differs from Off-Line 3 in restricting subjects to the response options *Yes* and *No* , while Off-Line 3 includes the *Don't Know* option. This change was made in order to investigate whether the lower overall number of *Yes* responses in Off-Line 1 was due to subjects giving large numbers of *Don't Know* responses. However, since the materials and method for both experiments was otherwise identical, and since this alteration does not relate to the main theoretical issues under investigation here, I shall report the two experiments together.

5.2.1. Method

5.2.1.1. Materials and Design

Sixty four experimental materials were written for the experiments. 32 of these were atmosphere statement passages, some based on those used in Off-Line 1. The other 32 were action statement passages. A full list of materials is given in Appendix B. All followed the pattern as those used previously, with the additional factor that the placing of the named character in the first or second sentence was manipulated as a further independent variable. This was included to check the claim made by Garrod and Sanford that naming alone, irrespective of position in a passage, is sufficient to ensure MC status[41]. The expectation was thus that the manipulation of Position would have no effect on main characterhood, and hence on attribution and the results obtained here.

Again an alternation in the reference of the experimental question was used to probe the attribution of the context information to the MC and to the SC. The crossing of the two levels of this variable with the two levels of the Position variable thus produced four versions of each material. These alternatives are represented by curly brackets in our example action statement material below. The two levels of the Position variable are numbered: 1 = named character first; 2 = named character second. The two levels of the Reference variable are lettered: A = question to MC; B = question to SC.

(3) SKIING
{Jeff[1]/ A novice skier[2]} was about to tackle his first slope. {The instructor[1]/ Jo[2]} followed behind. Colourfully clad skiers sped by. It was Christmas in two days.

Did {Jeff^{1A}/ the instructor^{1B}/ Jo^{2A}/ the novice^{2B}} notice the colourful skiers?

Both experiments thus contained eight conditions, with four within items variables occuring across two sets of passages, those with atmosphere statements and those with action statements.

The dependent variable was again the proportion of *Yes* answers. In Off-Line 2 *Yes* was selected from the options *Yes* or *No*. In Off-Line 3 a *Don't Know* option was also included.

As previously each passage was accompanied by a second, general question, and this was placed before the experimental question for half the materials.

In both experiments the 64 items - including all 32 atmosphere statements and all 32 action statements - were used to form four presentation lists. For each of these one quarter of the items were in each of the four between items conditions, these being circulated between lists using a Latin square so that each item was seen in all 4 conditions. This therefore realised a within subjects design.

5.2.1.2. Subjects and Procedure

In contrast to Off-Line 1, but in line with Garrod and Sanford's earlier work, these studies were run via computer and VDU. The experiment was performed on three Apple Macs running Psyscope software.

Presentation of the passages was sentence-by-sentence, subjects controlling the display of the next sentence using the space-bar of a

standard keyboard. The passage was thus not available for consultation when answering the questions. All text was displayed on the same line in 12pt New York font. After the last line of a passage was terminated with the space-bar the first question was displayed. Subjects responded using labelled keys (these were, for Off-Line 2, *Yes* = p, *No* = q, and for Off-Line 3 the same with the addition of *Don't Know* = w). Answering this question brought up the second. Four practice trials preceded the main body of the experiment to give subjects a feel for this procedure.

Psyscope's random presentation feature was used. This meant that a new random order of presentation was constructed for each subject.

Subjects were instructed both orally and in a written presentation on the screen. They were asked to read normally and for comprehension, and it was emphasised that the questions should be answered as quickly as possible. There were two break points in the experiment, at both of which these instructions were re-emphasised.

Forty volunteers participated as unpaid subjects in each experiment. All were undergraduates at Glasgow University. None of the subjects had taken part in Off-Line 1, and none who participated in Off-Line 2 also performed Off-Line 3. 10 subjects were assigned to each of the four presentation lists in each of the experiments. Completion of the experiment took approximately 20 to 25 minutes.

5.2.2 Results

5.2.2.1. Off-Line 2

Again the dependent variable was the number of *Yes* answers given. In Off-Line 2 subjects selected answers from the 2 choices, *Yes* or *No*. The first analysis performed on the data included all 3 factors: the *Type* of statement, action or atmosphere; the *Position* of the named character; and the character *Reference* of the question. This was calculated first across means for subjects (F1), then across means for items (F2). Subsidiary analyses were then performed looking separately at the results for the atmosphere and action statements. A primary interest in this experiment was to see if the effect of Reference found in Off-Line 1, for atmosphere statements, would also hold up for the action statements.

In the first analysis, including data for both atmosphere and action statements, my principal prediction was that there would be a main effect of question Reference, with more *Yes* answers to the MC questions. This arises from the theory that a marked MC is able to constrain attributional inference, resulting in a discourse representation which encodes the link between the MC and the context information.

The means for each condition are given in Table OL2.1 (here the means are out of a possible 8, these are also expressed as percentages.) Two 3 way ANOVAs were computed. An F1, for which the design was within subjects, and an F2, where Type was a between items factor, while Position and Reference were within items.

Table OL2.1 Type x Position x Reference

Type	Position	Reference	**Mean (as %)**	St. Dev	St. Err.
	Name	MC	**5.725 (72%)**	1.961	.310

Action Statement	first	SC	**4.475 (56%)**	1.961	.310
	Name	MC	**5.600 (70%)**	1.837	.290
	second	SC	**5.025 (63%)**	2.118	.335
Atmos Statement	Name	MC	**6.350 (79%)**	1.981	.313
	first	SC	**5.325 (66%)**	2.258	.357
	Name	MC	**6.475 (81%)**	1.826	.289
	second	SC	**5.325 (67%)**	1.953	.309

There was a significant main effect of Reference, with questions to the MC giving the higher value, see Table OL2.2 ($F1(1,39) = 19.349$, $MSe = 80$, $p < .001$; $F2(1,62) = 53.638$, $MSe = 98$, $p < .001$). This is illustrated in Figure OL2.1.

Figure OL2.1 Reference: MC v SC

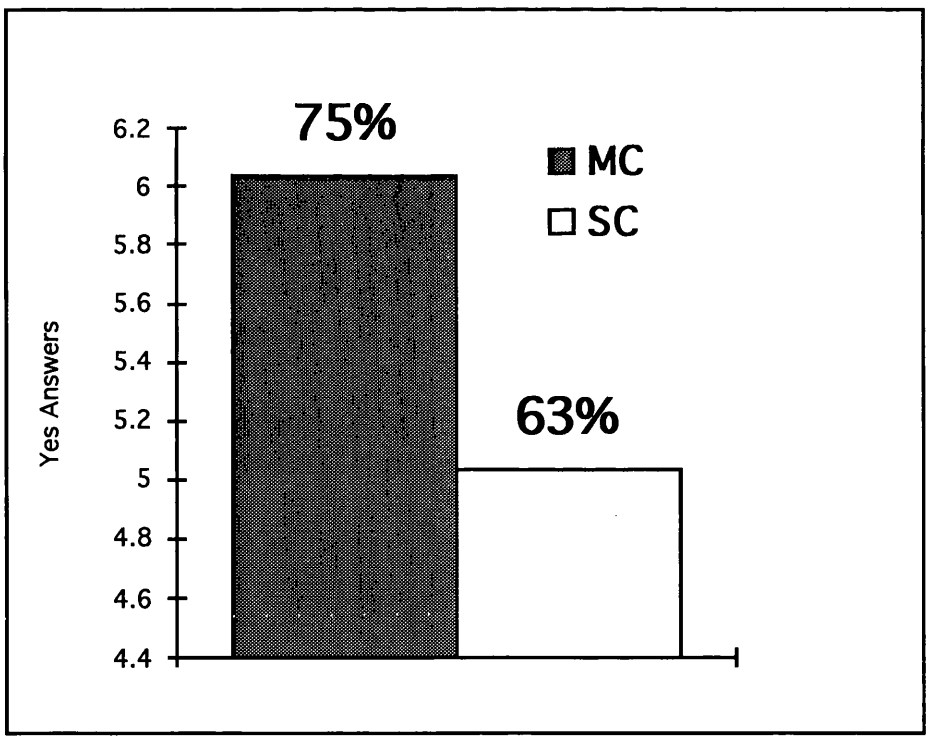


Table OL2.2 Reference: MC v SC

	Mean (as %)	St. Dev.	St. Err
MC Question	**6.0 (75%)**	1.92	.152
SC Question	**5.0 (63%)**	2.09	.165

This thus confirmed my primary prediction, repeating the effect of Off-Line 1 in a design using action, as well as atmosphere, statements.

There was also a significant main effect of Type ($F1(1,39) = 11.741$, $MSe = 35$, $p < .002$; $F2(1,62) = 6.817$, $MSe = 36$, $p < .02$). This reflects a tendency to give more *Yes* answers to the atmosphere statement passages (see Table OL2.3) regardless of the question Reference. This is illustrated in Figure OL2.2.

Figure OL2.2 Type: Atmosphere v Action

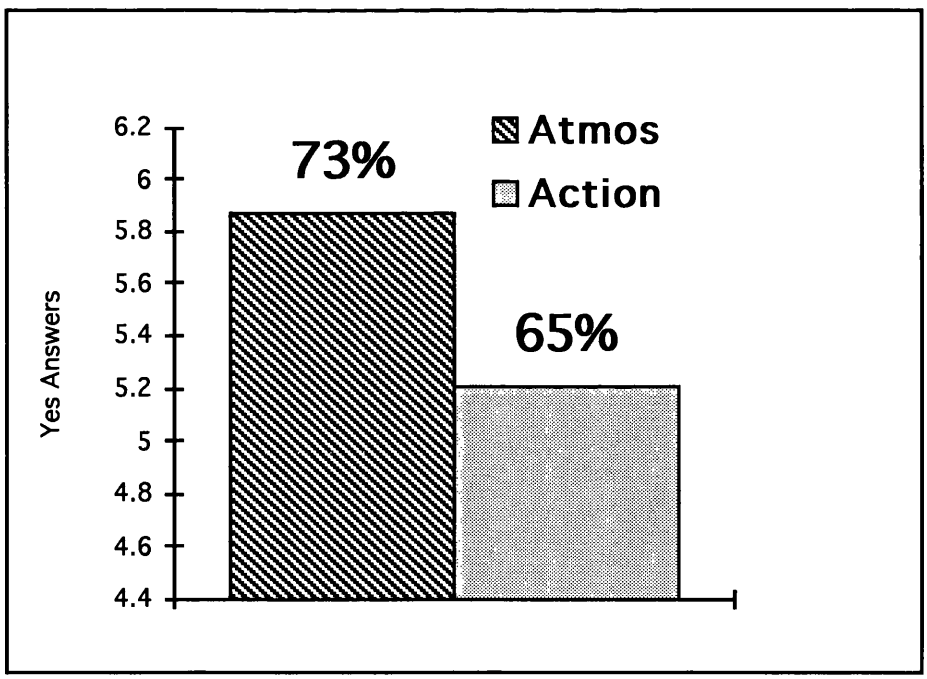


Table OL2.3 Type: Atmosphere v Action

	Mean (as %)	St. Dev.	St. Err
Atmosphere	**5.9 (63%)**	2.07	.163
Action	**5.2 (41%)**	3.02	.159

It seems that, in terms of my earlier discussion, the lack of syntactic and semantic agency in the atmosphere statements has triggered a greater tendency to make an assignment with these. This issue is returned to in the discussion section below.

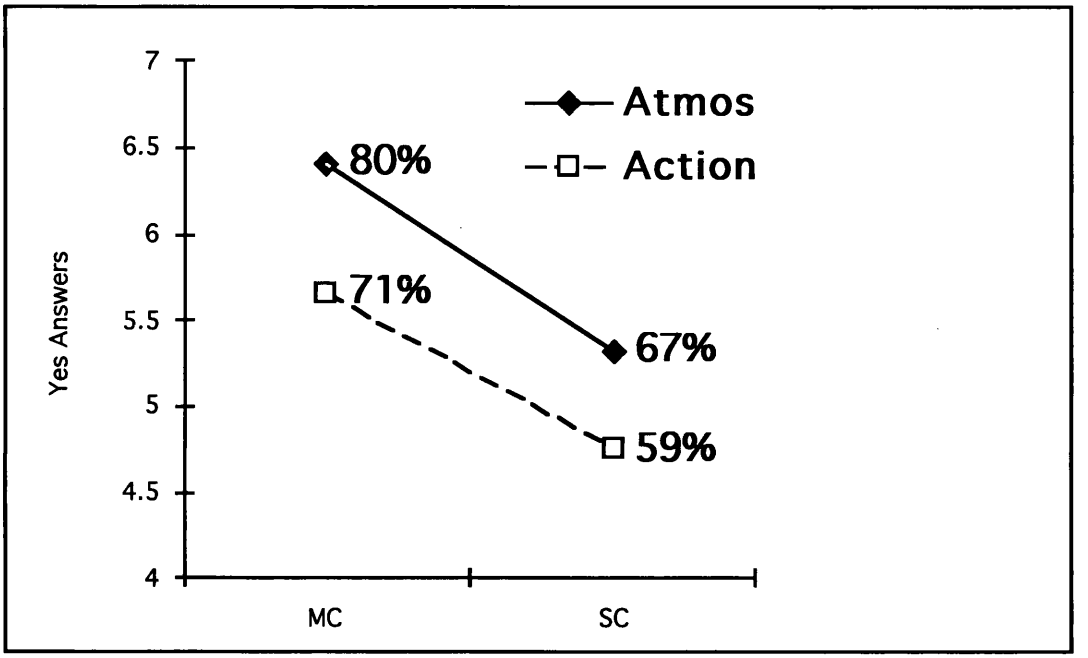
There were no other significant results, either for main effects or interactions. This is in line with my predictions. As expected the Position of the named character had no impact on the results. A very small difference in means in favour of the named character second condition (mean for named character first was 5.469, or 68%; mean for named character second was 5.606, or 70%) was not significant ($F1 < 1$; $F2(1,62) = 1.175$, $MSe = 1.891$, $p > .28$); nor was the interaction of this with question Type or Reference.

Whilst the overall number of *Yes* answers was lower with action statements, the effect of MC reference was very similar for both action and atmosphere statements, and hence there was no interaction of Reference with Type ($Fs < 1$). Means are given in Table OL2.4 and illustrated in Figure OL2.3.

Table OL2.4 Type x Reference

Type	Reference	Mean (as %)	St. Dev	St. Err.
Action Statement	MC	5.662 (71%)	1.889	.211
	SC	4.750 (59%)	2.047	.229
Atmos Statement	MC	6.412 (80%)	1.894	.212
	SC	5.325 (67%)	2.097	.235

Figure OL2.3 Type x Reference



This fits with my prediction that attribution to the MC will occur with any kind of context describing statement. To give more force to this conclusion separate ANOVA analyses were conducted on the atmosphere and action statement items.

For the atmosphere statements the 13% difference between the MC and SC reference conditions (means were 6.412 (80%) and 5.325 (67%) respectively; see Table OL2.2 and Figure OL2.3) was highly significant ($F1(1,39) = 13.930$, $MSe = 47$, $p < .001$; $F2(1,31) = 39.179$,

MSe = 58, $p < .001$). Neither Position nor the Position x Reference interaction were significant (all Fs < 1). This replicates the result of Off-Line 1. More interestingly, the main effect of Reference is also significant for the action statements. The 12% superiority of the MC condition (see Table OL2.2 and Figure 2.3) is again highly statistically significant both by subjects and by items ($F1(1,39) = 16.047$, MSe = 33, $p < .001$; $F2(1,31) = 18.739$, MSe = 41, $p < .001$). The main character attribution effect found for atmosphere statements by Garrod and Sanford and confirmed in Off-Line 1 and in the atmosphere items in this experiment has thus been successfully detected in a further class of sentence, what we have termed action statements.

In the analysis of the action statement materials Position again had no effect. There was, however, a marginal effect for the interaction of Position and Reference in the F1 analysis ($F1(1,39) = 3.889$, MSe = 5, $p < .056$). This was due to a larger effect of Reference when the named character was first (where there is a 16% preference for the MC over the SC) than when it was second (where there were 7% more *Yes* answers with the SC). The near significance of this completely disappeared in the F2 analysis (F < 1).

5.2.2.2. Off-Line 3

In a first attempt at running Off-Line 3 several errors in the construction of the presentation lists meant that some items, of both the atmosphere and action Type, appeared in only three conditions - one of these being used in two lists. The experiment was run again and these new results are reported below as Off-Line 3a. However, it was possible to analyse the data from the first running, using a

replacement procedure for the items analysis, and this data is reported as Off-Line 3b. There are no major discrepancies between the results of the two studies, and Off-Line 3b is offered as giving additional strength to the conclusions drawn from Off-Line 3a.

5.2.2.2.1. Off-Line 3a

The dependent variable was the number of *Yes* answers given. It will be recalled that in this experiment subjects were offered the chance of answering *Yes, No* or *Don't Know.* As with Off-Line 2, by subjects and by items analyses were made, first collapsing across the two different Types of statement, then independently for atmosphere and action statements.

The means for each condition are given in Table OL3.1 (here the means are out of a possible 8, these are also expressed as percentages.)

Table OL3.1 Type x Position x Reference

Type	Position	Reference	**Mean (as %)**	St. Dev	St. Err.
Action Statement	Name first	MC	**3.800 (48%)**	2.544	.402
		SC	**2.975 (37%)**	2.304	.364
	Name second	MC	**4.200 (53%)**	2.719	.430
		SC	**2.825 (35%)**	2.297	.363
Atmos Statement	Name first	MC	**4.875 (61%)**	2.954	.467
		SC	**3.775 (47%)**	2.486	.393
	Name second	MC	**5.375 (67%)**	2.657	.420
		SC	**3.675 (46%)**	2.454	.388

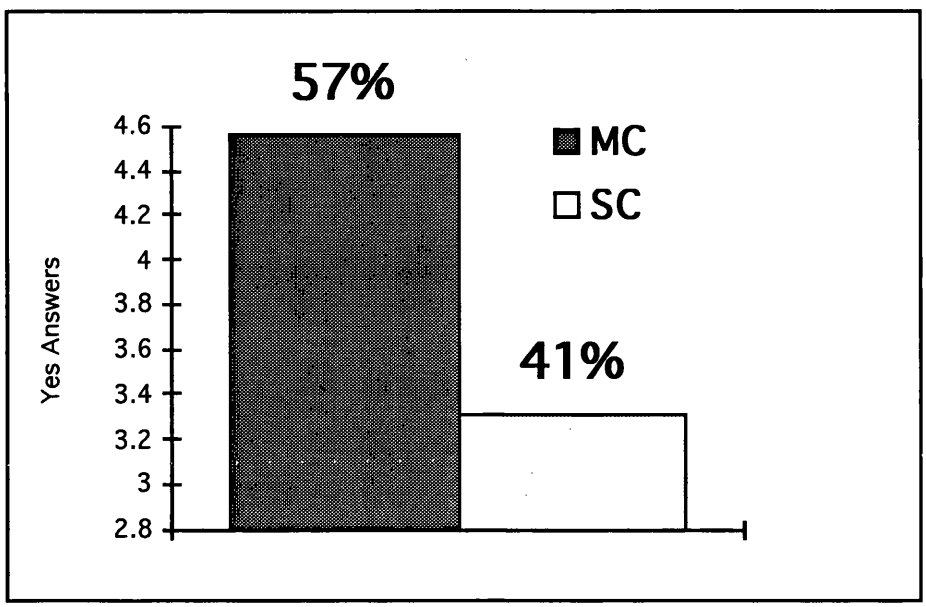
Two 3 way ANOVAs were computed. An F1, for which the design was within subjects, and an F2, where Type was a between items factor,

while Position and Reference were within items. The pattern of results followed that of Off-Line 2. My principal prediction, that attribution will be made to the MC rather than the SC, is again borne out with a significant main effect of Reference, the MC condition obtaining 1.25 (or 16%) more *Yes* answers than the SC condition ($F1(1,39) = 27.388$, $MSe = 125$, $p < .001$; $F2(1,62) = 74.670$, $MSe = 164$, $p < .001$). Means are given in Table OL3.2 and illustrated in Figure OL3.1.

Table OL3.2 Reference: MC v SC

	Mean (as %)	St. Dev.	St. Err
MC Question	**4.6 (57%)**	2.77	.219
SC Question	**3.3 (41%)**	2.40	.190

Figure OL3.1 Reference: MC v SC



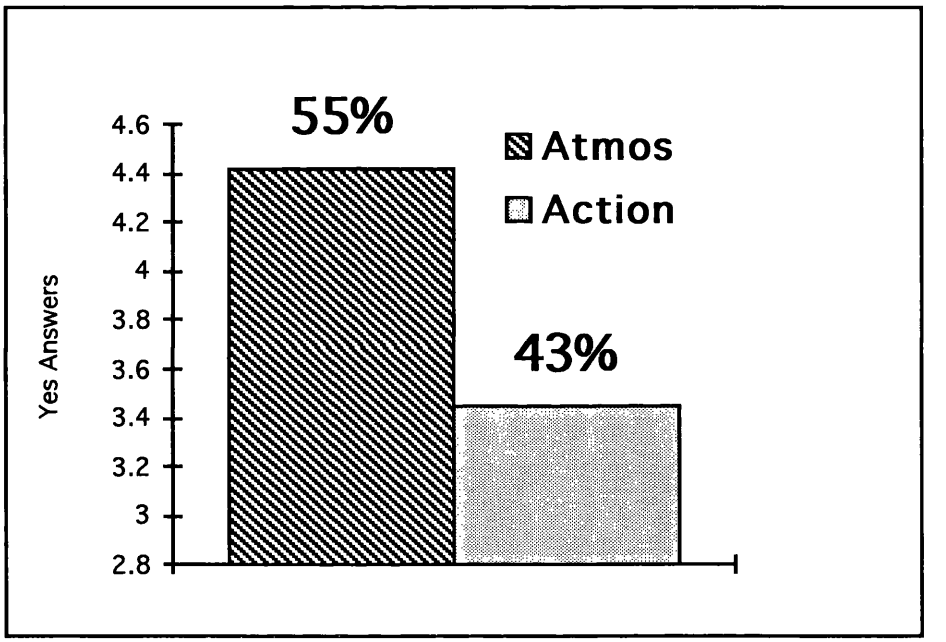
An effect of Type was also repeated, with subjects showing a preference to give a *Yes* answer to atmosphere questions, regardless of Reference, see Table OL3.3 ($F1(1,39) = 13.766$, $MSe = 76$, $p < .001$;

F2(1,62) = 25.732, MSe = 109, p < .001). This is illustrated in Figure OL3.2.

Table OL3.3 Type: Action v Atmosphere

	Mean (as %)	St. Dev.	St. Err
Atmosphere	**4.4 (55%)**	2.72	.215
Action	**3.5 (43%)**	2.52	.199

Figure OL3.2 Type: action v atmosphere



This effect is returned to in the discussion section below.

As in Off-Line 2 there were no other significant results. A very small difference in means in favour of the named character second condition (mean for named character first was 3.856, or 48%; mean for named character second was 4.019, or 50%) was not significant (F1(1,39) = 1.461, MSe = 2, p > .23; F2(1,63) = 1.487, MSe = 3, p > .22); nor was the interaction of this with question Type. In the F1 ANOVA

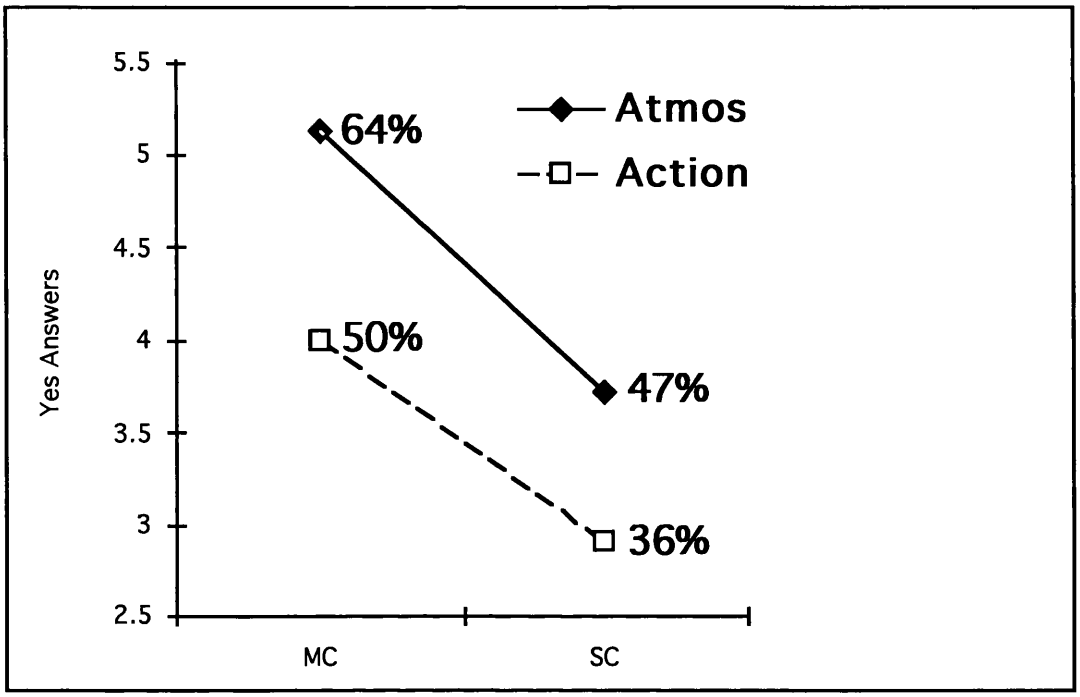
there was a marginal result for the interaction of Position with Reference ($F1(1,39) = 3.872$, $MSe = 7$, $p < .058$). This reflected a greater effect of Reference when the named character was second (a difference of 1.537, or 19%, for the MC versus the SC condition with the named character second, as against a difference of 0.963, or 12%, when the named character was first). This significance level fell in the F2 analysis ($F2(1,63) = 2.199$, $MSe = 7$, $p > .14$). The evidence points towards this tendency being a chance product of the experiment: it goes in the reverse direction to that found on action statement materials in Off-Line 2 and reported above; a non-significant trend in Off-Line 3b is also in the opposed direction. It seems safe to conclude, in line with the results from Off-Line 2, that the Position of the named character has no effect on the process of inferential attribution.

Again there was no interaction of Reference with Type ($F1(1,39) = 1.345$, $p > .25$; $F2(1,62) = 1.494$, $p > .22$). Means are reported in Table OL3.4 and illustrated Figure OL3.3.

Table OL3.4 Type x Reference

Type	Reference	**Mean (as %)**	St. Dev	St. Err.
Action Statement	MC	**4.000 (50%)**	2.624	.293
	SC	**2.900 (36%)**	2.287	.256
Atmos Statement	MC	**5.125 (64%)**	2.803	.313
	SC	**3.725 (47%)**	2.455	.274

Figure OL3.3 Type x Reference



Separate ANOVA analyses were conducted on the atmosphere and action statement items. For the atmosphere statements the 17% difference between the MC and SC reference conditions (means were 5.125 (64%) and 3.725 (47%) respectively; illustrated in Figure OL3.3) was highly significant ($F1(1,39) = 26.915$, $MSe = 78$, $p < .001$; $F2(1,31) = 80.265$, $MSe = 107$, $p < .001$). This replicates the result of Experiments 1 and 2, and as in Off-Line 2 the main effect of Reference is also significant for the action statements. The 14% superiority of the MC condition (see Table OL3.2) is again highly statistically significant both by subjects and by items ($F1(1,39) = 16.189$, $MSe = 48$, $p < .001$; $F2(1,31) = 19.742$, $MSe = 61$, $p < .001$). Thus the detection of the attribution effect in action statements found in Off-Line 2 is confirmed.

Off-Line 3a confirms the pattern of results found when the same materials were presented to subjects, but only two (*Yes/ No*) answers were offered. This alternation of question answering options was made to investigate why the overall number of *Yes* answers was lower in Off-Line 1 than in the original study reported by Garrod and Sanford (1988). It was suggested above, in the discussion of Off-Line 1, that this might be due to the whole-passage, printed presentation used, and perhaps to some subjects giving large numbers of *Don't Know* answers across conditions. The method of presentation does not, in fact, seem to be the cause. The overall number of *Yes* answers is 52% of the total possible in Off-Line 1, and 49% in Off-Line 3, where the same range of options was given, but presentation was line-by-line on a VDU. In Off-Line 2, also, although the overall number of *Yes* answers is higher, the number given in the MC question condition still falls well below the 90% reported by Garrod and Sanford. The presence of a *Don't Know* option does have an effect. The overall number of *Yes* answers is lower with the three choices: 49% as against 69% in Off-Line 2 (this difference is significant in a two-tailed t-test for independent samples using the by subjects means: $t(78) = 3.909$, $p < .02$). This is due to a relatively large number of *Don't Know* answers being given: 16% of the answers are *No*, 34% *Don't Know*. Subjects thus do seem to be giving *Don't Know* answers in some cases where they would give a *Yes* answer without this option. However, subjects do not seem to treat *No* and *Don't Know* differently in terms of the experimental manipulations. In both cases performing an F1 ANOVA on the response data gives two significant differences in means: main effects of Type, with action statements producing more of these negative responses than atmosphere statements, and Reference, with more negative responses

to the SC. For *Don't Know* response: main effect of Type, average number of *Don't Know* answers in action conditions = 3.018, against atmosphere conditions = 2.463 ($F1(1,39) = 7.594$, $p < .001$); main effect of Reference, average number of *Don't Know* answers in SC conditions = 3.199, against MC constions = 2.362 ($F1(1,39) = 13.354$, $p < .001$). For *No* response: Type, action = 1.462 against atmosphere = 1.056 ($F1(1,39) = 4.835$, $p < .05$); Reference, SC = 1.500 against MC = 1.019 ($F1(1,39) = 18.528$, $p < .005$).

These studies indicate that the main character attribution effect is highly reliable, and generalises beyond the particular case of atmosphere statements. However the absolute differences involved are smaller than those reported by Garrod and Sanford, regardless of presentation method and answering options given. It would seem that either the materials used in the earlier study were stronger, or this was fortunate to produce such a strong result.

5.2.2.2.2. Off-Line 3b

As noted above Off-Line 3b used the same materials and procedure as Off-Line 3a. In this first attempt at running the experiment errors in presentation lists meant that some items did not appear in all conditions. As a result 12% of the data was lost; the maximum in a single condition being 19% in the Action statement x Named character first x MC question condition. In the by subjects analysis cell means for each subject in each condition were calculated on the basis of the items that were presented. Twenty two cells still had a full 8 observations, 1 had 7, 3 had 6, 3 had 5, 2 had 4, and 1 had 3 (i.e., in this last case, the 10 subjects who saw Presentation List 2 saw just 3 items in the Action statement x Named character first x SC question

condition.) Scores were thus expressed as percentages, as not all cells now had a maximum score of 8 *Yes* answers. In the by items analysis means for some items is some conditions were thus empty. These were assigned the mean calculated across the remaining items in that condition.

The means for each condition are given in Table OL3.2 (here the means are expressed solely as percentages.)

Table OL3.2 Type x Position x Reference

Type	Position	Reference	**Mean %**	St. Dev	St. Err
Action Statement	Name first	MC	**42**	38	7.2
		SC	**29**	28	5.2
	Name second	MC	**38**	32	6.0
		SC	**31**	25	4.8
Atmos Statement	Name first	MC	**56**	35	6.6
		SC	**40**	26	5.0
	Name second	MC	**53**	31	6.0
		SC	**37**	31	5.9

Two 3 way ANOVAs were computed. An F1, for which the design was within subjects, and an F2, where Type was a between items factor, while Position and Reference were within items. The pattern of results followed exactly that of Off-Line 3a. My principal prediction, that attribution will be made to the MC rather than the SC, is again borne out with a main effect of Reference. 47% *Yes* answers were made to MC questions (St Err = 3.3) , against 34% to SC questions (St Err = 2.6). This difference was highly reliable ($F1(1,39) = 11.069$, $MSe = 9791$, $p < .003$; $F2(1,63) = 10.928$, $MSe = 12446$, $p < .002$). There was also a main effect of Type, with atmosphere statements

attracting 47% yes answers (St Err = 3.0) against 35% (St Err = 2.9) for action statements ($F1(1,39) = 23.137$, MSe = 7696, $p < .001$; $F2(1,63) = 27.878$, MSe = 12896, $p < .001$). There were no other significant effects. Separate analyses were performed for atmosphere and action statement materials. The former showed a significant effect of Reference: a 17% advantage for MC questions was highly reliable ($F1(1,39) = 16.406$, MSe = 7426, $p < .001$; $F2(1,31) = 5.347$, MSe = 8128, $p < .03$). For the action statements there was a 10% advantage for MC questions. This was reliable in the F2 analysis ($F2(1,31) = 6.034$, MSe = 4572, $p < .02$) and marginal in the F1 ($F1(1,39) = 3.693$, MSe = 2891, $p < .057$).

5.2.3 Discussion

Three facts emerge from these studies.

(A) It was confirmed that naming is a principal factor in determining main characterhood. In particular, this will dominate any influence of primacy of mention: attributive inferences are made to a named character, as against a role described character, irrespective of the point of introduction of these characters in the text (see (2.2.1) and (2.2.2.1)).

(B) The attribution effect is not contingent on the response options offered to subjects (see (2.2.2.1)).

(c) The most striking finding was that the attribution effect did, as predicted, generalise to action statements, despite the presence of a semantic agent, and their apparently objective observational status. Analysis of the action statement passages showed a highly significant

effect in Experiments 2 and 3a, and there was a strong marginal effect in Off-Line 3b. Somewhat complicating this picture is the additional strong effect of statement Type, with a greater number of *Yes* answers with atmosphere as against action statement passages, a difference significant in Experiments 2, 3a and 3b. It appears that certain types of background statement, e.g. atmosphere statements, provide stronger cues for an attributional inference, but that for any statement type, if an inference is made the MC acts as a constraint on the locus of attribution. I discuss these implications of the data further in Chapter 7.

A further experiment was conducted using the question answering paradigm, to explore further the extent of the control exercised by an MC over the inferential process and the resulting discourse representation.

5.3. Off-Line 4

Again this experiment considers the attribution of atmosphere statements, but differs from Off-Line 1, and the atmosphere materials in Off-Line 2 and 3, in the structure of the passages used. Specifically, the atmosphere statement was placed between the introduction of the two characters; so the second and third sentences of the example given in Off-Line 1 (used again for this study) are reversed.

(4) AT THE BANK
Rosemary completed a form closing her account. The bank was uncomfortably stuffy. A clerk tapped in her details at

his keyboard. Another customer entered, trailing in noises from the street.

Moreover, which of the characters was the MC was alternated - by changing which was named - so the atmosphere statement could come before or after the MC was introduced.

(5) AT THE BANK
A customer completed a form closing her account. The bank was uncomfortably stuffy. Adrian tapped in her details at his keyboard. Another customer entered, trailing in noises from the street.

I hypothesised that the pattern of results found in the earlier studies would be repeated, even with the late introduction of the MC. That is, attribution would still be made to the MC (in preference to the SC) even if it had not been introduced when the atmosphere statement was first read.

The experiments described so far have shown how an MC can control the processing of incoming linguistic information. However, if attribution is made to an MC not introduced when the atmosphere statement is read, then this must be affecting the representation which has already been constructed and stored in memory. Such a finding would demonstrate the power of the MC to control the direction of inference and the final discourse representation. This manipulation forms the basis of on-line investigations of the mechanism of the attribution effect, and its implications for the minimalist hypothesis, described in Chapter 8.

5.3.1. Method

5.3.1.1. Materials and Design

Thirty two experimental materials were written for the experiments. These were based on the atmosphere passages used in Off-Line 2 and 3, altered to realise the conditions described below (a full list is given in Appendix C). As described above, the atmosphere statement was placed as the second sentence of the passages, preceding the introduction of the second character. This character could be marked as either the MC or the SC. Again an alternation in the reference of the experimental question was used to probe the attribution of the context information to the MC and to the SC. As the question could be asked of these characters either when they preceded or when they followed the atmosphere statement there were thus four conditions. These alternatives are represented by curly brackets in the example material below. The two levels of the Order variable are numbered: 1 = question to character preceding atmosphere statement; 2 = question to character following atmosphere statement. The two levels of the Reference variable are lettered: A = question to MC; B = question to SC.

(6) AT THE BANK
{Rosemary^{1}/ A customer^{1}} completed a form closing her account. The bank was uncomfortably stuffy. {A clerk^{2}/ Adrian^{2}} tapped in her details at his keyboard. Another customer entered, trailing in noises from the street.
Did {Rosemary^{1A}/ the customer^{1B}/ Adrian^{2A}/ the clerk^{2B}} find the bank uncomfortably stuffy.

My hypothesis was that there would still be a preference to attribute the atmosphere information to the MC, even when this follows the

atmosphere statement. Thus I expected a difference between the two levels of the Reference condition under both levels of the order variable.

The dependent variable was again the proportion of *Yes* answers. In Off-Line 4 *Yes* was selected from the options *Yes* or *No*.

As previously each passage was accompanied by a second, general question, and this was placed before the experimental question for half the materials.

There were 32 experimental items to be presented in 4 conditions. Four presentation lists were therefore constructed. One quarter of the materials appeared in each condition in each list, these being circulated between lists using a Latin square so that each item was seen in all 4 conditions. This therefore realised a within subjects design. Each presentation list also contained 32 filler passages, these were identical across the lists. These were of the same length as the experimental items and like them they were accompanied by two questions. These fillers were designed to make the pattern of passages in the lists less predictable, and keep subjects attention.

5.3.1.2. Subjects and Procedure

The experiment was performed on three Apple Macs running Psyscope software. Presentation of the passages was sentence-by-sentence, the passage was thus not available for consultation when answering the questions. The display and procedure was identical to that described for Off-Line 2.

Psyscope's random presentation feature was used. This meant that a new random order of presentation was constructed for each subject.

Subjects were instructed both orally and in writing, strong emphasis was put on reading normally and answering questions as quickly as possible.

Thirty two volunteers participated as subjects in the experiment, each received a payment of £3. All were undergraduates at Glasgow University and had not participated in any of the previous experiments. Eight subjects were assigned to each of the four presentation lists in each of the experiments. Completion of the experiment took approximately 20 to 25 minutes.

5.3.2 Results

A very small amount of data was lost due to errors in the presentation lists which were not corrected until 6 subjects had been run. This affected 8 data points, that is 0.8% of the data, and these were removed from the analysis. Six of these missing data points were from of a single item (i.e. 19% of the responses for that item,) 2 responses missing from each of three conditions. The total possible number of *Yes* answers was not, therefore, 8 in all cells for all subjects, and so results are expressed as percentages of the total possible rather than absolute figures.

The means for each condition are given in Table OL4.1.

Table OL4.1 Order x Reference

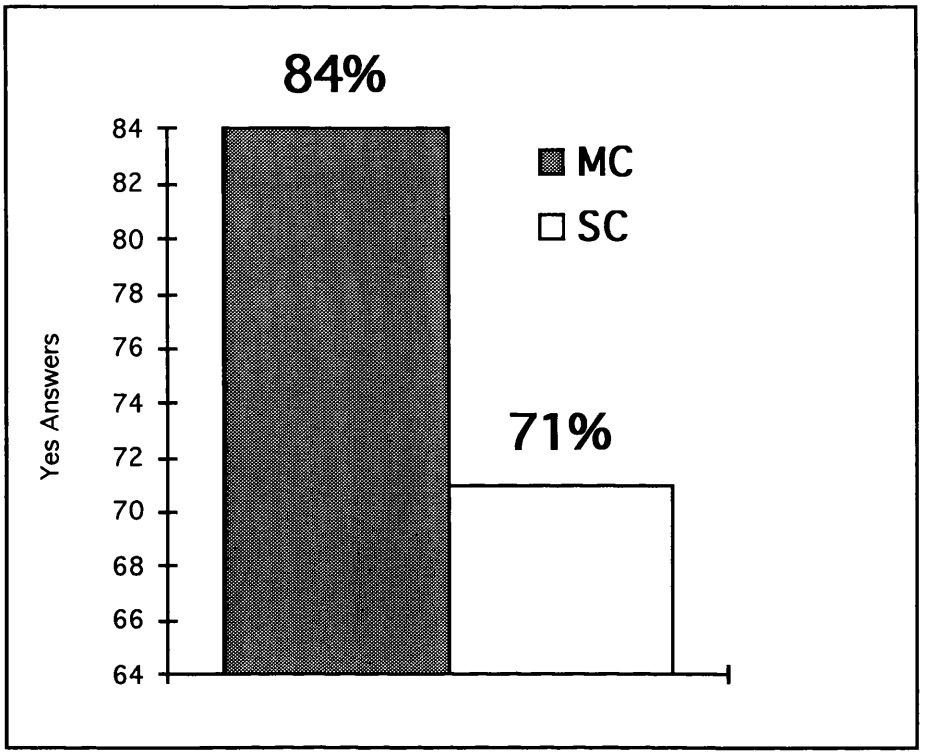
Order	Reference	**Mean %**	St. Dev	St. Err.
Preceding	MC	**89**	12	2.2
	SC	**80**	17	3.0
Following	MC	**79**	18	3.1
	SC	**63**	25	4.3

Two 2 way ANOVAs were computed, an F1 taking subjects as the random factor, and an F2 taking items as the random factor. Both main effects were significant. My primary prediction, that the main character attribution effect will be maintained despite the manipulation of order, was borne out by the effect of Reference, a 13% advantage to the MC conditions giving $F1(1,39) = 10.601$, MSe =51, $p < .003$; $F2(1,62) = 18.144$, MSe =39, $p < .001$. Means are reported in Table OL4.2 and illustrated in Figure OL4.1.

Table OL4.2 Reference: MC v SC

	Mean (as %)	St. Dev.	St. Err
MC Question	**84%**	16	2.0
SC Question	**71%**	23	2.8

Figure OL4.1 Reference: MC v SC



The composition of this effect was examined through means comparisons. These were performed for the 2 levels of the Reference variable at each of the two levels of the Order variable. The Reference effect was found to be significant not only when the question was to the character preceding the atmosphere statement (where a 9% advantage for the MC gives $F1(1,31) = 6.458$, $MSe = 13$, $p < .02$; $F2(1,31) = 6.400$, $MSe = 9$, $p < .02$) but also when it was to the character following (where a 14% advantage gives $F1(1,31) = 20.840$, $MSe = 42$, $p < .001$; $F2(1,31) = 22.658$, $MSe = 34$, $p < .001$).

The main effect of order showed that subjects were more likely to give a *Yes* answer when the question referred to the character preceding the atmosphere statement, a 13% advantage for these giving $F1(1,39) = 36.138$, $MSe = 53$, $p < .001$; $F2(1,62) = 15.795$, MSe

=69, p < .001. Means are given in Table OL4.3 and illustrated in Figure OL4.2.

Figure OL4.2 Order: preceding v following

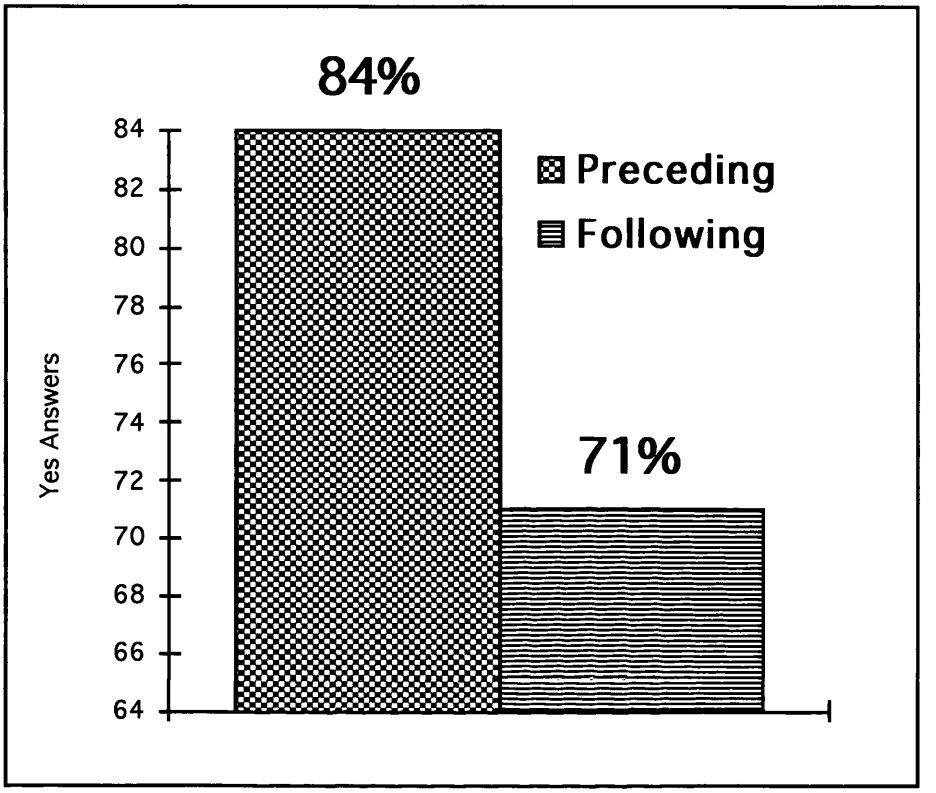


Table OL4.3 Order: preceding v following

	Mean (as %)	St. Dev.	St. Err
Preceding	**84%**	16	2.0
Following	**71%**	23	2.8

Means comparisons showed that the Order contrast was significant at both levels of the Reference condition. That is, for the MC there were significantly more *Yes* answers when the MC preceded the atmosphere sentence as against when it followed it (a 10% advantage giving F1(1,31) = 6.697, MSe = 14, p < .02; F2(1,31) = 13.281, MSe =

20, $p < .001$); and similarly for the SC there were significantly more *Yes* answers when it preceded (a 17% advantage giving $F1(1,31) = 21.267$, $MSe = 43$, $p < .001$; $F2(1,31) = 34.511$, $MSe = 51$, $p < .001$).

The interaction of Order with Reference was not significant ($F1(1,31) = 2.048$, $MSe = 4$, $p > .16$; $F2(1,31) = 2.487$, $MSe = 4$, $p > .12$)

5.3.3. Discussion

As noted above the principal hypothesis was upheld. Even if a character is introduced after the atmosphere statement, its status affects whether or not a subject will attribute this contextual information to it. Thus a marked MC is able to affect stored discourse representations as well as the processing of new input, at least as indexed in an off-line task. The main effect of order is discussed in section (8.1.).

All the experiments reported in this chapter have used the question answering paradigm pioneered in the work described by Garrod and Sanford (1988). It will be recalled that they complemented this with a self-paced reading (SPR) task. This was designed to demonstrate that attribution is not task dependent: resulting from a special strategy induced by the questions, or only occurring when the question is posed. I begin the next chapter with a parallel SPR experiment.

Chapter 6
On-Line Effects of Characterhood on Interpretation

6.1. Introduction

The conclusions that can be drawn from the question-answering paradigm studies are circumscribed by the off-line nature of the task. This has two limitations. First, it restricts the relevance of the findings to the main theoretical debates in discourse processing. The existing literature on inference has sought to identify those computations that are made during the normal reading process, rather than in response to a specific experimental technique. For example, the minimalist hypothesis limits its constrained view of inferencing to the processes that occur "automatically during comprehension" (McKoon and Ratcliff, 1992). In the off-line experiments we have seen the robustness and generality of the MC's role in shaping readers' responses to questions, but we cannot be sure either that the inference is made during reading, rather than when the question is posed, or that such attribution is not a strategic response to repeated questioning about it. If claims about the impact of text structure on discourse processing are to be advanced, evidence of an on-line impact will be needed.

The second limitation of the technique is that little can be said about the mechanisms underlying the effect. Question-answering gives us a retrospective view of the effect, probing its outcome, rather than revealing its development. Again, to find out more about the mechanisms involved we need to turn to on-line experimentation.

In this chapter I consider the attribution of psychological atmosphere sentences using two on-line techniques: self-paced reading and eye-tracking. The aim is to answer two basic questions.

(a) Can we find evidence that such atmosphere statements are processed with respect to MCs, rather than SCs, during the course of normal reading? Sanford and Garrod (1988) conducted a self-paced reading time experiment showing that target sentences, semantically related to an earlier atmosphere sentence, were processed differently depending on whether their agent was an MC or SC (see Section (3.3.3.)). However, they noted that this might be due to characterhood affecting processing of the target, rather than earlier attribution. We are looking for evidence that attribution itself is the cause; evidence that this is the case emerges here and is supported in later chapters.

(b) If we can show an on-line effect, when, during processing, does this emerge? Is it at the level of word-by-word incremental processing, or later, in the integration of larger text units?

In the chapters following this, (7) and (8), I return to questions of the generality of the effect - can it be demonstrated on-line with action statements or altered orders of introduction - and consider the processing mechanisms that underlie it.

6.2. SPR 1

SPR 1 was intended primarily as a replication of the SPR experiment reported by Garrod and Sanford (1988), using more tightly controlled materials. Their experiment demonstrated that the basic main character attribution effect shown in their question answering study,

and replicated here in Off-Line 1, could also be detected using reading times and without the additional task. For my experiment, new materials were constructed to give more general force to the conclusions, and their design was altered to give better control, and with the hope of strengthening the effect found.

The logic of the experimental design followed that of the successful Garrod and Sanford study mentioned in the previous section (and see (3.3.3.). I shall briefly recap. A target sentence was introduced. This described an action which followed from the atmosphere information, thus if it was hot a character might mop her brow. The action could be conducted by either the MC or the SC. However, the presence of the atmosphere statement was included as a variable in the experiment - in half the conditions it was removed. The resulting need for a bridging inference to explain the target action led to an increased reading time (RT) if the MC was its agent. However, with the SC as agent the absence of the atmosphere statement had no effect. This was predicted since if the atmosphere information is attached to the MC, a bridging inference will be needed in the SC condition anyway.

In the following example material from SPR 1 alternatives are given in curly brackets, and the target sentence is italicised.

(1) A MATINEE PERFORMANCE
{An usher/Paul} settled himself in a seat by the stairs. {Patricia/A woman} sat in the row behind. The show was {tedious/very funny}. *She yawned noisily several times.* The performance was well attended.

Manipulation of the presence of the atmosphere statement has been replaced by using Plausibility as an independent variable. The target action may be either Plausible in the light of the contextual information, or Implausible - as when yawning follows the statement that the show is very funny in the example. When the MC is agent we would thus expect not only that the ready availability of plausible atmosphere information would facilitate reading the target, as compared to the SC condition, but additionally that when the atmosphere is incongruent availability of this information would slow reading, as compared to the SC condition[42]. This design also ensures that the target sentence is constantly four sentences in to the passage, thus controlling for any changes in reading rate across the text.

The alternation of target sentence Reference (MC or SC) was achieved by having characters of opposing gender and altering which was introduced by name, i.e. which was the MC, while maintaining the same pronoun in the target sentence. This contrasts with the Garrod and Sanford study where changing this pronoun was used to the same effect. The new method gave improved control. First, in the original study the target pronoun varied between conditions, here it is identical in all cases. Second, in the original study characterhood was confounded with character role; i.e. a particular character, say Alistair, the customer, was MC, and another, the waitress, SC. It was

possible that a particular atmosphere description was more relevant to the MC in its role, rather than because of its status: we may assume that heat and humidity are not noticed by a waitress who has been in the atmosphere all day, but are important to a customer deciding what to eat. This is an alternative cause of the MC attribution found. In the new design, however, characterhood is no longer identical with character role. One further advantage of this design was that since the antecedent is always at the same distance, and always the last mentioned character, there is no need for an intermediary sentence to reintroduce the reference.

A concluding sentence following the target was also introduced. This was intended to improve readability, and to prevent any unusual processing occurring on the target due to its concluding the passage.

My main prediction was for an interaction of Reference with Plausibility. The availability of the atmosphere information with an MC, compared to with an SC, was expected to produce a significantly larger contrast between the two Plausibility conditions.

6.2.1. Method

6.2.1.1. Materials Pretest

Twenty four items were originally written for the experiment, but 4 were dropped following a pretest to check the success of the Plausibility manipulation. The pretest used a pencil and paper rating task. Booklets were constructed containing items cropped at the target sentence verb; thus for the above example the item would end at *yawned*. Each booklet contained 6 materials in each of the 4

conditions used in the main experiment. Across the pretest each item was seen in each condition the same number of times. Passages were randomly ordered across 4 A4 pages, and these pages were randomly ordered within each booklet. Subjects were asked to read the passages, and after each to rate how well they felt the final pronoun and verb (*She yawned*) fitted with what had preceded giving answers by circling a number on a scale from 1 (fits poorly) to 7 (fits well). Forty subjects were used, giving 10 ratings for each item in each condition.

The purpose of the pretest was to check that the intended contrasts in Plausibility were matched by subjects' perceptions. Mean ratings were thus calculated for the two Plausibility conditions, and an index of the manipulation calculated by subtracting the score for Implausible versions from that for Plausible. On the basis of these results a second pretest was conducted using 6 items - 5 re-written versions from the earlier test, and one new passage. Forty subjects were again used. The 20 best performing materials were then selected. These gave mean ratings, out of maximum 7 and minimum 1, of 5.8 for Plausible passages (with 4.6 as the lowest,) and 2.5 for Implausible (highest 3.2). The materials are listed in Appendix D.

6.2.1.2 Materials and Design

There were four conditions, formed by crossing the two independent variables, Reference and Plausibility, both of which have two levels. The dependent variable was reading time to the target sentence. The 20 experimental items were used to form 4 lists. In each list one quarter of the items were in each condition, and conditions were

circulated between list using a Latin square so each item was seen in each condition. This therefore realised a within subjects design.

Twenty filler passages were constructed (listed in Appendix E). These were the same length as the experimental items - title and 5 sentences - but varied the number of characters and their means of introduction. The aim was to make the pattern of the passages less predictable and to keep subjects' attention. Each list contained these same fillers, so subjects read a total of 40 passages. One half of the passages in each list were followed by a comprehension question, 8 were to experimental items and 12 to fillers. These had *Yes* or *No* answers. The questions were designed to ensure that subjects paid attention to the whole of each passage.

A random presentation was used: i.e. a new random order of presentation was constructed for each subject, mixing conditions and fillers.

6.2.1.3. Subjects and Procedure

The experiment was performed on an Apple Mac running Psyscope software[43]. The text was displayed in 12 point Chicago font, with a fixed left hand margin. Subject responses were given through a 3 option CMU button box. This was designed at Carnegie-Mellon University for use with Psyscope. A separate microprocessor within the button box recorded timings.

Presentation of the passages was sentence-by-sentence. Each item was preceded by an asterisk as a fixation spot. Depressing the middle button of the button box then replaced this with the title. A further

press of the button brought up the first sentence in place of the title, and so on until the passage was completed. If a question was attached this followed the final line, subjects indicating a Yes or No answer through the other two buttons on the box. The appearance of the asterisk marked the start of another trial. The dependent variable was thus reading times to the target sentence, measured as the interval between the button push calling up that sentence and the signal to remove it.

Subjects were instructed both orally and in a written presentation on the screen. They were asked to read at a normal speed and to ensure they comprehended the passage. Four practice trials preceded the main body of the experiment. There were two break periods during the experiment, the length of these was controlled by the subject.

Twenty four subjects participated in the experiment as unpaid volunteers. All were undergraduates at Glasgow University and none had participated in Experiments 1 to 4. Six subjects were assigned to each of the presentation lists. Completion of the experiment took approximately 20 minutes.

6.2.2 Results

Due to a malfunction of the button box a very small amount of data was lost from the calculation of subject and item means. This affected just 4 data points (i.e. 0.833% of the data.)

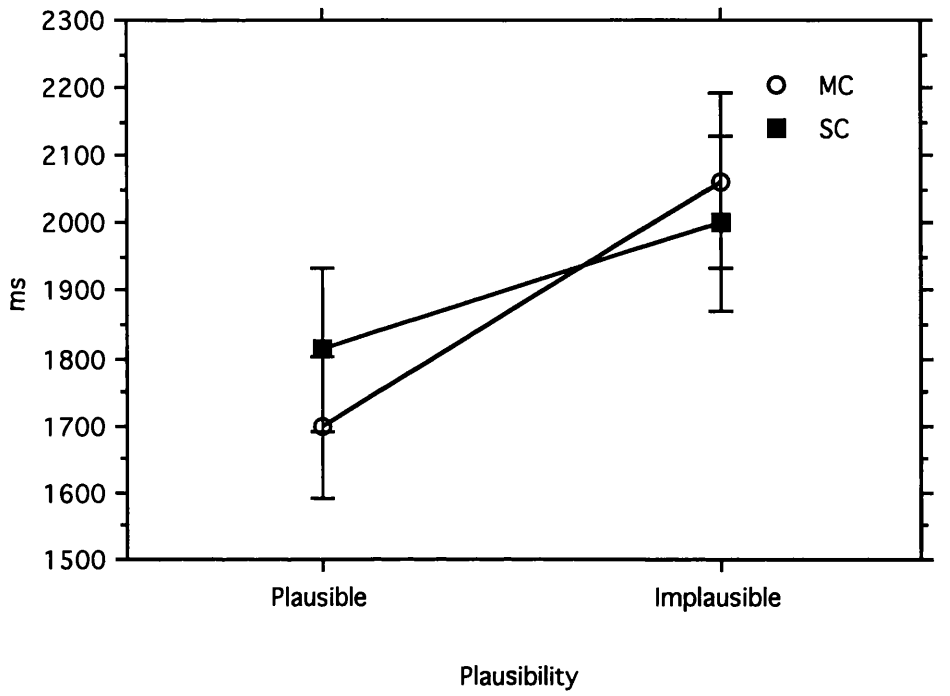
My primary prediction was of a Plausibility effect when the target agent was the MC, and a much attenuated or non-existent effect with the SC, leading to an interaction between Reference and Plausibility.

To determine this two 2 way ANOVAs were performed on the data, one by subjects and one by items. There was no main effect of Reference (mean for MC = 1880 ms, for SC = 1906 ms; F1 and F2 < 1). However, there was a main effect of Plausibility, with a mean RT for Plausible items of 1755 ms (St Err = 81), 276 ms faster than the mean for Implausibles at 2031 ms (St Err = 91): F1(1,23) = 20.790, MSe = 1,834,462, $p < .001$; F2(1,19) = 15.436, MSe = 1,397,878, $p < .001$. More importantly for my argument, there was also an interaction between the two variables: as predicted there is a greater effect of Plausibility when the MC is the agent of the target, see Table SPR1.1 and Figure SPR1.1. This gave F1(1,23) = 7.054, MSe = 191,845, $p < .02$; F2(1,19) = 7.024, MSe = 242,284, $p < .02$.

Table SPR1.1 Reference x Plausibility

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**1697**	525	107
MC, Implausible	**2063**	631	129
SC, Plausible	**1812**	603	123
SC, Implausible	**2000**	639	130

Figure SPR1.1 Reference x Plausibility



The composition of this interaction was probed using means comparisons. It was found that the contrast between Plausible and Implausible conditions held both with the MC as reference ($F1(1,23) = 59.070$, $MSe = 1{,}606{,}392$, $p < .001$; $F2(1,19) = 40.649$, $MSe = 1{,}402{,}047$, $p < .001$) and with the SC as reference ($F1(1,23) = 15.441$, $MSe = 419{,}914$, $p < .001$; $F2(1,19) = 6.904$, $MSe = 238{,}115$, $p < .02$). I also compared the two Reference conditions under each level of Plausibility. As I suggested in the introduction to the experiment, when the target was Implausible the MC condition gave longer RTs than the SC condition. However, this contrast did not reach a significant value ($F1(1,23) = 1.784$, $MSe = 48{,}511$, $p > 19$; $F2(1,19) = 2.841$, $MSe = 97{,}982$, $p > .10$). When the target is Plausible the direction of the contrast is reversed. The 115 ms difference is significant in the by items analysis ($F1(1,23) = 5.859$, $MSe = 159{,}338$,

$p < .025$) but is just above the .05 level of significance in the F2 ($F2(1,19) = 4.255$, $MSe = 146{,}757$, $p < .053$).

These findings for the two Reference conditions were checked using a Newman-Keuls multiple comparison. This confirmed the earlier results, the values for the comparison of Plausibility at the SC level are not significant (F1: $q_{24,2} = 1.87$, $p > .1$; F2: $q_{18,2} = 2.38$, $p > .1$), while at the MC level the contrast is clearly significant in a by subjects analysis (F1: $q_{24,2} = 3.42$, $p < .05$) and marginal in a by items analysis (F2: $q_{18,2} = 2.91$, $p < .1$).

6.2.3 Discussion

The experiment successfully replicated the interaction reported by Garrod and Sanford (1988), using a more rigorously controlled set of materials, and thus confirms that the attribution effect is not simply a response to the specific questions used in the earlier paradigm. However, the shape of the interaction is somewhat different to that in the earlier study; here there is a full cross over effect, whereas previously it rested on a slow RT for the MC, Implausible condition, the other three, including both levels of the Congruity condition with SC reference, having very similar RTs. This has some interesting implications for the processing underlying the effect.

In reviewing the Garrod and Sanford experiment (3.3.3.) I noted that there were two possible explanations of the interaction found. One is the attribution argument, consistent with the off-line data. The other is that with an SC as agent in the target there is no attempt at integrating this into the existing discourse representation - no

bridging inference is made - as readers are not motivated to find explanations for the SC's actions. Hence the content of the atmosphere statement has no impact. As I noted, both explanations appeal to the control of the MC on inferential processing, but only the former supports the attribution effect. The evidence from this experiment supports the attribution argument. I found that Plausibility does have an effect on RTs to the target even when this has an SC agent, it is simply weaker than with the MC. In the means comparisons this contrast was significant. It seems, therefore, that when the SC is referent, at least on some occasions a connection is made between the action described in the target and the atmosphere information, contrary to the alternative explanation.

A second factor appears to support this interpretation, but should be treated with caution. When the passages are Plausible there is an RT advantage when the referent is the MC. Thus it might be argued that, when the MC is agent, the information supporting the description in the target is immediately available, while, when the SC is agent, explanatory information is still sought, but some additional processing is necessary to bring that information into focus. However, the advantage to the MC here could be due to unexpected reference to the non-focused character[44]. In SPR 2 and 3, below, the same advantage appears as a statistical trend, even though there is no MC attribution effect. Nonetheless this experiment does favour the attribution explanation, and other evidence favouring this is offered in the following sections.

We thus have evidence that atmosphere statements are processed with respect to MCs, rather than SCs, during the course of normal

reading. I now turn to the question of when, during processing, the consequences of attribution emerge, and for this use an eye-tracking paradigm. This brings with it a number of further advantages.

6.3. Eye-Tracking

The following experiments develop the findings of SPR1. They are intended to test the same basic hypothesis, and in the case of Eye-Tracking3 use the same experimental materials, but utilise a different methodology: eye-tracking. In eye-tracking reading times are measured directly from a subject's eye-fixations on a text, thus removing the need to use button push intervals for data collection. Hence, in contrast to SPR, there is no secondary response task to intrude on the behaviour under investigation, reading. In addition, the entire paragraph making up an experimental material can be displayed from the beginning of the trial. This precludes the potential criticism of SPR results that the sentence-by-sentence presentation may have given rise to special reading strategies; in particular that readers may engage in unusually deep semantic processing of each sentence, the absence of visible continuing material encouraging them to treat each as the potential conclusion of a paragraph. Eye-tracking allows the use of whole paragraphs and normal line breaks, i.e., where these are not necessarily at sentence boundaries. In sum, eye-tracking more closely approximates the situation of normal reading and text presentation.

However, in addition to this improved ecological validity, eye-tracking also provides a very rich data record. This gives the potential for precision in determining the locus and time course of an

effect, but also demands care in interpretation of the data There are three main differences from the straightforward, unitary dependent variable provided by target sentence reading time in SPR[45]. First, there is a flexibility in defining the regions of interest. We can look at the whole target sentence, as in SPR1, but in addition can divide this into any sub-regions felt to be of interest. This gives the potential for predicting and testing exactly where in a text an effect is detectable. Second, there are two dimensions to the data. We can look not only at the duration of fixations on areas of text, akin to the RTs of SPR, but also at the pattern of eye movements during reading, considering where in the text backward movements are triggered, and where these regressions land. Third, there are a variety of available measures of reading time. Measures aimed at capturing early processing, such as first fixation or first pass, exclude certain refixations on the target region, with the intention of capturing only what happens at the moment new information becomes available. Other measures, such as total time, will include these refixations so as to capture effects on processing at later stages of analysis[46]. This gives the potential for predicting and testing exactly when during the processing of a text an effect emerges.

6.4. The time course of Processing: Localising semantic effects

In order to make use of the richness of available analyses it is important to have theories that make strong predictions about when and where effects are expected to show up. Moreover, without this there is a danger of compromising the .05 level of probability by random divisions of the data in a hunt for significances. Before preceding with the eye-tracking investigation of the main character

attribution effect, I will therefore discuss expectations for the localisation of this effect, in the light both of existing research and of a preliminary eye-tracking experiment of my own.

The effect demonstrated in SPR1 is a semantic phenomenon. It is semantic both in the projected underlying cause, the marked status of a focused character, and in the diagnostic factor used to give a purchase on this, the plausibility or implausibility of a target statement in a given context. This use of plausibility means that the first constraint on when the effect can emerge is the point at which semantic processing occurs; that is when new text is interpreted and integrated into the existing discourse representation[47]. For instance, it might be hypothesised that the language processor constructs a syntactic representation for whole sentences, then uses this as a pre-structured input to a semantic component. Chater et al (1995) note that this is a consequence of the Derivational Theory of Complexity, applied to Chomsky's Standard Theory, proposed in early works of transformational psycholinguistics (see Fodor et al, 1974, for description and criticism). Under such a theory we could not expect to locate semantic effects until after an entire first reading of a target sentence, as up to this point no semantic analysis will have been undertaken. However, existing evidence favours the proposal that processing is highly incremental; that is, both syntactic and semantic interpretation, including the making of inferences, is carried out - in most circumstances - for each new word of the input text. This gives the potential for semantic context effects to be located at the first reading of specific words.

Very early Plausibility effects have been found. For instance in Pickering and Traxler (in press) subjects were eye-tracked whilst reading texts such as

(2) That's {the pistol/ the garage} with which the heartless killer shot the hapless man yesterday afternoon.

In these cleft sentences, the argument expressing the instrument role of the main verb, *shot*, has been fronted, forming an unbounded dependency. Whilst one of these arguments is plausible as an instrument of the verb, *the pistol*, one is not, *the garage*. The earliest point we can, therefore, expect a Plausibility effect is at the verb (assuming a syntactic processing theory predicting direct association of dependent argument and verb).

Pickering and Traxler found effects emerging at the verb during first pass reading (that is prior to forward or regressive eye-movements to any other part of the text) and hence during processing of this word, along with the existing context, alone[48]. This implies that not only has a full syntactic structure been constructed at this point, but also a deep semantic interpretation, with access of the word meaning, interpretation of the partial verb phrase (*the garage* is an instrument of *shot*), and integration of this with world knowledge, leading to detection of the anomaly *shot with the garage*.

However, the possibility of incremental interpretation does not mean that exhaustive interpretation will be carried out with each new word of input, or that all effects need be localised to a word level. The theory of incremental interpretation argues for the immediate integration of input into prior context, but it does not state the extent

of this integration, or the grain of contextual information used. Indeed, earlier discussion (3.2.) noted that in cases where information is integrated across sentences, e.g. in the *Moses effect* and Barton and Sanford's (1983) *Survivors* text, inferences are not always even made, though these are part of the minimal conditions for a locally coherent interpretation. In contrast the Pickering example, above, exploits an intrasentential anomaly: the relationship between *the garage* and *shot* is determined by the syntax.

There has been little eye-tracking work on such discourse semantic phenomena to guide expectations about the locus of effects. One exception is a study by Garrod et al (1994) into the time course of pronoun resolution. Like Pickering and Traxler's study this manipulated Plausibility, but like SPR1 this depended on the integration of information across sentences. Subjects read passages such as the following (the target sentence is italicised in the example):

(3) Joan wasn't enjoying the flight at all. The dry air in the plane made her really thirsty. Just as she was about to call him, she noticed the steward coming down the aisle with the drinks trolley. *Right away she {ordered/ poured} a large glass of coke.* Joan finished it in one go and ordered another one.

When the verb *poured* is used there is a clash between the agent of the verb, and what we know of this agent from the context and our background knowledge - that Joan is a passenger, and therefore the likely recipient of the drink. Mobilising this contextual information at the new verb represents what Garrod et al call a pragmatic

inference. The results illustrated that this information was potentially available very quickly: there was a significant difference between these two Plausibility conditions not only using a diffuse measure - total reading times for the whole sentence - but also in a measurement sensitive to localised early processing - first pass fixation to the verb alone. This gave a difference of 6.1 ms per character in favour of the Plausible condition which was statistically significant. The first pass effect continued in a weakened form in the post-verb region of the sentence. Regressions analysis showed the same pattern. During the first pass through the verb region significantly more regressions were made to the pronoun in the Implausible condition, as compared with the Plausible. There were also more regressions from the post-verb region to the verb (plus pronoun) when this was Implausible.

These results show a Plausibility effect, dependent on the semantic analysis of cross-sentential information, which shows up in measures of early processing on a specific word. However, Garrod also presents evidence of more delayed and diffuse effects. The target pronouns were switched to the opposite gender, so the above example would now use *he*, referring to the steward, the secondary character in the preceding description. The manipulation of Plausibility remains, but in this case *ordered* is now the incongruent verb. With these versions of the experimental materials the effect remained strong and significant for the total time results taken across the full sentence. However, there was no effect for the early reading time measure of first pass at the verb, and there were a larger number of regressions here with the Plausible materials, reversing expectations (though this difference was not significant). The authors conclude

that if gender constraints pick out a non-focused antecedent for an anaphor in the current sentence then there is a delay in its resolution (note this is in keeping with the model of a focus system for pronoun resolution described in (4.3.). As a result of this delay, contextual information about this agent cannot be immediately accessed, and the anomaly is not noticed in early processing.

In a second experiment Garrod et al adapted the materials so that the pronoun in the target was replaces by a full NP (proper name or role description). Thus in the above example the target sentence would be:

> *Right away {Joan/ the steward} {ordered/ poured} a large glass of coke.*

The effect of Plausibility was again significant in the total time results taken across the full sentence. However, there were no significant early, localised effects either in reading time or regressions measures.

This is taken as evidence for the different functions of different anaphor types. Pronouns contain a minimum of new information, but serve to signalled continuation of reference to individuals; the processor therefore attempts to establish antecedence as soon as possible, and maps new information about the individual into the existing representation (adopting the Sanford and Garrod (1981) model (see (3.3.2), Garrod et al see this information as in *implicit focus*). Fuller anaphors, it is claimed, introduce new discourse referents, which may be then matched with those already in the

representation, and do not cue the same mapping of new information into old. The implausibility is thus only noticed at later stages of sentence integration.

Garrod et al's studies thus show the possibility of incremental interpretation, even when this involves the integration of semantic information from across sentences, leading to early effects on specific items, but also the possibility of delay in readers' response to implausibility, leading to diffuse effects in total reading times. What kind of expectations should we have for the type of materials used in SPR1? The effect found there rests on the completion of several operations. To begin with the agent pronoun of the target sentence must be resolved, this is fundamental to the manipulation of target sentence Reference. Garrod et al demonstrate a delay in plausibility detection following reference to a non-focused antecedent; though over the sentence as a whole the Plausibility effect is as strong as with focused referent versions. Very early differences in plausibility detection between the Reference conditions in an attribution effect experiment may, therefore, be due to delayed pronoun resolution, not differential attribution. In the second operation, the action described by the verb (e.g. *yawning*) will have to be mapped into contextual information about the situation that has been described (e.g. that it is *boring* or *funny*) and this, along with general knowledge about the usual response to such a situation, will result in successful integration, or detection of an anomaly. If the attribution theory is correct, then access to this contextual information is controlled by the status of the agent character; as the description will have been linked to the main character by an attributional inference. Thus only if the agent is a MC will the information be readily available, resulting in a

Plausibility effect. However, regardless of the status of the agent character, there may be some delay in accessing this contextual information, and hence in the Plausibility effect.

Given the potentially vast quantity of relevant contextual information (along with other, general, world knowledge of a reader) if it is to provide inputs to the processing on incoming text then it must be structured in some way so as to facilitate the search for relevant material. Schank and Abelson (1977; see also Graesser et al, 1979; Kintsch and van Dijk, 1978; Sanford and Garrod, 1981; Sharkey and Mitchell, 1985) propose the organisation of memory by *scripts* or *scenarios.* These are stereotypical representations of scenes, with open slots for the participants, events etc. that characterise them (so a court script will have a slot for a judge, witnesses, testimony, the verdict, and so on.) During discourse processing the particular details offered by a text's descriptions will be mapped into these underspecified characterisations. Thus textual information relating to core aspects of a reader's script of a situation will be well remembered and easily recovered. The details of script theory have been criticised (Rayner and Pollatsek, 1989, Chapter 8) but they do capture a point salient to this discussion: not all contextual information will have the same status or recoverability. Information about the roles of characters within a scene seems likely to be immediately available (in schema theory participant roles are central to characterising a scene). Hence we see an immediate, localised Plausibility effect when information anomalous to a character's role is introduced in Garrod et al's first experiment (i.e. if a passenger is described as serving the drink on a plane). The descriptive information introduced by an atmosphere statement, on the other

hand, is at a level of detail which makes it unlikely that it relates to a pre-given slot in a stereotypical schema. We might predict that such information will not, therefore, be available to the most immediate processing, and hence that Plausibility effects resulting from new material anomalous with the atmosphere described will appear relatively late and diffuse in eye-tracking.

An eye-tracking experiment was carried out to determine where and when effects of Plausibility due to contextual atmosphere information would appear in the eye movement record. This gives a baseline against which other experiments manipulating characterhood, in the manner of SPR1, can be interpreted.

6.5. Eye-Tracking1

6.5.1. Method

6.5.1.1. Materials and Design

The materials were based on those used in SPR1. The only change was that the atmosphere statement was explicitly assigned to the perception of a character. This character was always the agent of the target action.

(4) A MATINEE PERFORMANCE
{An usher/ Paul} settled himself in a seat by the stairs. {Patricia/ A woman} sat in the row behind. She found the show {tedious/ very funny}. She yawned noisily several times. The performance was well attended.

As in SPR1, there were thus 4 conditions, resulting from the interaction of two independent variables each with two levels.

Reference was manipulated by maintaining the same pronoun in the target while altering which character was introduced by name (i.e. was the MC). The 2 levels of the Plausibility factor were realised by changing the atmosphere statement so that the target action either followed from, or conflicted with it. As eye-tracking gives us the ability to examine regions within the target, it was important to be specific about where in the sentence Plausibility could be determined if the processor was making a maximal interpretation. Only with this information can we determine whether the processor is indeed making such a maximal interpretation for each new lexical input. For these materials Plausibility could be tied to the main verb of the target. It will be recalled that in the pretest of Plausibility performed for these items (reported under SPR1) subjects made a judgement on just the pronoun and verb of the target.

Reference was maintained as an independent variable in this experiment. However, in discussing SPR1 I have argued that the larger Plausibility effect with MC targets, as against SC targets, is due to the relative accessibility of contextual atmosphere information, as a result of attributional inferences made to the MC, rather than being due to a failure to integrate SC targets with existing information. Thus in this experiment, with an explicit assignment of the atmosphere statement, there will be no difference in the accessibility of this information, and hence the Plausibility effect, across Reference conditions. Thus, I make no predictions of either a main effect of Reference, or an interaction of it with Plausibility, resulting from the main character attribution effect. Garrod et al (1984), however, have shown that pronominal reference to a non-focused antecedent will slow the emergence of a Plausibility effect on the following verb. If

these materials are sensitive to such fine temporal distinctions, then we would expect a delay in the emergence of a Plausibility effect with SC reference.

My main prediction was thus for a main effect of Plausibility. The first point at which this might become apparent was at the target verb.

There were 20 experimental items, these were identical to those used in SPR1, except for the inclusion of an agent and an assigning verb in the atmosphere statement. A variety of verbs was used: *found*, as in the example above, *saw*, *felt*, *thought*, *reckoned* and *considered*. A full list of materials is given in Appendix F. These items were used to form 4 experimental lists. In each list one quarter of the passages were in each condition, and conditions were circulated between lists using a Latin square, so each item appeared in each condition across the lists. Each subject saw one of these lists, containing material in each of the experimental conditions, realising a within subjects design. Each list also contained 20 filler passages, intended to make the passages less predictable and to keep subjects' attention. The fillers were identical across lists and were the same as those used in SPR1 (Appendix E). Fillers and experimental items were mixed randomly together, with the constraint that the first three items in the lists were fillers, and acted as practice items, and that following each of 3 breaks (see Procedure, below) the first item was a filler. The order of presentation was fixed for experimental and filler passages; i.e. each subject saw the items in the same order. For instance for every subject *A Matinee Performance* was the fourth

passage, and first experimental item, presented; though its condition varied between lists.

Sixteen of the 20 fillers and 12 of the 20 experimental items were accompanied by straightforward comprehension questions. Half of these had a *yes* answer and half a *no* answer. These were designed to maintain subjects' attention across the whole of each passage.

The positioning of the target regions in the presentation of passages was carefully controlled. To avoid noise associated with the initial fixations on a line (affected by the physiological difficulties of controlling the long return sweep from the end of the previous line (Rayner and Pollatsek, 1989: 114)) the beginning of the target sentence was placed at least one word, and a minimum of 12 character spaces, from the start of the line. For any item the number of words separating the target and start of line was held constant across conditions. In addition, in each material the whole target sentence was presented unbroken on a single line.

6.5.1.2. Apparatus

Eye movements were recorded using a Stanford Research Institute Dual Purkinje Generation 5.5 Eye-tracker, manufactured by Forward Technologies. The eye-tracker had an angular resolution of 1' arc. Viewing was binocular with eye location monitored form the right eye alone. The position of a subject's eye was sampled every millisecond and analysed using software developed at UMASS which continuously monitors the output to establish the sequence of fixations and their start and finish times.

Passages were presented on a VDU interfaced with a Vanilla 368 computer which controlled the experiment. The presentation was white-on-black in 12 point New York font and the VDU was located 70 cms in front of the subject. Subjects moved through the materials and gave answers to the comprehension questions using a button box constructed in house.

6.5.1.3. Subjects

Data from 24 subjects was collected and analysed, 6 being assigned to each experimental list. Prior to presentation of the experimental materials, the eye-tracker was locked on and calibrated to the subject. If this could not be done with sufficient accuracy the volunteer was not used. Data preprocessing (see below) revealed that for 7 of the initial 24 subjects more than 4 experimental items (i.e. 25%) suffered from loss of track in the target regions, meaning no data was collected. These were replaced by new subjects.

Participation was voluntary, and subjects were paid £5. All volunteers came from the University of Glasgow community, had English as their first language, and were able to read from the VDU without glasses. None had participated in any of the other experiments reported here.

6.5.1.4. Procedure

Prior to the experiment subjects were verbally familiarised with the eye-tracking procedure, and given the opportunity to adjust their seat for height and comfort. A bite bar was prepared which, in combination with a head-strap, was used to minimise head movements, thus facilitating tracking. The eye-tracker was locked on

to the subject's 1st and 4th Purkinje images, and then the eye-tracker's output calibrated with prestored locations on the screen. This was repeated until accurate tracking was achieved or the subject abandoned. Materials were presented in 4 blocks, giving subjects 3 rest periods, after each of which the tracker was recalibrated.

Before each trial a fixation point, a small "+" symbol, was displayed at the upper-left-hand corner of the screen. Only when subjects fixated on this was the item then displayed, with the first character replacing the "+". This ensured subjects read from the beginning of the text, while additionally acting as a check on the calibration. Only when the system detected stable fixation on the prestored location of the symbol did the computer show the item, hence difficulty in bringing down the material indicated a problem with the calibration and the calibration procedure could be repeated.

Subjects read at their own pace, signalling completion of an item by pressing a key on a three-response button-box. Subjects then received a question, answer *yes* or *no* via the remaining button-box keys, or, in the absence of a question, moved on to the next trial.

The passages were double spaced, primarily to ease data preprocessing (see below). The presentation software constrained each line to a maximum of 65 characters.

Subjects were requested to read at their normal rate, ensuring they had understood each passage, and to be as accurate as possible in answering the questions.

6.5.1.5. Data Preprocessing

Initial output was in the form of x and y letter co-ordinates for fixation positions, and start and finish times for durations. This raw data was preprocessed so as to obtain an interpretable set of measurements. In the first stage, horizontal co-ordinates were manually inspected, and fixations judged to be part of the progress along a line, but with different y co-ordinates, were corrected to that line. These differences in y value were caused either by subjects fixating just above or below the line, but still taking in linguistic information (double spacing meant the lines above and below text were blank,) or by loss of calibration accuracy in the y dimension.

An automatic procedure was then used to pool short, contiguous fixations. As a result, all fixations of less than 80 ms and separated by only one character from an adjacent fixation, and all fixations under 40 ms and no more than three characters from their neighbour, were pooled with this. The assumption is that these short fixations represent adjustments in the site of what is essentially the same fixation (Rayner and Pollatsek, 1989: 123).

At the preprocessing stage some items for some subjects were deleted from further analysis due to tracker loss. This led to the loss of 12 data points, i.e. 3% of the data.

6.5.2. Results

6.5.2.1. Regions and Measures

At this stage of analysis it is necessary to define regions of interest, so that reading time measures can be calculated, by combining

fixation durations within these regions, and patterns of regressions between regions can be determined. As mentioned above, eye-tracking allows a flexibility in defining regions: the output data from preprocessing, still in the form of x, y co-ordinates, can be combined with any number of different regions devisions. Since the purpose of this experiment was to determine at what point in reading a Plausibility effect based on contextual information would become apparent, speculative analyses were made of a number of different regions. (1) Verb alone: this was the earliest point at which Plausibility could be detected. (2) Pronoun + verb: this allowed for the possibility that the verb was read while the pronoun was fixated (Rayner and Pollatsek, 1989: 127-133). (3) Verb + following adverb: this allowed for a delayed mapping of the verb to contextual information, and hence a less localised Plausibility effect. (4) Pronoun + verb + adverb: this combined (2) and (3). (5) Full sentence: this allowed for a more dispersed effect still, and was the region used in SPR1. In each case the region contained the space to the left of the first letter, but not that to the right of the last: since the window of information taken in on a fixation extends primarily to the right fixations on spaces between words are assumed to be taking in the word on that side.

Eye-tracking also allows a number of different measures to be used. However, interpretation of how these relate to processing load and difficulty is not straightforward. Firstly, early RT measures, excluding refixations, should not be equated with the processor's initial analysis; there is no reason to assume such a close relationship between cognitive computation and eye movement behaviour (Clifton, 1995). Secondly, there is a complex relation between

reading time and regressions. We would normally expect processing difficulty to be indexed by longer RTs. However, if difficulty triggers regressions, then RT measures that include only those fixations made before a target region is exited, whether that be to the right *or to the left*, will be reduced by this.

For this experiment results were calculated for two traditional measures of early processing: duration of the *first fixation* (FF) in a region, and *first pass* (FP) duration (Rayner and Pollatsek, 1989: 177, where first pass is termed gaze duration). The former is the duration of a single fixation, the first made within a region. The latter combines all those fixations made in a region before it is exited either to the left or the right, and hence maybe unreliable in a situation in which there are a large number of regressions. Such measures have a fine temporal resolution and will detect immediate effects triggered by a specific word or phrase in the text. I also examine the *total time* (TT) results. This measure combines every fixation made in a region, including those that follow regressions. It will thus pick up effects that are delayed, or only occur when some larger portion of the sentence has been read. Two further measures are calculated, these are intended to take account of the regressions problem with first pass mentioned above, but are still somewhat more restricted than a simple total time measure. The first, *right bounded* (RB) reading time pools the duration of all fixations made prior to exiting the region to the right. That is, it includes fixations on other regions, to the left of the target, and refixations on the target region itself, as long as these follow a regression from the target. The second, *restricted right bounded* (RRB) reading time, includes only fixations on the target region, but includes all those made before the target is exited to the

right; so this may include refixations on the region if they follow a regression.

The experimental design used here means that all targets are identical across conditions, so there is no need to use a transform to compensate for uneven lengths. However, as is customary in eye-tracking studies I report RTs in terms of milliseconds per character for most measures, dividing the RT measure by the number of characters in the target region. The exceptions are first fixation in a region, considering the absolute value of this single fixation, and the right bounded measure, where fixation times are being combined from more than just the target region.

Regressions themselves provide an indicator of difficulty that has been particularly associated with higher order processing (Rayner and Pollatsek, 1989: 178). Here I present data both on the number of regressions from a region, and on the number made to it. Two regressions measures are used. First, *Leading edge* regressions considers only those eye movements where the originating fixation was the rightmost point yet reached in the text; this is taken as an indicator of immediate difficulty following the input of this new information. Second, the *total* number of regressions, an index of later processing difficulty. I count as a regression only those leftward eye movements whose destination is another region. The evidence is that regressions within words are simply corrections to gain the best alignment on a word, rather than reflecting higher order processes.

6.5.2.2. Results summary

It will be recalled that my principal prediction was for a main effect of Plausibility. This was confirmed by the results. For total time, the plausible conditions gave faster RTs across all regions divisions, from the verb alone to the full target sentence. However, in the earlier RT measures the effect emerged only when the full target was considered (with a significant advantage to the plausible conditions in first pass, and in the restricted right bounded measure.) Additionally, the contrast was significant for total regressions from and to the verb region.

Below I present the details of these results, organised into the five regions analyses mentioned above and starting with the most localised region in which a Plausibility effect could have been detected, the verb alone.

6.5.2.3. The verb region

In this analysis just fixations associated with the verb, shown between slashes in the example below, were considered.

She/ yawned/ noisily several times

Two, 2 way ANOVAs were performed for each of the RT measures, one by subjects and one by items. There was no effect of Reference, or of the interaction of Reference and Plausibility in any of the measures (all Fs < 1). Below I report on the **main effect of Plausibility.**

First fixation (FF) shows a tendency in the expected direction for the main effect of Plausibility, see Table ET1.1. The 17.1 ms difference between conditions produced a marginal significance in the F1 analysis, $F1(1,23) = 2.943$, $MSe = 7,288$, $p < .099$, but this fell off in the F2, $F2(1,19) = 2.111$, $MSe = 4,992$, $p > .16$.

Table ET1.1 Verb region, first fixation: Plausibility

	Mean (ms)	St. Dev.	St. Err
Plausible	**203.6**	62.6	9.0
Implausible	**221.0**	70.8	10.2

The same tendency in the main effect was apparent in the **first pass** (FP) results with a 2.3 ms/character advantage for the Plausible conditions, see Table ET1.2. However this did not approach statistical significance ($F1(1,23) = 2.108$, $MSe = 121$, $p > .16$; $F2(1,19) = 1.179$, $MSe = 71$, $p > .29$).

Table ET1.2 Verb region, first pass: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**30.1**	9.7	1.4
Implausible	**32.4**	10.8	1.6

However, any interpretation of the results from these early RT measures is complicated by an additional factor. Because of the small size of this region, there are many trials where no fixation has landed on it; that is it has been skipped, resulting in a Zero-ms RT in first fixation and first pass. This occurs in 72 data points, or 15% of the total number. These zeros are not evenly distributed, 41 occur in the Plausible conditions, against 31 in the Implausible. If these trials are

removed from the data prior to calculation of the ANOVAs, the Plausibility effect disappears. The advantage for Plausible conditions shrinks to 6.7 ms for first fixation and 0.7 ms/character for first pass, with neither of these approaching significance (Fs < 1). Interpretation of this distribution of zeros is not clear from this data alone: it could be that parafoveal preview[49] whilst the eye is fixated on the preceding pronoun allows full interpretation of the verb if this is easily processed, and hence causes skipping. There is some evidence that words are more likely to be skipped if they are predictable from the context (Rayner and Pollatsek, 1989: 226) and so this distribution of Zero-ms RTs would be predicted by the hypothesis. Alternatively this distribution could simply be noise, resulting from a random process or a cause orthoganol to the experimental manipulations. Full interpretation of these measure is thus best held off until we have expanded the region and decreased the number of zeros.

Again with the **right bounded** (RB) and **restricted right bounded** (RRB) measures we see a non-significant tendency in the predicted direction. For the right bounded analysis, see Table ET1.3, F1(1,23) = 2.182, MSe = 22,078, p > .15; F2(1,19) = 2.989, MSe = 16,736, p > .10).

Table ET1.3 Verb region, right bounded: Plausibility

	Mean (ms)	St. Dev.	St. Err
Plausible	**249.1**	99.2	14.3
Implausible	**278.4**	140.2	20.2

For the restricted right bounded analysis, see Table ET1.4, F1(1,23) = 2.808, MSe = 152, p > .10; F2(1,19) = 1.445, MSe = 81, p > .24).

Table ET1.4 Verb region, restricted right bounded: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**30.8**	10.5	1.5
Implausible	**33.3**	11.1	1.6

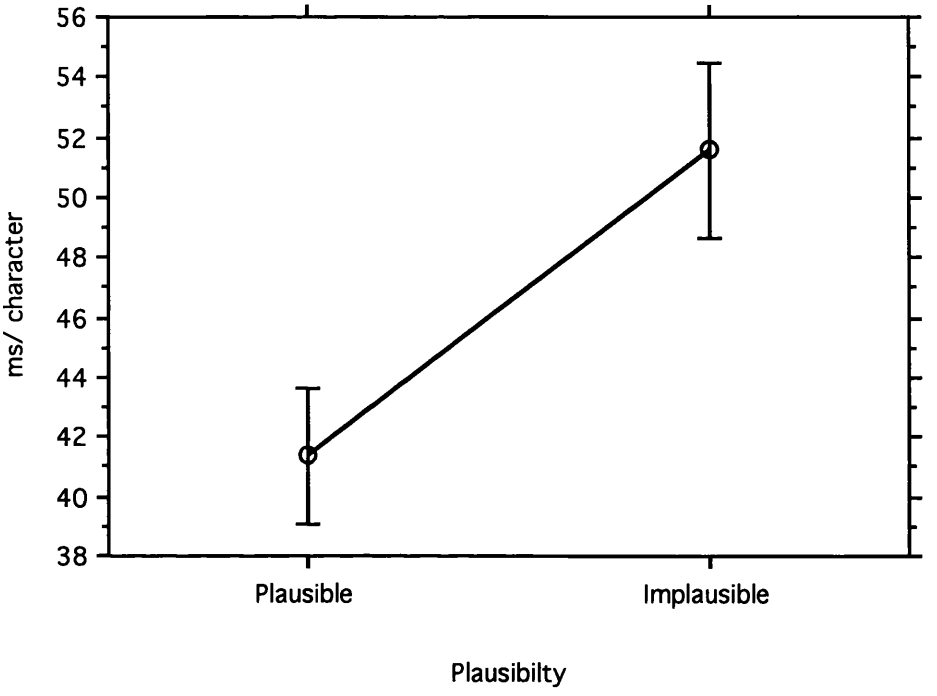
However, the same distribution of zeros occurs in these two measures as with first fixation and first pass, so again interpretation is best delayed until the region has been expanded and the number of zeros decreased.

In contrast to the above measures, the **total time** (TT) produces a strong effect of Plausibility, with a 10.2 ms advantage for the Plausible conditions, see Table ET1.5 and Figure ET1.1, giving a highly reliable statistical significance ($F1(1,23) = 24.091$, $MSe = 2501$, $p < .001$; $F2(1,19) = 8.737$, $MSe = 1925$, $p < .01$). The total number of zero-ms RTs here falls to 34, constituting 7% of the data points. These are again unevenly distributed, but the advantage to the Plausible conditions has fallen to just 5 (19 against 14).

Table ET1.5 Verb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**41.2**	15.9	2.3
Implausible	**51.4**	20.1	2.9

Figure ET1.1 Verb region, total time: Plausibility (with St. Err. bars)

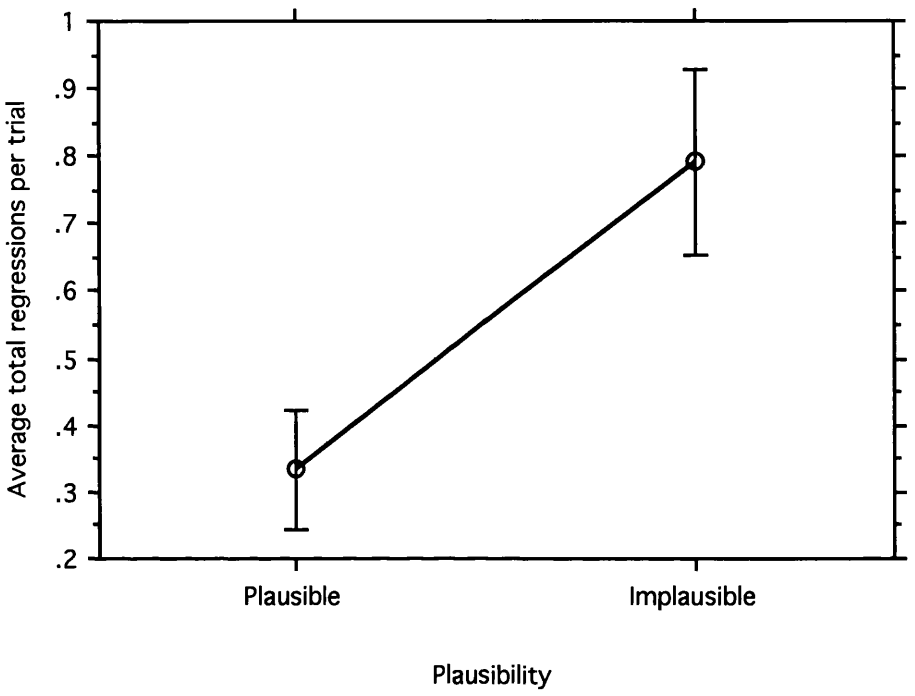


The pattern of **regressions** fits well with the RT data and gives us a clearer picture of the effect. The regression inclusive early RT measures show a tendency of similar strength to that in first pass, indicating that early regressions from the verb are not a significant factor. This is confirmed in the regressions analysis, with a very small number of **leading edge** regressions from the verb equivalent across conditions (all Fs < 1). The large effect in TT as compared with FP suggests a larger number of regressions from the post-verbal regions back to the verb in the Implausible conditions. With the leading edge regressions measure the number of regressions per trial to the verb produces an average of 0.875 for the Plausible conditions against 1.146 for the Implausible, showing as a trend in the inferential statistics ($F1(1,23) = 2.702$, $MSe = 1.761$, $p > .11$; $F2(1,19) =$

2.044, MSe = 2.112, $p > .16$). However, if we include regressions from after the verb to any pre-verbal region then the difference (1.146 against 1.750) is significant by subjects, and shows a strong trend by items ($F1(1,23) = 7.907$, MSe = 8.762, $p < .01$; $F2(1,19) = 4.163$, MSe = 8.450, $p < .06$). We can further analyse this leading edge effect to see the origin of these regressions. From the adverb there is a small increase in the average number of regressions for the Implausible condition (0.812 against 0.649) but this does not approach significance ($F1(1,23) = 1.108$, MSe = 0.667, $p > .30$). From the remainder of the target there is a larger contrast (1.125 against 0.813) giving a marginal significance ($F1(1,23) = 3.285$, MSe = 2.343, $p < .083$). The number of regressions to the verb and before from the final sentence of the text is small, but the larger number in the Implausible conditions remains: a contrast of 0.583 against 0.354 giving, $F1(1,23) = 2.764$, MSe = 1.260, $p > .11$. The principal source of the effect found with regressions to the verb and before is thus the latter part of the target sentence.

A similar pattern is apparent with the **total** number of regressions. Here the number of regressions per trial to the verb alone produces an average of 1.854 for the Implausible conditions versus 1.167 for the Plausible, a significant difference ($F1(1,23) = 11.344$, MSe = 7.475, $p < .02$; $F2(1,19) = 6.690$, MSe = 13.603, $p < .02$). Total regressions analysis also shows a significant effect for regressions from the verb region: 0.333 regressions per trial in the Plausible conditions against 0.792 in the Implausible ($F1(1,23) = 21.244$, MSe = 5.042, $p < .001$; $F2(1,19) = 12.853$, MSe = 6.049, $p < .002$) see Figure ET1.2. Note that, as with RTs, there is no effect of Reference or interaction of Reference with Plausibility in either regressions measure ($Fs < 1$).

Figure ET1.2 Total regressions from verb: Plausibility (with St. Err. bars)



Overall the results from this region show a strong effect, but one that principally emerges downstream of the first pass through the verb. In the Implausible conditions, total reading time at the verb is lengthened following a high number of regressions to this region, and also the preceding text, while second and later passes show disruption here with a significantly higher number of total regressions.

6.5.2.4. The pronoun plus verb region

The region was extended to include the initial pronoun. Since the window of information taken in on a fixation can extend approximately 14 characters to its right[50], fixations on the pronoun could, as noted above, initiate processing on the verb. In addition,

the anomaly in the Implausible conditions is a result of the mismatch of action and agent, thus, after the verb has first been read, additional second pass reading times resulting from the implausibility may effect both verb and pronoun. Overall, it is possible that such an enlargement of the region will produce stronger results. In addition the expansion reduces the number of zero-ms RTs in the early measures, while, for the early measures, still controlling the information available to the processor to the verb.

Again there were no signs of an interaction between Reference and Plausibility (all Fs < 1). Early measures showed a weak tendency towards a main effect of **Reference** with the MC conditions being read more slowly: FF, difference of 16.6 ms, 241.7 ms for MC reference against 225.1 for SC reference ($F1(1,23) = 2.077$, $MSe = 6,586$, $p > .16$; $F2(1,19) = 2.713$, $MSe = 4,594$, $p > .11$); RB, difference of 65.6 ms, 373.7 ms against 308.1 ms ($F1(1,23) = 2.468$, $MSe = 103,369$, $p > .13$; $F2(1,19) = 2.375$, $MSe = 63,151$, $p > .14$). However this was not apparent in first pass with a difference of only 1.5 ms/character ($F1(1,23) = 1.522$, $MSe = 54$, $p > .23$; $F2<1$) and had disappeared by TT, where the difference is under 1 ms/character (Fs < 1). In addition there remains a skewed distribution of zero-ms RTs between these conditions, with 13 more zeros in the SC reference cases. If these are removed the tendency disappears in all measures (all Fs < 1).

The tendencies towards the predicted main effect of **Plausibility** found in early measures at the verb are preserved, but further weakened, both in their absolute values and their level of statistical probability. In particular the difference between Plausible and

Implausible conditions in the **first pass** has fallen to a mere 0.7 ms/chr, giving Fs < 1 (for FF, RB and RRB all Fs < 1 except for by subjects analysis of FF where a 10.6 ms advantage to the Plausible conditions gives F1(1,23) = 1.752, MSe = 2,722, p > .19). As intended the extension of the regions greatly reduces the number of zeros in the data points (there are 27, representing less than 6% of the data) and evens their distribution between Plausibility conditions (to a difference of just 1). That this is accompanied by a disappearance of the trend towards an early Plausibility effect indicates that in the verb only region this was an artefact of the zero-ms RT distribution and not a processing effect.

However, the **total time** results again give a strong main effect of Plausibility, see table ET1.6. For this measure there are only four zero-ms data points, i.e. less than 1% of the data, and these are evenly distributed across Plausibility conditions.

Table ET1.6 Pronoun + verb, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**34.2**	13.3	1.9
Implausible	**41.6**	16.8	2.4

The 7.4 ms/character difference is significant in both analyses F1(1,23) = 16.701, MSe = 1,304, p < .001; F2(1,19) = 9.460, MSe = 1,014, p < .01

6.5.2.5. The verb plus adverb region

Extending the verb region to the left allowed for the possibility of preview of the verb during fixations on the pronoun. In this analysis

the region was extended to include the word to the right, in each case an adverb; thus the region under consideration is shown between slashes in the example below:

She/ yawned noisily/ several times

My intention here was to further examine the time course of the effect. Results from the verb region demonstrate that a Plausibility effect based on the mismatch of atmosphere information with a character's action does occur, but does not emerge until some point after the first pass reading of the verb. By looking at early measures for a region including the adverb we can see if the anomaly has become apparent by the time one additional word has been processed.

Two, 2 way ANOVAs were performed for each of the RT measures, one by subjects and one by items.

There was no main effect of Reference for any measure (all Fs < 1), nor an interaction of Reference and Plausibility in FF, FP, RRB or TT (all Fs < 1). The means in the right bounded analysis show a trend towards an interaction, with the Plausibility effect stronger accompanying MC reference, see table ET1.7.

Table ET1.7 Verb + adverb, right bounded: Interaction

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**518.3**	153.7	31.4
MC, Implausible	**616.5**	265.2	54.1
SC, Plausible	**546.6**	200.8	41.0
SC, Implausible	**555.6**	192.8	39.3

However, this does not approach significance: F1(1,23) = 1.956, MSe = 47,766, p > .17; F2(1,19) = 1.774, MSe = 35,286, p > .19. There were four zero-ms data points for this region division, removing these further weakened the significance level of this interaction (F1(1,23) = 1.652, MSe = 41,224, p > .21) although the trend for the means remained.

In contrast the predicted **main effect of Plausibility** again shows a more complex pattern of results. **First fixation** is of limited interest here. It includes values for trials where there was a zero-ms data point on the verb region, but where a fixation is made on the following adverb; but since the adverb does not itself contain implausible information we would not expect these fixations to strengthen the Plausibility effect. The means do indeed show a weakened tendency in the expected direction with an advantage of 11.7 ms to the Plausible conditions (F1(1,23) = 2.325, MSe = 3,308, p > .14) see table ET1.8. However, the small number of zero-ms data points here (4, or less than 1% of the data) and there relative balance across conditions (there are two more in the Plausible conditions) do remove this distribution as a cause for the trend.

Table ET1.8 Verb + adverb, first fixation: Plausibility

	Mean (ms)	St. Dev.	St. Err
Plausible	236.3	46.6	6.7
Implausible	248.0	56.2	8.1

In **first pass** the tendency apparent at the verb remains but still fails to reach significance, although, as with first fixation, we are able to rule out the distribution of zeros as the cause. There is a 2.1 ms/character advantage for the Plausible conditions, see table ET1.9. This is marginal in a by subjects analysis ($F1(1,23) = 3.230$, $MSe = 109$, $p < .085$) but much weaker by items ($F2(1,19) = 1.905$, $MSe = 75$, $p > .18$).

Table ET1.9 Verb + adverb, first pass: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	28.1	7.6	1.1
Implausible	30.2	10.6	1.5

For the **right bounded** measure evidence of a Plausibility effect remains merely a trend. A 53.7 ms advantage for the Plausible conditions, see table ET1.10, does not approach significance ($F1(1,23) = 2.808$, $MSe = 69{,}015$, $p > .10$; $F2(1,19) = 1.977$, $MSe = 51{,}471$, $p > .17$).

Table ET1.10 Verb + adverb, right bounded: Plausibility

	Mean (ms)	St. Dev.	St. Err
Plausible	532.4	177.5	25.6
Implausible	586.1	231.4	33.4

However, from the **restricted right bounded** there is stronger evidence for the predicted effect. Implausibility results in a 3 ms/character increase in RT, see table ET1.11, a difference that is significant in by subjects analysis ($F1(1,23) = 5.659$, $MSe = 224$, $p < .03$) and marginal in the by items analysis ($F2(1,19) = 3.548$, $MSe = 166$, $p < .075$).

Table ET1.11 Verb + adverb, restricted right bounded: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**29.3**	8.3	1.2
Implausible	**32.3**	11.5	1.7

As with the previous regions divisions, **total time** produces a strong effect of Plausibility, with a 7.1 ms/character advantage for the Plausible conditions (see table ET1.12) giving a highly reliable statistical significance ($F1(1,23) = 13.719$, $MSe = 1,243$, $p < .002$; $F2(1,19) = 6.742$, $MSe = 991$, $p < .02$). There were only two zero-ms data points here, constituting less than 0.5% of the data, one in each of the Plausibility conditions.

Table ET1.12 Verb + adverb, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**36.4**	13.5	1.9
Implausible	**43.5**	16.5	2.4

Both the TT RTs and the absolute value of the Plausibility effect have fallen somewhat from the verb only analysis, reflecting the increased

character length of the region and a concentration of fixations on the verb.

The **regressions** data shows a similar pattern to that in the analysis of the verb alone. There is no effect of **leading edge** regressions from the region (Fs < 1) but a large effect for **total** regressions from the region, with the number of regressions per trial for the Implausible conditions giving an average of 2.208 versus 1.208 for the Plausible ($F1(1,23) = 14.526$, $MSe = 23.999$, $p < .001$; $F2(1,19) = 13.957$, $MSe = 28.798$, $p < .002$). If we look at the total number of regressions to the adverb alone there is almost no advantage to the Plausible condition (0.883 regressions per trial against 1.000, giving Fs < 1). Thus regressions from later in the material that contribute to the TT effect seem to land mostly at the verb or before.

I also look at RTs on the region following the verb and adverb, that is the remainder of the target sentence. In both FP (see table ET1.13)

Table ET1.13 post-adverb, first pass: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**27.9**	10.2	1.5
Implausible	**30.5**	8.8	1.3

and TT (see table ET1.14)

Table ET1.14 post-adverb, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	34.2	13.9	2.0
Implausible	38.5	13.9	2.0

there was a trend in the expected direction, but in neither case does this reach significance (FP: F1(1,23) = 2.363, MSe = 163, p > .13; TT: F1(1,23) = 2.891, MSe = 441, p > .10).

Overall results from the verb plus adverb region confirm the strength of the total time effect already found. They also indicate that this emerges quite late: even after the first pass through the word following the verb, implausibility is still not producing clear disruption to processing as indexed through either lengthened RTs or leading edge regressions.

6.5.2.6. The pronoun plus verb plus adverb region

As noted in 5.2.3, it is possible that information from the verb is recovered during fixations on the preceding pronoun. I thus conducted a further analysis for a region including both the adverb following the verb, and the pronoun preceding it. The general pattern of results follows that already reported. In this case, however, the first pass analysis reaches a marginal level of significance. There is a 2.4 ms/character advantage to the Plausible conditions (see table ET1.13) giving values of F1(1,23) = 3.686, MSe = 141, p < .067 and F2(1,19) = 3.542, MSe = 103, p < .075).

Table ET1.15 Pronoun + verb + adverb, first pass: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	25.9	6.9	1.0
Implausible	28.3	10.2	1.5

A total time difference of 6.1 ms is also significant ($F1(1,23) = 11.575$, $MSe = 895$, $p < .003$; $F2(1,19) = 6.699$, $MSe = 718$, $p < .02$).

6.5.2.7. The target sentence

The final analysis conducted on the data looked at the target sentence as a whole, shown between slashes in the example below:

/ She yawned noisily several times./

Two, 2 way ANOVAs were performed for each of the RT measures, one by subjects and one by items.

There was no main effect of Reference for any measure (for RB, RRB and TT all $Fs < 1$; for FP, $F1(1,23) = 1.430$, $MSe = 52$, $p > .24$; $F2(1,19) = 1.852$, $MSe = 49$, $p > .19$). Nor is there an interaction effect for Reference and Plausibility (RB, RRB and TT all $Fs < 1$); though note that a very weak trend in the means for FP shows a larger Plausibility effect at SC than MC, see table ET1.14 ($F1(1,23) = 1.799$, $MSe = 116$, $p > .19$; $F2(1,19) = 2.395$, $MSe = 97$, $p > .13$).

Table ET1.16 Target sentence, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**28.6**	6.9	1.4
MC, Implausible	**30.6**	10.2	2.0
SC, Plausible	**27.9**	7.6	1.6
SC, Implausible	**34.3**	11.3	2.3

With this extended region the **main effect of Plausibility** produces a clear result in **first pass**, with a 4.3 ms/character advantage to the Plausible condition, see table ET1.15 and Figure ET1.3. This is significant in both analyses: F1(1,23) = 8.332, MSe = 437, $p < .01$; F2(1,19) = 7.326, MSe = 352, $p < .015$.

Figure ET1.3 Target sentence, first pass: Plausibility (with St. Err. bars)

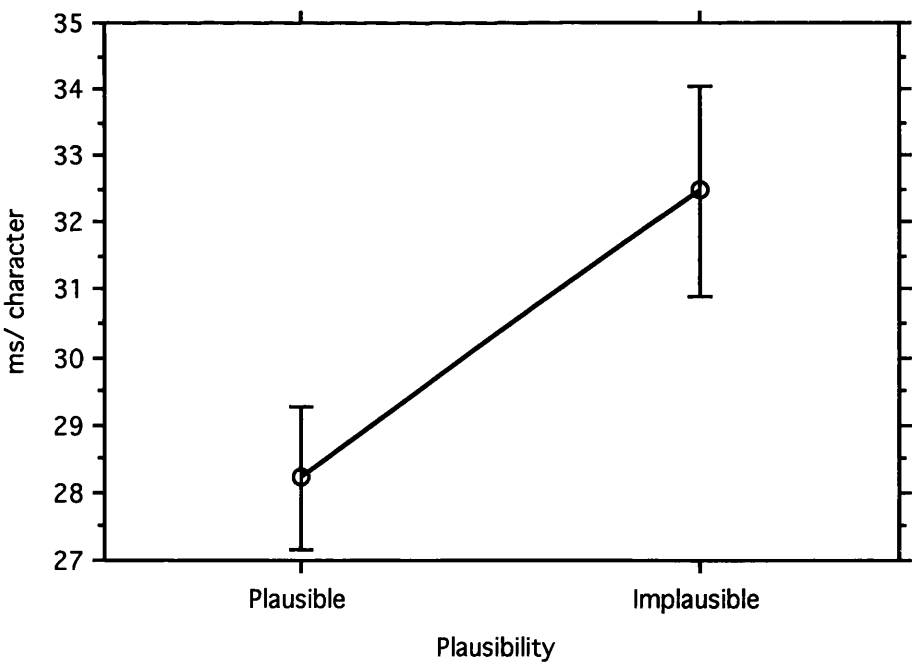


Table ET1.17 Target sentence, first pass: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**28.2**	7.2	1.0
Implausible	**32.5**	10.8	1.6

For the **right bounded** measure a difference of 133.9 ms, see table ET1.16, is significant in the by subjects analysis ($F1(1,23) = 4.802$, $MSe = 430,397$, $p < .04$) but not in the by items analysis ($F2(1,19) = 2.086$, $MSe = 316,624$, $p > .16$).

Table ET1.18 Target sentence, right bounded: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**1266.5**	432.8	62.5
Implausible	**1400.4**	400.2	57.7

For the **restricted right bounded** measure a difference of 4 ms/character, see table 1.17, is significant in both analyses: $F1(1,23) = 9.093$, $MSe = 383$, $p < .01$; $F2(1,19) = 4.776$, $MSe = 303$, $p < .05$.

The significant effect in **total time** is again apparent, the Plausible conditions showing an RT 5.3 ms/character faster than the Implausible, see table ET1.16 ($F1(1,23) = 8.871$, $MSe = 681$, $p < .01$; $F2(1,19) = 5.996$, $MSe = 562$, $p <. 025$).

Table ET1.19 Target sentence, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**33.7**	11.6	1.7
Implausible	**39.0**	12.8	1.9

6.5.3. Discussion

This first eye-tracking experiment thus confirms the predictions made about the time course of this Plausibility effect (based on a cross-sentential anomaly between contextual atmosphere information and a character's action) and sets the scene for investigation of the main character attribution effect.

First, there is a reliable effect of Plausibility. We see an effect in total time measures, of RT and regressions, centred on the verb and spreading across the whole target sentence, along with a first pass result for the target sentence as a whole.

Second, this effect does not emerge until late into processing of the target sentence, and considerably downstream of the verb by which it is signalled. The failure to get an FP result until the whole target is considered indicates either long RTs in the Implausible condition at the end of the sentence, or a large number of regressions from the end of the sentence to earlier points. It seems likely that both these occur. Under (5.4.4) I analyse RTs on the tail of the target, showing a non-significant trend towards a Plausibility effect. While in (5.2.2) I show this area to be the principal site of regressions to the verb and before. In either case, the prediction that this effect occurs late in processing (see (4)) is confirmed: on this eye-tracking evidence it appears to emerge in sentence wrap-up rather than during incremental processing.

Third, there is no evidence of pronominal reference to the secondary character in the target having any impact on the results. It seems

likely that the late emergence of this Plausibility effect means that pronominal reference, even under these conditions, has been secured by the time the effect emerges.

In returning to the main character attribution effect, therefore, we will expect a late and diffuse pattern of results in eye-tracking experiments, as differential attribution interacts with this already late emerging effect.

6.6. Eye-Tracking 2 and 3

I will present two studies investigating the main character attribution effect found in SPR1 through eye-tracking, in the light of the time course information gained in Eye-Tracking1. The first, Eye-Tracking 2, uses a different set of materials which realise a slightly different experimental logic. The second, Eye-Tracking3, aims to replicate and develop SPR1 by using the same materials. In both experiments the principal prediction is for a replication of the interaction effect found in SPR1, demonstrating that differential attribution of contextual atmosphere information occurs on-line.

6.7. Eye-Tracking 2

6.7.1. Method

6.7.1.1. Materials and Design

It will be recalled that the materials used in SPR1 developed Garrod and Sanford's (1988) design by changing the presence or absence of an atmosphere statement, supporting the action described in the target, to a manipulation of Plausibility (see (2) and (5.1)). The

materials used in this experiment compromise between these two. While a context describing statement is present across conditions (avoiding confounding the manipulation with different text lengths, see (2)) the atmosphere statements supporting the described action in the target are contrasted in the alternate conditions with a neutral statement, rather than one creating an implausible context. The assumption is that where there is only a neutral statement in the context, the need for a bridging inference to explain the target action will lead to disruption in the eye-tracking record. I call this the Congruity effect. In the following example from Eye-Tracking 2 the congruent atmosphere statement describes the heat, motivating the action of mopping the brow, with the incongruent, neutral statement describes a smell, giving no such motivation. The alternatives are given in curly brackets, and the target sentence is italicised.

(5) AT THE RESTAURANT
{A customer/ Richard} took a seat and picked up the menu. {Caroline/ A waitress} approached and took his order. {The atmosphere was very hot and sticky./ The restaurant smelled of fresh garlic.} *She mopped her brow.* At the next door table a child was throwing food on the floor.

As noted above, the presence of the neutral statement avoids confounding the congruency manipulation with different text lengths. It was thus important that atmosphere and neutral statements should be of equal length: this was controlled to within 3 characters.

As in SPR1 and Eye-Tracking1, target Reference was manipulated by maintaining the same pronoun in the target while altering which character was introduced by name (i.e. was MC). As noted, see (2),

this gives identical targets across conditions, precludes the need for an intervening sentence, and controls for character role.

In this experiment, therefore, my main prediction was for an interaction of Reference with Congruity: the availability of the atmosphere information with an MC, compared to with an SC, was expected to produce a significantly larger contrast between the two Congruity conditions. Whilst Eye-Tracking1 shows that any effect is likely to be late and diffuse, with these materials we are not, anyway, able to make precise predictions about the locus of the effect. The materials used in SPR1 were designed and pretested to ensure that the verb of the target alone induced a semantic implausibility; this was not the case here. This is clear from the above example where the opening of the target, *She mopped,* is not in itself congruous or incongruous with either context statement, and could be continued in ways irrelevant to either, *She mopped the table.*

There were 24 experimental items. These were developed from the best performing texts used in Off-Line 1. A full list is given in Appendix G. These items were used to form 4 experimental lists. In each one quarter of the passages were in each condition, and conditions were circulated between lists using a Latin square. Thus each item appeared in each condition across the lists, and the design was within subjects. Each list also contained 20 filler passages. These were identical across lists and were the same as those used in SPR1 and Eye-Tracking1 (Appendix E). Fillers and experimental items were mixed randomly together, with the constraint that the first three items in the lists were fillers, and acted as practice items, and that following each of 3 breaks (see Procedure, below) the first

item was a filler. The order of presentation was fixed for experimental and filler passages; i.e. each subject saw the items in the same order. Twelve of the filler and twelve of the experimental items were followed by straightforward comprehension questions; half with a *yes* and half with a *no* answer.

As in Eye-Tracking1, the position of the target sentence in the materials was carefully controlled (see 5.1.1): at least one word separated its beginning from the left-hand margin, and each target sentence was presented unbroken on a single line.

6.7.1.2. Apparatus

The apparatus used was identical to that described in Eye-Tracking1.

6.7.1.3. Subjects

Data from 24 subjects was collected and analysed, 6 being assigned to each experimental list. Prior to presentation of the experimental materials, the eye-tracker was locked on and calibrated to the subject. If this could not be done with sufficient accuracy the volunteer was not used. Data preprocessing revealed that for 3 of the initial 24 subjects more than 4 experimental items (i.e. 17%) suffered from loss of track in the target regions, meaning no data was collected. These were replaced by new subjects.

Participation was voluntary, and subjects were paid £5. All volunteers came from the University of Glasgow community, had English as their first language, and were able to read from the VDU without glasses. None had participated in any of the other experiments reported here.

6.7.1.4. Procedure

The procedure was identical to that described in Eye-Tracking1.

6.7.1.5. Data Preprocessing

The two stage data preprocessing procedure reported in Eye-Tracking1 was repeated here. First, horizontal co-ordinates were manually corrected to ensure that fixations were tied to the line being read. Second, an automatic procedure pooled short, contiguous fixations if these were of less than 80 ms and separated by only one character from an adjacent fixation, or less than 40 ms and no more than three characters from the neighbouring fixation.

At the preprocessing stage some items for some subjects were deleted from further analysis due to tracker loss. This led to the loss of 16 data points, i.e. less than 3% of the data.

6.7.2. Results

The principal prediction was for a replication of the interaction between Reference and Congruity, paralleling SPR1. For total time this interaction is significant by subjects at the verb region, and marginally significant in F1 and F2 when the pronoun is included. It is again significant in F1 analysis for total regressions from the verb. For the full target sentence there is a first pass main effect of Congruency. Detail of all analyses follow.

6.7.2.1. The Verb Region

Initial analysis was performed on the verb of the target sentence alone. Given the results of Eye-Tracking1, and the dispersed locus of

the Congruity manipulation, there was no expectation of any effect in early measures here. Total time, on the other hand, includes refixations following the reading of later material, and so here we would expect the emergence of the predicted interaction. Two, 2 way ANOVAs were performed for each RT measure, one by subjects and one by items.

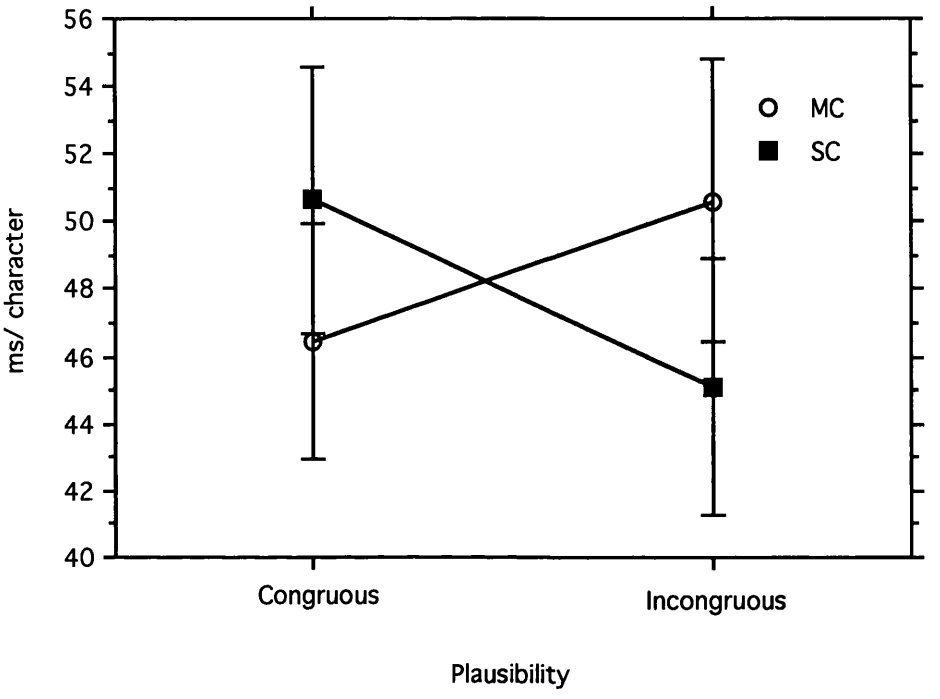
There were no signs of an interaction in FP, RB or RRB (all Fs < 1). However, in total time there is a 4.1 ms/character advantage in the Congruent condition when reference is to the MC; while when reference is to the SC it is actually the Incongruent condition which is read faster (see Table ET2.1 and Figure ET2.1). This difference is significant in the by subjects analysis ($F1(1,23) = 5.049$, $MSe = 558$, $p < .04$), but not in the by items ($F2(1,23) = 2.504$, $MSe = 461$, $p > .12$).

The pattern of results here fits well with our prediction of a main character attribution effect interacting with a late emerging Congruity effect. The shape of the interaction is similar to that in SPR 1, with a full cross-over. Though the advantage to MC reference in the Plausible conditions is not significant in a means comparison: $F1(1,23) = 1.880$, $MSe = 208$, $p > .18$; $F2<0$, and note that SPR 1 did not show the reversed Congruity effect with SC reference evident here.

Table ET2.1 Verb region, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**46.5**	17.1	3.5
MC, Incongruent	**50.6**	20.5	4.2
SC, Congruent	**50.6**	19.4	4.0
SC, Incongruent	**45.1**	18.7	3.8

Figure ET2.1 Verb, total time: Interaction (with St. Err. bars)



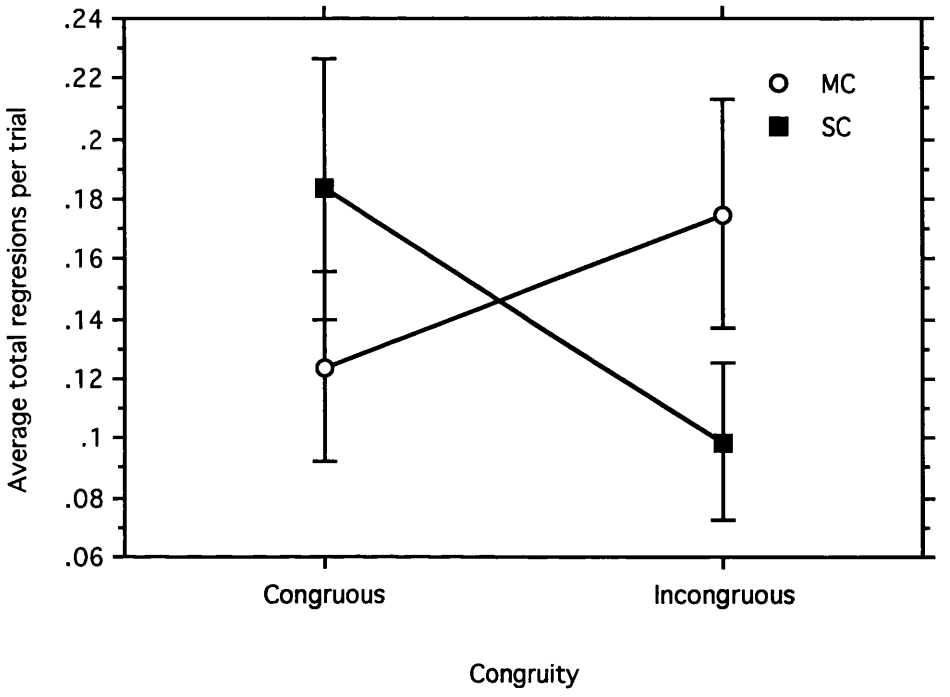
However, note that two factors argue for circumspection in the interpretation of this result. Firstly there is the failure to obtain a significant by items result. Secondly, there are a considerable number of zero-ms data points (59 or 11% of the data) distributed in a way which confounds with the hypothesis: 6 more in the MC, Congruent condition than the Incongruent, 3 less in the SC, Congruent condition than the corresponding Incongruent. As noted in Eye-Tracking1, the cause of this distribution is not entirely clear, though skipping is thought more likely for more predictable words, and thus this distribution would be predicted by the hypothesis. The two main effects were not significant in TT, Fs < 1.

Regressions analysis showed a corresponding pattern. For **leading edge** regressions there are no results (i.e. in either of the main effects or the interaction) for regressions from the verb, or for regressions to the verb (all Fs < 1; except for regressions to verb, by subjects, where a difference between the Congruity conditions with MC reference of .072 regressions per trial contrasts with a difference with SC reference of .012, giving for the interaction F1(1,23) = 1.281, MSe = .043, p > .26). As with total reading times, **total** regressions from the verb show evidence of the expected interaction between attribution and Congruity with an interaction between Reference and Congruity in the data. Again this is composed of both an advantage to the Congruous condition when there is reference to the MC in the target, indexed by less regressions, and a disadvantage to this condition with SC reference (see Table ET2.2 and Figure ET2.2). The interaction is significant in the by subjects analysis (F1(1,23) = 6.775, MSe = .111, p < .02), just rising above the critical level when analysed by items (F2(1,23) = 3.946, MSe = .120, p < .06). There were no main effects of total regressions from verb.

Table ET2.2 Total regressions from verb: Interaction

	Mean (average total regressions per trial)	St. Dev.	St. Err
MC, Congruent	**.124**	.156	.032
MC, Incongruent	**.175**	.187	.038
SC, Congruent	**.183**	.212	.043
SC, Incongruent	**.099**	.130	.027

Figure ET2.2 Total regressions from verb: Interaction (with St. Err. bars)



With total regressions to verb there are again no main effects (Fs < 1), but a trend towards an interaction (see Table ET2.3).

Table ET2.3 Total regressions to verb: Interaction

	Mean (average total regressions per trial)	St. Dev.	St. Err
MC, Congruent	**.275**	.235	.048
MC, Incongruent	**.382**	.282	.057
SC, Congruent	**.364**	.284	.058
SC, Incongruent	**.315**	.228	.046

This is expected - additional fixations following regressions to the verb are a likely cause of the interaction evident in total RT - but does not reach significance, with a marginal F1 value ($F1(1,23) = 3.242$, $MSe = .145$, $p < .085$) weakening in F2 ($F2(1,23) = 1.678$, $MSe = .126$, $p > .20$).

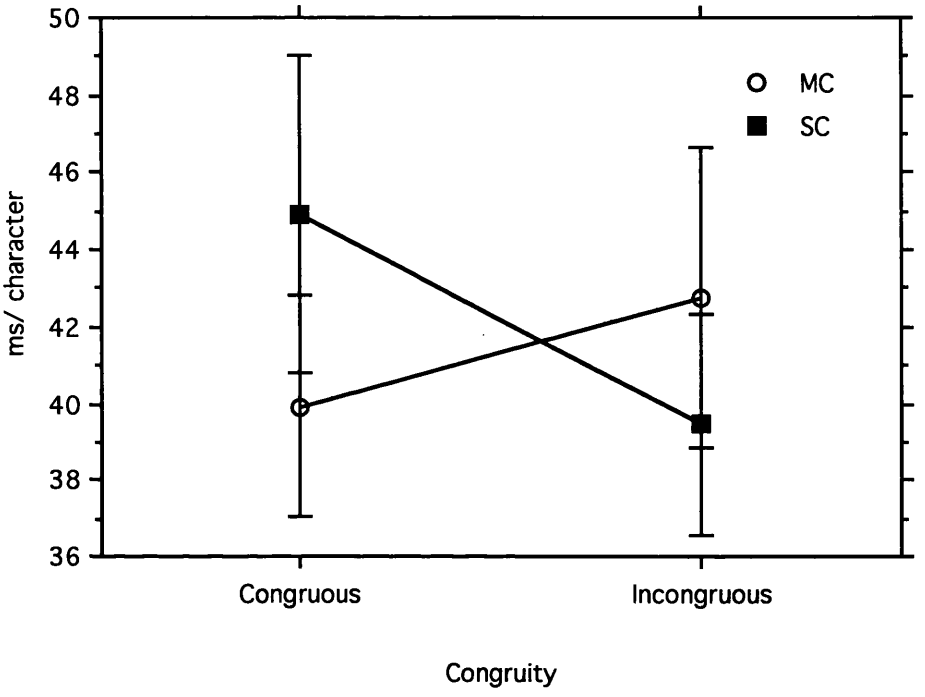
6.7.2.2. The pronoun plus verb region

The region under analysis was extended to include the pronoun preceding the verb (see (5.2.1) for motivation). Means for the TT interaction are shown in Table ET2.4 and illustrated in Figure 2.3. This gave a smaller F value in the by subjects analysis, but strengthened that by items, giving a marginal result in both cases: $F1(1,23) = 3.279$, $MSe = 416$, $p < .084$; $F2(1,23) = 3.758$, $MSe = 395$, $p < .065$. Again the means show a cross-over effect, but a means comparison shows no significant advantage of the MC, Plausible to the SC, Plausible condition. The number of zero-ms data points here is 23, or 4% of the data. These are evenly distributed across the conditions, 7 in the MC, Congruent condition against 6 in the Incongruent, and 5 in both SC reference cases.

Table ET2.4 Verb + pronoun, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**39.9**	14.2	2.9
MC, Incongruent	**42.8**	19.1	3.9
SC, Congruent	**44.9**	20.0	4.1
SC, Incongruent	**39.4**	14.3	2.9

Figure ET2.3 Pronoun + verb, total time: Interaction (with St. Err. bars)



Earlier measures followed the pattern for the verb region.

6.7.2.3. Rightward extended verb regions

In contrast to Eye-Tracking1 - where the TT main effect found at the verb is preserved as this region is expanded - here, increasing the region's size, whilst maintaining trends in the predicted direction, weakens the statistical significance of the interaction. RTs for the verb plus following word are shown in Table ET2.5. Note that, given the relative heterogeneity of targets in these materials, this additional word was not always of the same syntactic type, e.g. an adverb, as in Eye-Tracking1. There was a single zero-ms data point; in the SC, Congruent condition.

Table ET2.5 Verb + following word, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**43.8**	14.0	2.9
MC, Incongruent	**47.6**	16.0	3.3
SC, Congruent	**47.7**	15.7	3.2
SC, Incongruent	**47.9**	16.0	3.3

This gives F values of: F1(1,23) = 1.206, MSe = 75, p > .28; F2(1,23) = 0.479, MSe = 44, p > .49. The 3.8 ms/character contrast between the Congruity conditions with MC reference was tested with a means comparison, but proved not to be significant: F1(1,23) = 2.787, MSe = 173, p > .10; F2(1,23) = 2.426, MSe = 225, p > .13.

Extending this region to include the pronoun gives the means shown in Table ET2.6. This removed all zero-ms data points.

Table ET2.6 Pronoun + verb + following word, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**39.6**	12.8	2.6
MC, Incongruent	**42.8**	15.7	3.2
SC, Congruent	**44.7**	17.9	3.6
SC, Incongruent	**42.9**	12.8	2.6

In inferential analysis this shows as a very weak trend: F1(1,23) = 2.038, MSe = 156, p > .16; F2(1,23) = 1.843, MSe = 132, p > .18.

Finally, over the whole target sentence, the TT means are as shown in ET2.7. This gave Fs of less than one for the interaction.

Table ET2.7 Target sentence, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**39.9**	11.4	2.3
MC, Incongruent	**42.2**	14.4	2.9
SC, Congruent	**42.3**	13.6	2.8
SC, Incongruent	**41.6**	9.9	2.0

In Eye-Tracking1 a main effect of Plausibility was found in the first pass for the target sentence as a whole. Here, the equivalent manipulation, Congruity, gives a marginal result, strengthening a trend apparent in the verb plus word following regions. There is a 3.0 ms/character advantage to the Congruous conditions, see Table ET2.8: $F1(1,23) = 3.515$, $MSe = 218$, $p < .074$; $F2(1,23) = 3.789$, $MSe = 220$, $p < .064$. This effect is not apparent in either of the regression inclusive early measures, RB or RRB; nor does it survive into total time, where a 0.8 ms/character advantage for Congruous conditions gives Fs less than one.

Table ET2.8 Target sentence, first pass: Congruity

	Mean (ms/chr)	St. Dev.	St. Err
Congruent	**30.1**	7.9	1.1
Incongruent	**33.1**	9.3	1.3

However, while this gives (qualified) support for a Congruity effect, there is nothing approaching a significant interaction with Reference to give indication of an effect of attribution. Means are given in Table ET2.9; $F1 < 1$, $F2(1,23) = 1.136$, $MSe = 59$, $p > .29$.

Table ET2.9 Target sentence, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Congruent	**29.1**	8.2	1.7
MC, Incongruent	**33.5**	9.3	1.9
SC, Congruent	**31.2**	7.7	1.6
SC, Incongruent	**32.8**	9.5	1.9

6.7.3. Discussion

The pattern of results fits my predictions. As expected following Eye-Tracking1, Congruity emerges as a factor late in processing: giving a marginal main effect in first pass over the entire target sentence, and showing in total time results in the interaction with Reference. The main prediction was that attribution of atmosphere information to the main character would lead to a larger Congruity effect when target sentence reference was to this character, and hence an interaction between Reference and Congruity. This interaction was concentrated at the verb, becoming apparent in the verb and pronoun plus verb regions in total RT, and in the pattern of total regressions. As with SPR 1, the shape of the interaction, with MC, Plausible conditions being read more easily than SC, Plausible conditions, argues for attribution to the MC having already occurred, during reading of the atmosphere statement (though in each case an unpredicted difficulty with the SC, Congruent condition was a component of the interaction). Elsewhere trends towards an interaction in the means failed to reach significance.

6.8. Eye-Tracking 3

6.8.1. Method

6.8.1.1. Materials and Design

The materials were identical to those used in SPR1 and described in (2), a full list is given in Appendix D. I repeat the example given there, showing alternatives inside curly brackets and the target sentence italicised:

(6) A MATINEE PERFORMANCE
{An usher/ Paul} settled himself in a seat by the stairs. {Patricia/ A woman} sat in the row behind. The show was {tedious/very funny}. *She yawned noisily several times.* The performance was well attended.

Reference was manipulated by maintaining the same pronoun in the target while altering which character was introduced by name (i.e. was the MC). Plausibility was manipulated by changing the atmosphere statement so that the target action either followed from, or conflicted with it. It will be recalled form SPR1 that the materials were pretested to ensure a strong contrast in Plausibility between the conditions and tied to the verb. There were thus 4 conditions, resulting from the crossing of these independent variables. The control across conditions given by holding constant the target sentence is particularly important in eye-tracking, given the sensitivity of eye-tracking measures to lexical features such as word length and frequency (Rayner and Pollatsek, 1989: Chapter 4).

My main prediction was thus for an interaction of Reference and Plausibility, emerging in later measures of RT and regressions.

There were 20 experimental items. These were used to form 4 experimental lists in a within subjects design. Each list also contained 20 filler passages, identical to those used in the previous on-line experiments (Appendix E). Fillers and experimental items were mixed randomly together, with the constraint that the first three items in the lists were fillers, and acted as practice items, and that following each of 3 breaks the first item was a filler. The order of presentation was fixed for experimental and filler passages; i.e. each subject saw the items in the same order, and was identical to that in Eye-Tracking1. Sixteen of the 20 fillers and 12 of the 20 experimental items were accompanied by straightforward comprehension questions. Half of these had a *yes* answer and half a *no* answer.

The positioning of the target regions in the presentation of passages was carefully controlled. To avoid noise associated with the initial fixations on a line the beginning of the target sentence was placed at least one word, and a minimum of 12 character spaces, from the start of the line. For any item the number of words separating the target and start of line was held constant across conditions. In addition, in each material the whole target sentence was presented unbroken on a single line.

6.8.1.2. Apparatus

The apparatus used was identical to that described in Eye-Tracking1.

6.8.1.3. Subjects

Data from 24 subjects was collected and analysed, 6 being assigned to each experimental list. Some subjects were rejected prior to running

as accurate calibrations could not be obtained. Data preprocessing revealed that for 6 of the initial 24 subjects more than 4 experimental items (i.e. 25%) suffered from loss of track in the target regions, meaning no data was collected. These were replaced by new subjects.

Participation was voluntary, and subjects were paid £5. All volunteers came from the University of Glasgow community, had English as their first language, and were able to read from the VDU without glasses. None had participated in any of the other experiments reported here.

6.8.1.4. Procedure

The procedure was identical to that described for Eye-Tracking1.

6.8.1.5. Data Preprocessing

The two stage data preprocessing procedure reported in Eye-Tracking1 was repeated here. First, horizontal co-ordinates were manually corrected to ensure that fixations were tied to the line being read. Second, an automatic procedure pooled short, contiguous fixations if these were of less than 80 ms and separated by only one character from an adjacent fixation, or less than 40 ms and no more than three characters from the neighbouring fixation.

At the preprocessing stage some items for some subjects were deleted from further analysis due to tracker loss. This led to the loss of 10 data points, i.e. 2% of the data.

6.8.2. Results

Again, the principal prediction was for an interaction between Reference and Plausibility. This effect is only clearly significant in total regressions from the verb. For first pass in the verb plus adverb region there is a significant interaction, but in the reverse direction to that predicted. Additionally, there is a main effect of plausibility for total time, significant at the verb plus adverb, and whole target sentence regions.

6.8.2.1. The verb region and pronoun plus verb region

Initial analysis was performed on the verb of the target sentence alone, where we expect an interaction effect in the TT and total regressions results.. The region was then expanded to include the preceding pronoun (see (5.2.1) for motivation). Two, 2 way ANOVAs were performed for each RT measure, one by subjects and one by items.

For the verb alone the **first pass** means show a non-significant (Fs < 1) trend for the interaction. Unexpectedly, this is in the reverse direction to that predicted to emerge in TT, with a 3.6 ms/character Plausibility effect with SC reference compared to a 1.7 ms/character effect with MC reference, see Table ET3.1. There are 73 zero-ms data points in this data, i.e. 16%, with 24 falling in the MC, Congruent condition, 13 in the corresponding Incongruent condition, and 19 and 17 in these two with SC reference.

Table ET3.1 Verb region, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**33.6**	13.2	2.7
MC, Implausible	**35.3**	12.4	2.5
SC, Plausible	**34.4**	15.4	3.1
SC, Implausible	**38.0**	15.3	3.1

No other effects approach significance: Fs < 1, except Plausibility, by subjects where the contrast 34.0 ms/character for Plausible against 36.7 ms/character gives F1(1,23) = 1.549, MSe = 169, p > .22.

When the pronoun is included in the analysis this trend is removed. Here there is a 0.4 ms/character Plausibility effect with MC reference, set against a small advantage (1.2 ms/character) for the Implausible condition with SC reference (this gives Fs < 1).

Returning to the verb alone, the **right bounded** measure shows a trend in the interaction returned to the expected direction (see Table ET3.2), but again this is non-significant (F1(1,23) = 1.174, MSe = 25,005, p > .28; F2(1,19) = 1.956, MSe = 24,102, p > .17). Using the **restricted right bounded** analysis the interaction is flat (Fs < 1).

Table ET3.2 Verb region, right bounded: Interaction

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**288.8**	114.7	23.4
MC, Implausible	**332.2**	141.4	28.9
SC, Plausible	**324.9**	245.7	50.1
SC, Implausible	**303.7**	120.1	24.5

Total Time, where an interaction was predicted, shows no such effect at the verb, though the trend of the means is in the predicted direction, see Table ET3.3: F1(1,23) = .056, MSe = 15, p > .81; F2(1,19) = .286, MSe = 35, p > .59.

Table ET3.3 Verb region, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**42.8**	15.2	3.1
MC, Implausible	**51.1**	22.1	4.5
SC, Plausible	**45.1**	22.1	4.5
SC, Implausible	**51.8**	17.8	3.6

There is a main effect of Plausibility, with the Plausible conditions read 7.5 ms/character faster than the Implausible (43.9 ms/character against 51.4 ms/character), though this reaches significance only in the by subjects analysis: ET3.3: F1(1,23) = 7.171, MSe = 1362, p < .02; F2(1,19) = 2.576, MSe = 1074, p > .12. There are 38 zero-ms data points in the TT data, i.e. 8%, with 14 falling in the MC, Congruent condition, 4 in the corresponding Incongruent condition, and 14 and 6 in these two with SC reference.

Analysis of the **regressions** pattern showed no effects in regression to the verb using either a leading edge or a total regressions measure. Regressions from the verb, however, bear out our predictions. The reversal of the first pass trend in the regression inclusive RB measure suggests leading edge regressions means will show a trend in the predicted direction. In fact (see Table ET3.4) there is a marginal effect for the interaction, in the predicted direction, in the by subjects

analysis, but this falls of slightly when considered by items, F1(1,23) = 3.710, MSe = 1.042, $p < .067$; F2(1,19) = 2.713, MSe = 1.249, $p > .11$.

Table ET3.4 Leading edge regressions from verb: Interaction

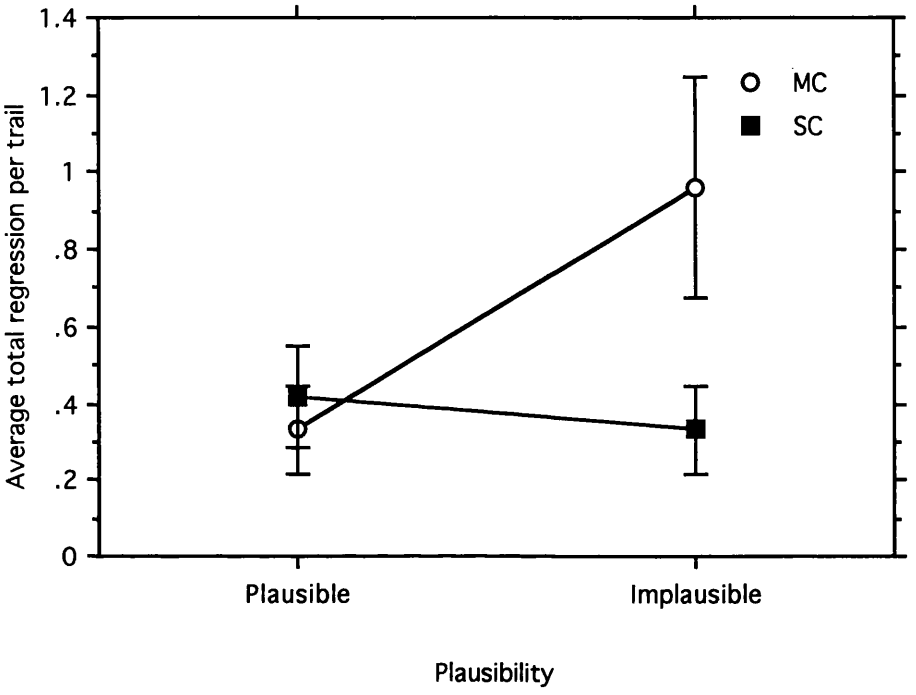
	Mean (average regressions per trial)	St. Dev.	St. Err
MC, Plausible	**.292**	.550	.112
MC, Implausible	**.542**	.779	.159
SC, Plausible	**.333**	.482	.098
SC, Implausible	**.167**	.381	.078

For total regressions the interaction is significant (see Table ET3.5 and Figure ET3.1): F1(1,23) = 4.399, MSe = 3.010, $p < .05$; F2(1,19) = 5.433, MSe = 3.607, $p < .04$.

Table ET3.5 Total regressions from verb: Interaction

	Mean (average total regressions per trial)	St. Dev.	St. Err
MC, Plausible	**.333**	.565	.115
MC, Implausible	**.958**	1.398	.285
SC, Plausible	**.417**	.654	.133
SC, Implausible	**.333**	.565	.115

Figure ET3.5 Total regressions from verb: Interaction (with St. Err. bars)



With the exception of the FP analysis, the pronoun plus verb region follows the same pattern as the verb alone.

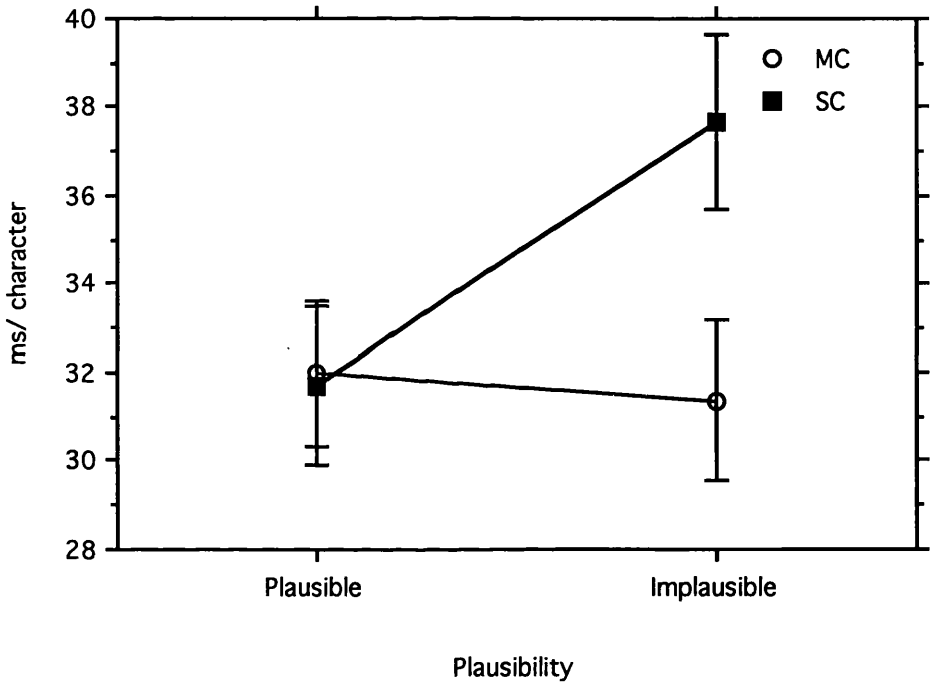
6.8.2.2. The verb plus adverb region

The unexpected **first pass** interaction effect shows itself even more strongly with this region division, see Table ET3.6 and Figure ET3.2. Underlying this is a failure to obtain a Plausibility effect with MC reference, and a large reversed Plausibility effect with SC reference.

Table ET3.6 Verb + adverb region, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	32.0	8.0	1.6
MC, Implausible	31.4	8.9	1.8
SC, Plausible	31.7	8.7	1.8
SC, Implausible	37.7	9.6	2.0

Figure ET3.2 Verb + adverb, first pass: Interaction (with St. Err. bars)



This interaction is significant in both analyses: F1(1,23) = 5.095, MSe = 261, $p < .04$; F2(1,19) = 8.091, MSe = 210, $p < .02$. As might be expected from this interaction, there are also marginal main effects. For Reference, a 3.0 ms/character advantage to the MC conditions (31.7 ms/character against 34.7 ms/character) gives F1(1,23) = 3.835, MSe = 217, $p < .062$; F2(1,19) = 3.458, MSe = 144, $p < .079$. For

Plausibility, a 2.7 ms/character advantage to the Plausible conditions (31.8 ms/character against 34.5 ms/character) gives F1(1,23) = 4.146, MSe = 174, $p < .054$, but F2(1,19) = 2.504, MSe = 150, $p > .13$. There were just 3 zero-ms data points in this analysis, 1 in the MC, Plausible condition, and 2 in MC, Implausible.

Whilst the RRB measure gives a similar pattern, but with a weakened significance for the interaction (Fs < 1), **RB** analysis again reverses the pattern of means, with the interaction realising its predicted shape (see Table ET3.7), but again this is a non-significant trend (Fs < 1).

Table ET3.7 Verb + adverb region, right bounded: Interaction

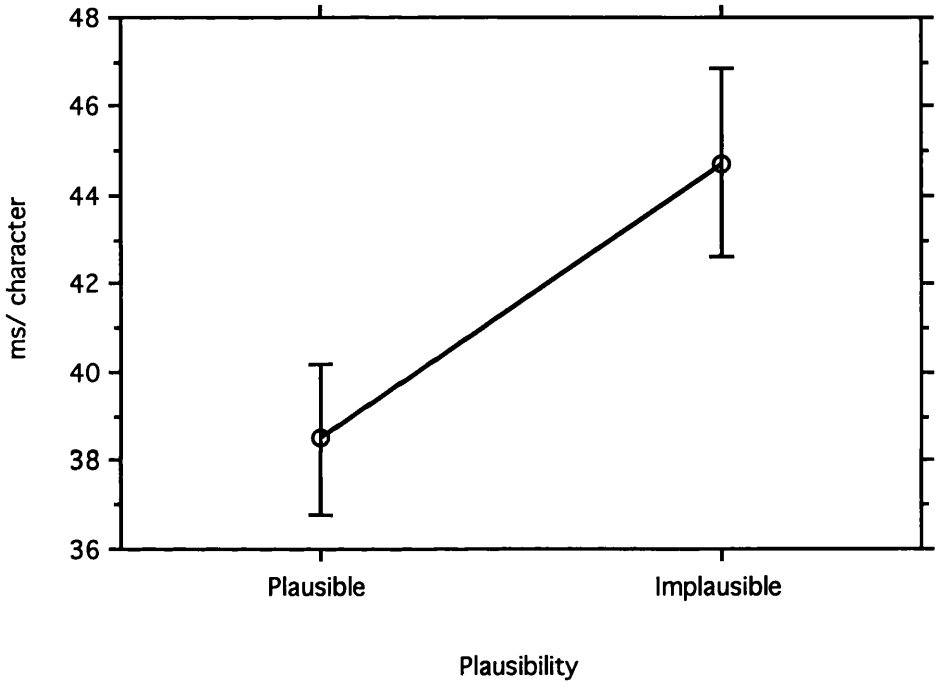
	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**612.6**	172.5	35.2
MC, Implausible	**675.7**	194.7	39.7
SC, Plausible	**661.6**	331.9	67.7
SC, Implausible	**686.9**	184.5	37.7

In **total time** there is no hint of an interaction (a 6.5 ms/character Plausibility effect with MC reference is matched by a 6.0 ms/character effect with SC reference, Fs < 1,) but there is a main effect of Plausibility, see Table ET3.8, significant in F1 (F1(1,23) = 8.459, MSe = 938, $p < .01$), and in F2 (F2(1,19) = 6.751, MSe = 768, $p < .02$).

Table ET3.8 Verb + adverb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	38.5	11.7	1.7
MC, Implausible	44.7	14.7	2.1

Figure ET3.3 Verb + adverb, total time: Plausibility (with St. Err. bars)



6.8.2.3. The pronoun plus verb plus adverb region and the full target sentence

The general pattern found with the verb plus adverb region was repeated in these two larger regions. However, the **first pass** interaction (contra-prediction) is no longer significant. For the pronoun to adverb region, though the Plausibility effect is greater with SC reference (1.9 ms/character) than with MC reference (0.4

ms/character), Fs are less than 1. Similarly with the full target sentence the effect with SC reference (3 ms/character) exceeds that with MC reference (0.4 ms/character) but this gives F1(1,23) = 1.137, MSe = 39, $p > .29$ and F2 < 1.

The first pass effect of Congruity found in Eye-Tracking 2 for the full target sentence is not matched with a Plausibility result here. There is a 1.7 ms/character advantage to the Plausible conditions (30.4 ms/character against 23.1 ms/character) but this is significant in neither analysis (F1(1,23) = 1.359, MSe = 70, $p > .25$; F2 (F2(1,19) = 1.419, MSe = 60, $p > .24$).

The main effect of Plausibility found for **TT** found in (8.2.2) is preserved in these regions. For the pronoun to adverb region see Table ET3.9 (F1(1,23) = 4.588, MSe = 417, $p < .05$) and in F2 (F2(1,19) = 5.058, MSe = 348, $p < .04$).

Table ET3.9 Pronoun + verb + adverb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**35.5**	10.3	1.5
MC, Implausible	**39.6**	13.3	1.9

For the sentence region see Table ET3.10 (F1(1,23) = 7.150, MSe = 226, $p < .025$) and in F2 (F2(1,19) = 5.942, MSe = 186, $p <. 025$).

Table ET3.10 Target sentence, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	34.6	9.2	1.3
MC, Implausible	37.7	9.8	1.4

6.8.3. Discussion

Although the first pass interaction in the verb plus adverb region was unexpected, it does not contradict the predictions, and overall the experiment conforms to the expected patterns. Again there is a late emerging Plausibility effect, apparent at the verb in total time and continuing through rightward expansion of the region up to the full sentence. This parallels the pattern in Eye-Tracking1, using explicit assignment versions of these materials.

Direct evidence for an interaction in later measures- central to the claim for a main character attribution effect - is slight, with only the total regressions results from the verb giving unequivocal demonstration. Otherwise the converse interaction in the first pass complicates the results. Note that no predictions were made here about first pass effects: Eye-Tracking1, backed by Eye-Tracking 2, demonstrates that we should not expect a Plausibility effect this early. In part at least, the first pass RT effect here seems to be a function of the pattern of regressions. By definition (see (5.2.1)) a regressive movement from a region will terminate the first pass, and hence is likely to lead to a shorter FP reading time, though it is itself an index of reading difficulty. Thus, while there are a very small number of leading edge regressions from the verb in the SC, Implausible condition, the larger number of such exits in the other

conditions will serve to decrease their first pass RTs. The regression inclusive measure, right bounded reading time, reverses the pattern of the interaction.

Total reading times show a very slight trend in the means towards the predicted interaction. This shows clearly that second and later pass readings contain a strong Plausibility effect with MC reference, overtaking the effect for SC found in the first pass. An attempt to quantify this was made by calculating the difference between first pass and total RTs for the verb plus adverb region; the first pass values for each condition for each subject were subtracted from the total times. A by subjects ANOVA was then performed. While this showed the expected trend (see Table ET3.11), this was not significant: $F1(1,23) = 2.365$, $MSe = 307$, $p > .13$.

Table ET3.11 Verb + adverb region, TT-FP: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	5.1	5.1	1.0
MC, Implausible	12.2	16.1	3.3
SC, Plausible	8.2	8.2	1.7
SC, Implausible	8.2	7.8	1.6

However, the evidence is again in line with a main character attribution effect impacting on a late emerging Plausibility effect.

Chapter 7
On-Line Effects of Characterhood on Interpretation with Action Statements

7.1. Introduction: two explanations for the main character attribution effect

The core conclusion from the empirical work presented so far is that a marked MC is able to constrain attributional inference processes, and that the resulting discourse representation encodes the link between the MC and the atmosphere statement. But what are the processing mechanisms involved in this attribution? The evidence we have so far is compatible with two, alternative, explanations.

(A) This may be a solely **top-down** effect, in which the MC acts as a focused entity which controls the interpretation of any context-descriptive background statement in the text.

(B) Alternatively, there may be a **bottom-up** element to the flow of information. It may be that certain types of background sentence (specifically psychological atmosphere statements) signal the need for interpretation of their content with respect to a character in the main line of the narrative, triggering an attributional inference. Only at this stage would the top-down controlling function of the MC become relevant.

As noted in Chapter 2, the focus of recent research into discourse processing has been the extent to which on-line inferencing is bound by minimalist constraints. It is thus pertinent here to consider how

the two mechanisms above, proposed as explanations for the attributional inference effect found in experimentation, fit within this debate. As noted in (2.1.) the minimalist position allows for two conditions in which on-line inference will occur: following a break in local coherence, or when the contextual information needed is readily available (McKoon and Ratcliff, 1992). Again as already noted, attributional inferences cannot be seen to follow from a loss of local coherence, but can be accommodated within the theory if the MC is taken to be readily available information. We could thus see the top-down explanation, see above, as a development of the minimalist position: the MC is in focus, hence this character alone is readily available information, and hence the results demonstrating a selective attributional inference. The bottom-up explanation, however, would not seem to be consistent with the theory, since minimalism does not allow for the triggering of inference by incoming textual information, unless this results in a local coherence break. This gives the surprising result that the minimalist position is consistent with the top-down, globally controlled, explanation, rather than the proposal for a locally controlled bottom-up mechanism[51]. Within the alternative constructionist position[52], there are no broad principles for the mechanisms underlying inference, and thus either of the explanations above would be consistent with the theory. Investigation of these two mechanisms will not, therefore, select between the competing theories of inference, although rejection of the top-down explanation would raise difficulties for the minimalist theory. More important is that this investigation takes research in a new, and potentially more productive direction: considering specific textual cues that direct inferential effort.

As a first line of approach to distinguishing between the two alternative mechanisms I examine whether certain kinds of background statement behave differently in their interpretation relative to character.

7.1.2. Off-Line 2 and 3 reconsidered

We already have some information on this from Off-Line 2 and 3. These considered the attribution of background *action statements* within the question-answering paradigm. It will be recalled that these describe an activity by a third party. They contrast with psychological atmosphere statements both in having an overtly expressed agent, and in the absence of the need for subjective verification expressed in the psychological predicate. In other words, they lack exactly the qualities of atmosphere statements which make these ideal candidates to act as the kind of cue for an attributional inference set out in the bottom-up explanation above. Thus, assuming that action statements could not trigger an attributional inference, the two competing explanations above lead to competing hypotheses for Off-Line 2 and 3. If the top-down explanation is correct we would expect to find an MC attribution effect for the action as well as atmosphere statements. If the bottom-up explanation is correct then we would expect no such effect with the action statement materials.

Examination of the results from these experiments suggest that, in fact, a compromise between these positions more accurately captures the processing situation. The most striking finding was that the attribution effect did indeed generalise to action statements, despite

their explicit subjects and apparently objective observational status. Analysis of the action statement passages showed a highly significant effect in Off-line 2 and 3a, and there was a very strong trend in Off-Line 3b. This would favour the top-down explanation. What complicates the issue is that there is also a strong effect of statement Type, with a greater number of *Yes* answers with atmosphere as against action statement passages, a difference significant in Off-Line 2, 3a and 3b. Thus atmosphere statements do seem to trigger additional attributive inferences, as described in the bottom-up explanation. The results point to a situation in which both cues, presence of an MC and sentence type, are active in cueing inference.

Moreover, it is clear that an MC acts as a strong constraint on inference. It is capable of cueing attributional inferences for various kinds of context description, leading to a link between itself and this information in the discourse representation (though, of course, it cannot be determined whether this occurs during reading or in question answering.) Hence the effect of question Reference with both types of statement. In addition, if there is some other cue initiating inferential processing, such as the presence of a psychological atmosphere statement, then the MC will determine the representational outcome of this inference, with attribution made to it rather than any alternative available character.

The next phase of investigation was to examine the processing of action statements in relation to character on-line. Although we have parallel results to the atmosphere statement passages in the question-answering paradigm, we should not necessarily expect this to extend to the on-line situation. As noted, the off-line studies

encourage attribution: inferences may occur at the time of answering questions, or as a strategic response to these questions The weaker general tendency towards attribution with the action statement passages off-line, regardless of the retained attribution bias towards the MC, may mean there is no inference at all under on-line constraints.

7.2. SPR 2

A self-paced reading experiment was thus conducted, using the same logic and procedure as that in SPR 1. Materials followed the same format, but here the activity described in the target sentence was linked to the information in the action statement. In the Plausible conditions the action statement provided a motivation for the activity in the target, which was a natural reaction to it, while in the Implausible conditions the target activity was a very unlikely response to the described third party action. In the following example alternatives are given in curly brackets, and the target sentence is italicised.

(1) AT THE POND
{A man/ Jeremy} sat on a bench, staring out over the pond. {Claire/ A woman} held her toddler's hand at the water's edge. Some young boys were {picking out litter/ throwing in litter}. {*Claire/ The woman*} *praised their public spirit.* The fine weather had brought out a lot of people.

The form of the action statements complicated the establishment of a co-referential link between the target subject and the intended antecedent. Unlike atmosphere statements, the action statements contain an overt syntactic subject, creating an additional potential

antecedent for the adjacent pronoun in the target. In SPR 2 the solution adopted was to use full NPs, a name in the MC conditions, an NP role description in the SC conditions. The target sentences in the 2 levels of this variable were not, therefore, identical. In SPR 3, below, the experiment was repeated, but using a different solution to this problem.

The logic of both these experiments is that if attribution of the action statement information has been made to the MC, in preference to the SC, then the Plausibility effect that this information underlies will be much more apparent when the target refers to the MC as against the SC. The Plausibility effect is indexed by longer RTs to Implausible as against Plausible conditions. Given the discovery of a main character attribution effect off-line, my main prediction was that, using materials containing action rather than atmosphere statements, there will still be an attribution effect, indicated by repetition of the interaction between Reference and Plausibility found in SPR 1.

7.2.1. Method

7.2.1.1. Materials Pretest

Twenty eight items were originally written for the experiment, but 8 were dropped following a pretest to check the success of the Plausibility manipulation. The format of the pretest was identical to that described for SPR 1, with the exception that the booklets used extended over 6 pages. Thirty two subjects were used, giving 8 Plausibility ratings for each item in each condition.

The purpose of the pretest was to check that the intended contrasts in Plausibility were matched by subjects' perceptions. Mean ratings were thus calculated for the two Plausibility conditions, and an index of the manipulation calculated by subtracting the score for Implausible versions from that for Plausible. On the basis of these results 8 materials were rejected whose index score was below 3.0. For the remaining 20 items the mean ratings, out of maximum 7 and minimum 1, were 6.0 for the Plausible passages (with 4.8 as the lowest,) and 1.9 for Implausible (highest 2.8). The materials are listed in Appendix H.

7.2.1.2. Materials and Design

The design was identical to that used in SPR 1, with 4 conditions, formed by crossing Reference and Plausibility, presented within subjects via 4 experimental lists. The same fillers were also used (Appendix E); and again one half the passages were followed by straightforward *yes/ no* answer comprehension questions. A random presentation order was used, i.e. a new random ordering of materials and fillers was constructed for each subject.

7.2.1.3. Subjects and Procedure

The procedure followed that used in SPR 1, with identical equipment.

Twenty four subjects participated in the experiment, each received a payment of £3. All were undergraduates at Glasgow University and none had participated in any of the preceding experiments.

7.2.2. Results

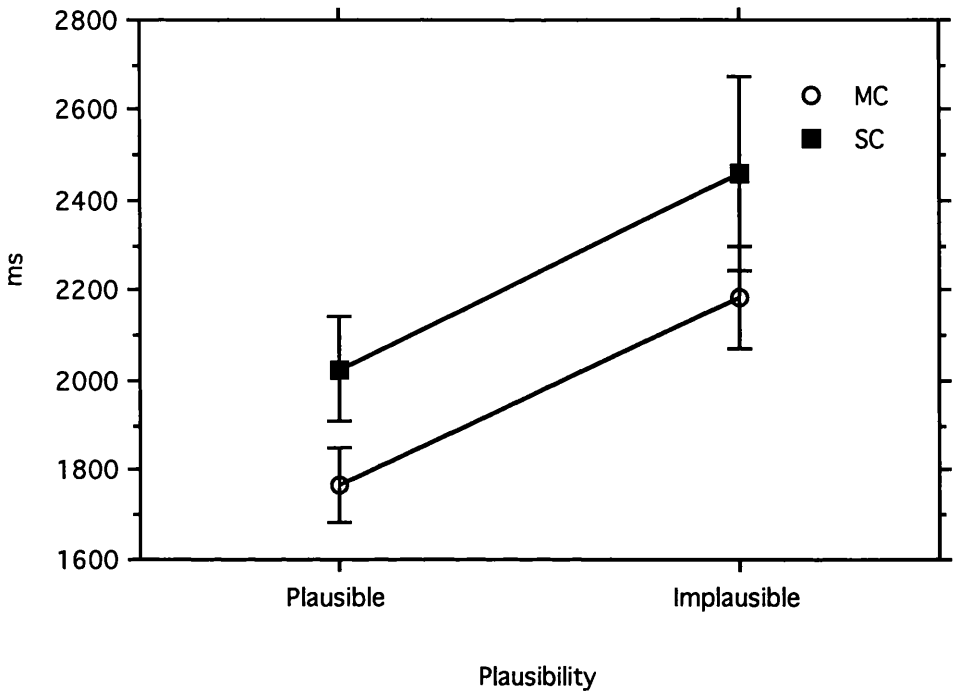
My primary prediction was that the results found with atmosphere statements would be repeated here with action statements. Thus there would be a Plausibility effect when the target agent was the MC, and a much attenuated or non-existent effect with the SC, leading to an interaction between Reference and Plausibility.

To determine this, two 2 way ANOVAs were performed on the data, one by subjects and one by items. The results, reported in Table SPR2.1 and illustrated in Figure SPR2.1, show that the expected interaction did not occur (Fs are less than 1). Rather there was an additive effect of Reference across the Plausibility conditions, with both main effects giving significant results. As in SPR1, there were faster RTs to Plausible materials (mean = 1896 ms; St Err = 73) than to Implausible ones (mean = 2323 ms; St Err = 122); the 427 ms difference being statistically significant ($F1(1,23) = 15.496$, MSe = 4,381,278, $p < .001$; $F2(1,19) = 8.058$, MSe = 3,651,066, $p < .02$). Means comparisons were performed on the interaction to separate out the effects of Plausibility at each of the Reference levels. Plausibility proved to be significant both when the MC was target agent ($F1(1,23) = 12.112$, MSe = 2,132,031, $p < .003$; $F2(1,19) = 11.582$, MSe = 1,776,695, $p < .003$); and with the SC as target agent ($F1(1,23) = 12.783$, MSe = 2,250,041, $p < .002$; $F2(1,19) = 12.223$, MSe = 1,875,034, $p < .002$)

Table SPR2.1 Reference x Plausibility

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**1765**	404	82
MC, Implausible	**2187**	554	113
SC, Plausible	**2026**	569	116
SC, Implausible	**2459**	1056	216

Figure SPR2.1 Reference x Plausibility



In contrast to SPR 1 there was also an effect of Reference. In the SC conditions the target was read 266 ms more slowly than in the MC conditions (MC mean = 1976, St Err = 76, SC mean = 2242, St Err = 125); this was significant in the by subjects and by items analysis ($F1(1,23) = 5.085$, MSe = 1,701,497, $p < .04$; $F2(1,19) = 13.926$, MSe = 1,417,914, $p < .002$). Again means comparisons were performed on the interaction to see if the effect of the Reference manipulation was significant for both Plausible and Implausible conditions. This was the case, items with the MC as target agent being read more quickly both in the Plausible cases ($F1(1,23) = 4.626$, MSe = 814,375, $p < .05$; $F2(1,19) = 4.424$, MSe = 678,647, $p < .05$) and the Implausible ($F1(1,23) = 5.044$, MSe = 887,917, $p < .04$; $F2(1,19) = 4.823$, MSe = 739,930, $p < .05$)

Given the unpredicted direction of results a further analysis was performed in which outliers were removed, in case rogue data points were masking the true pattern of the data. For each subject, data points more than 2.5 standard deviations from the mean were altered to the value of the subject mean plus 2.5 standard deviations, calculated after the outliers exclusion (there were no outliers 2.5 SDs less than the mean.) This affected 9 data points. The resulting means are shown in Table SPR 2.2. As can be seen the pattern of results was identical to the original analysis, and there were no changes in the significance of any effects.

Table SPR2.2 Reference x Plausibility (after outlier correction)

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**1749**	381	78
MC, Implausible	**2168**	550	112
SC, Plausible	**2026**	569	116
SC, Implausible	**2367**	891	182

7.2.3. Discussion

The predicted interaction did not occur in the experiment, and from this result it would seem that the MC attribution effect does not occur on-line with action statements. This is further discussed in (7.4), following SPR 3.

One unexpected feature of the results was the main effect of Reference. This might be taken as evidence that the Reference manipulation was effective in this experiment, strengthening our conclusions from the failure to obtain an interaction of this with

Plausibility. However, it should be remembered that this comparison was not well controlled, being confounded with the use of a name versus a role description. The SC targets contained a minimum of one extra word, and were on average 4.15 characters longer than the MC targets.

One potential objection to these results lies in the form of anaphor used in the target sentence. Previous experimental work has shown that, relative to pronouns, full NP anaphors show a delay in accessing conceptual information about their antecedents (Cloitre and Bever, 1988; Garrod et al, 1994). Here such access is essential, since it is the mismatch between the target sentence verb and the information ascribed (according to our hypothesis) to the pronoun's antecedent that underlies the plausibility manipulation. It may therefore be considered that the use of a full NP anaphor undermines the manipulaion of this independent variable. The results run contrary to this objection since there is a reliable main effect of plausibility. It was nonetheless decided to repeat the experiment using a pronominal anaphor in the target.

7.3. SPR 3

7.3.1. Method

7.3.1.1. Materials and Design

The materials were based on those used in SPR 2. However, the full NP subject in the target sentence was replaced with a pronoun. This gave identical targets across all 4 conditions. To ensure unambiguous resolution of this pronoun to the MC/SC introduced in the second

sentence, the potentially competing subjects of the action statements were all ruled out by grammatical features, either being plural or of a different gender to the target pronoun. This demanded slight changes to some of the materials. A full list is given in Appendix (I).

The design was identical to that used in SPR 2, with 4 conditions, formed by crossing Reference and Plausibility.

7.3.1.2. Subjects and Procedure

The procedure followed that used in SPR 2, with identical equipment.

Twenty four subjects participated in the experiment as unpaid volunteers. All were member of the Glasgow University community and none had participated in any of the preceding experiments.

7.3.2. Results

Given the result of SPR 2, my primary prediction was for a main effect of Plausibility, but for no interaction between Plausibility and Reference.

To determine this, two 2 way ANOVAs were performed on the data, one by subjects and one by items. The results, reported in Tables SPR3.1 and 3.2, and illustrated in Figure SPR3.1, show that the pattern of results for SPR 2 was confirmed, with an additive relation between the two factors.

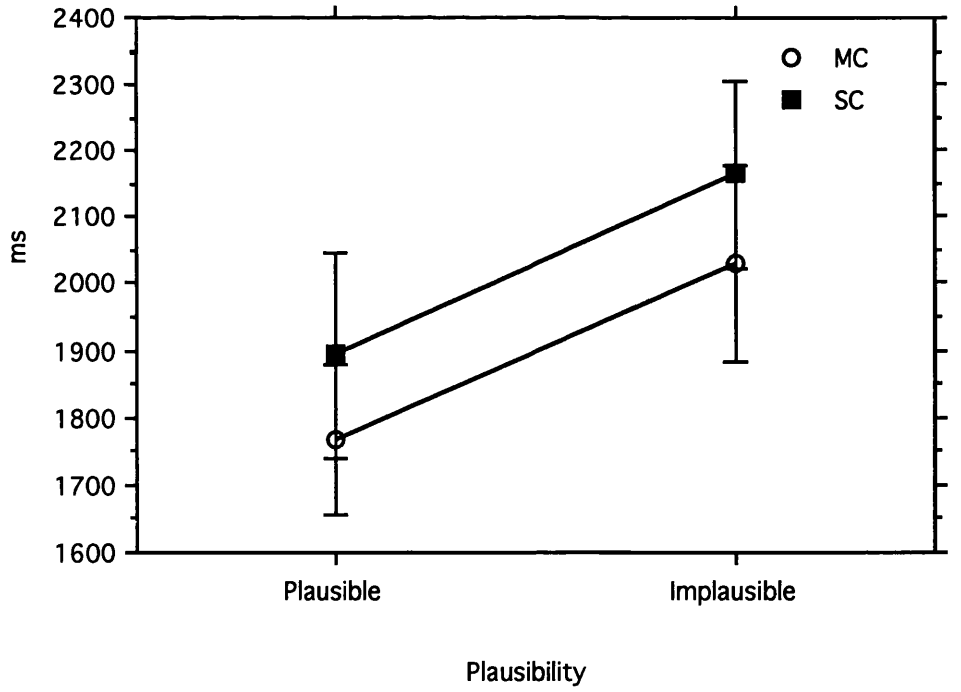
Table SPR3.1 Plausibility

	Mean (ms)	St. Dev.	St. Err
Plausible	1829	650	94
Implausible	2096	705	102

Table SPR3.2 Reference x Plausibility

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	1766	545	111
MC, Implausible	2029	729	149
SC, Plausible	1893	747	152
SC, Implausible	2163	690	141

Figure SPR3.1 Reference x Plausibility



There was a main effect of Plausibility, the 267 ms difference being statistically significant (F1(1,23) = 10.664, MSe = 1,711,630, $p < .004$;

F2(1,19) = 5.424, MSe = 1,426,358, p < .03). There was no effect for the interaction (Fs < 1). Means comparisons performed on the interaction showed Plausibility to be significant both when the MC was target agent (F1(1,23) = 9.814, MSe = 835,560, p<.005; F2(1,19) = 8.177, MSe = 696,299, p < .01); and with the SC as target agent (F1(1,23) = 10.293, MSe = 876,313, p < .004; F2(1,19) = 8.576, MSe = 730,260, p < .01)

In contrast to SPR 2 the main effect of Reference was only marginally significant, a 130 ms advantage to MC reference giving F1(1,23) = 3.810, MSe = 408,961, p < .063; F2(1,19) = 2.692, MSe = 340,800, p > .12.

7.3.3. Discussion

The results from SPR 2 were confirmed: there is no interaction, rather Plausibility produces an effect for both levels of character status. The main effect of Reference is better controlled here, and the effect has fallen to marginal significance. If we assume that this represents a genuinely greater processing difficulty with the SC referent materials, then this seems likely to be as a result of relative difficulty in resolving the target subject across the action statement. This confirms the efficacy of the Reference manipulation, and is controlled for within the interaction.

7.4. General Discussion: SPR 2 and SPR 3

The absence of an interaction in both experiments contradicted my main hypothesis: that there would again be an MC attribution effect,

with connection of the action information to the MC leading to a plausibility effect only if the target referred to this character. However, given the demonstration of such an effect with atmosphere statements, this new result enables us to understand the effect in more detail. It will be recalled that, in earlier discussions of the effect, I have floated an alternative explanation of the reduced plausibility effect with the SC: namely that in this case no inference is made to link the target sentence with its context, whatever the status of the atmosphere statement - readers simply do not attempt to find motivations for the SCs action. The result here shows that this is not the case: a means comparison reveals that with the SC as target agent the plausibility manipulation is significant - this is the root of the failure to obtain an interaction. The conclusion with regard to this study must be that the contextual information contained in the atmosphere statement is equally available across the Reference conditions. Either an inference is made attributing this information to both characters - contradicting my central argument that the MC is a controller of inference - or no such inference is made to either.

We have strong evidence of preferential attribution of action statements to the MC in the question answering paradigm. This result was replicated across Experiments 2, 3a and 3b. It seems unlikely that attribution of action information is made to both characters during reading, but that the SC attribution is later weakened or undone. Rather, SPR 2 demonstrates that with action statements no attributional inference is made at the time of reading, rather the action statement remains unattached in the foreground of the discourse representation, leading to longer RTs with contradictory incoming information, whoever its agent. If an attribution is

explicitly asked for, as with the question answering paradigm, then the controlling effect of the MC on inference will shape the result. This is in line with the relatively low level of attributions made to any condition with action statements in that paradigm.

Why should no attributional inference be made with the action statements? At least two explanations seem credible. The first, given as the bottom-up explanation in the introduction to Experiments 2 and 3, frames the issue as one akin to sentence processing. As I noted earlier, atmosphere statements differ from action statements in lacking an overt syntactic agent; from this arises the sense of their semantic incompleteness, they need a perceiving agent to register the atmosphere information. It is a situation analogous to that for the argument structure of a verb. Certain role slots must be filled for a verb phrase to be semantically well formed: *sneezed* needs an agent, *gave* an agent, theme and goal (see Sells, 1987.) If a role slot is unfilled in a text, processing will involve establishing an antecedent to bind to that role. While not wishing to claim the same kind of formal argument structure at the level of the whole sentence, it is suggestive to see atmosphere statements as having a similar agentive role slot, setting off an attributional inference if it is not filled. Action statements, lacking such a slot, will not have the same effect.

The second possible explanation again centres around the agentless nature of the atmosphere statement. Within functional grammar this is seen as a linguistic marker that a sentence is part of the *background* of a narrative; i.e. it provides comment or context for the main points of the narrative carried by foreground sentences. A full

explication of this theory is given by Hopper and Thompson, 1980. They enumerate linguistic markers of *transitivity*. This they see as much more complex than the traditional notion of a verb with subject and direct object. Rather they see it as a complex of features, allowing sentences to exist on a continuum of transitivity. Moreover, transitivity itself is seen to determine grounding: a highly transitive sentence will also be a foregrounded one. Atmosphere statements have no transitive features, and so will be taken as part of the background. If we take, for example, *The show was very funny* and compare it with a list of transitivity features (Hopper and Thompson, 1980: 252) we find that it is low in Kinesis, i.e. it describes a state and therefore cannot be transferred, and that it has no overt Participant, with the additional consequence that there can be no Volitionality in her action, nor can she be high in Agency. An action statement, such as *A dog was waiting patiently for its owner to return from the bar,* or, *All of the horses jumped over the last fence*, by contrast, has a Participant and hence the possibility of varying degrees of Volitionality and Agency. These features will place the statement in the foreground. The authors see the degree of grounding as having psychological consequences. Sentences signalled as foreground will be stored for immediate sequential processing; those signalled as background will be stored for future reference (Hopper and Thompson, 1980: 282). Thus action statements will be an active presence in the representation leading to plausibility effects whoever is the agent of the target. In contrast, atmosphere statements will be stored as part of the contextual representation. It will be recalled that Garrod and Sanford suggest how the MC acts as a controller of the information instantiated in implicit focus from the reader's general background knowledge. It would be natural to

extend this to seeing the MC as controller of contextual information arising from the text, hence we would expect an MC attribution effect for atmosphere statements.

As both these explanations rest on a common factor - the agentless nature of atmosphere statements - it will not be possible to distinguish between them. However, both tend towards seeing the making of an attributive inference as cued, either by the particular nature of atmosphere statements, or in response to specific questions in the question answering paradigm. The MC functions to control the inferences that result. Note that both are versions of the bottom-up explanation presented in (7.1.). As noted there, this is incompatible with the minimalist theory since this does not allow for the cueing of inferences by incoming material if this is locally coherent. We thus have evidence contradicting the minimalist position.

In this chapter I have presented empirical work aimed at extending understanding of the MC attribution effect, first described by Garrod and Sanford (1988) and replicated in the studies of Chapters 5 and 6. Two points have been established. One, that atmosphere statements are cues to attributional inference. Two, that an MC will control the pattern of inference, whatever their originating cause.

Chapter 8
The Limits of the Main Character Attribution Effect

8.1. Introduction: Off-Line 4 reconsidered

One study from my off-line research has yet to be followed up on-line, and that forms the basis of this chapter. It will be recalled that Off-Line 4 examined attribution in texts where the MC was not introduced until after the atmosphere statements. It was found that in such cases significantly more *Yes* answers were still given when questions about the perception of the atmosphere referred to the MC rather than the SC. That is, the MC attribution effect was preserved.

One further aspect of these results is suggestive, in the light of the discussion in the preceding chapter, as to the mechanisms underlying the effect. In addition to the predicted effect of question referent, these results also showed a main effect of order (i.e. whether the question was to a character coming before or after the atmosphere statement,) see (5.3.2), and Figure OL4.2. Taking only those questions with an SC referent, there is a 17% advantage for characters preceding the context statement as against those following, giving a significant means comparison. Thus it seems that if the SC is the only character available when the atmosphere statement is encountered then this is likely to be the target of attribution; while reaching a marked MC at a later point will cue a second attributional inference, hence the standard MC preference effect. Note that the cueing of an attributional inference by the atmosphere statement itself was what I termed the bottom-up explanation in the previous chapter, and

which was supported by the failure to obtain an on-line result with action statements. Here we see evidence that both top-down and bottom-up mechanisms are at work, the former accounting for the Reference effect, even when the character follows the atmosphere statement, the latter for the order effect[53].

In this chapter I examine whether attribution occurs on-line if characters are introduced following the atmosphere statement, and again consider the implications of this for the underlying mechanisms. SPR 4 and ET 5 look at the effect of this order manipulation on the MC attribution effect using materials similar to those in the off-line study, where one character precedes and one follows the atmosphere statement. I note the varying predictions made for such a case by the top-down and bottom-up explanations of the attribution effect already introduced, and by the minimalist theory of constraints on inference. These hypotheses are analysed in the light of the results. However, I precede these experiments with ET 4, examining the simpler case in which a single character is introduced, following the atmosphere statement.

8.2. Eye-Tracking 4

This experiment was conducted to determine whether any such retrospective attribution - between an atmosphere statement and a character introduced after it, regardless of that character's status - can be made on-line. Whilst the off-line results point towards this conclusion, we have seen with the disparity between off and on-line results for action statements that the former are not necessarily a reliable guide to the situation during reading. However, I take as the

hypothesis for this experiment that retrospective attribution will occur, resulting in a Plausibility effect.

This experiment is thus a necessary precursor to later experiments, SPR 4 and ET 5, employing more complex order manipulations. Additionally, as an eye-tracking experiment, it gives us a guide to where we can expect any Plausibility effects to emerge, and hence the earliest point we can expect to see evidence of an interaction with the MC attribution effect in ET 5.

8.2.1 Method

8.2.1.1. Materials and Design

The materials were based on those used in SPR 1, with the atmosphere sentence and target being unchanged. However, only one character was introduced prior to the target, and this followed the atmosphere statement, that now opened the passages. Which character introducing sentence was retained was based on my own intuitive sense of readability, and some small changes were made to these sentences, for instance if there was reference to now deleted material. An example is given below (there is a full list in Appendix J) where alternatives are shown inside curly brackets and the target sentence is italicised:

(1) A MATINEE PERFORMANCE
The show was {tedious/ very funny}. {Paul/ An usher} sat in a seat beside the aisle. *He yawned noisily several times.* The performance was well attended.

There were 4 conditions, formed by crossing of the two factors Reference and Plausibility. Plausibility was manipulated by changing

the atmosphere statement so that the target action either followed from, or conflicted with it. It will be recalled form SPR1 that the materials were pretested to ensure a strong contrast in Plausibility between the conditions (note the atmosphere and target sentences were unchanged for this experiment) which is tied to the verb. Reference was manipulated by maintaining the same pronoun in the target while altering whether the character was introduced by name. Although this was maintained as a manipulation, no predictions were made about Reference effects. Since there is only a single character, the idea of a marked character is weakened (in the absence of any other character it seems likely that a role described character is taken as MC.) However, for clarity I continue to call this the Reference variable, with two levels, MC and SC reference.

My main prediction was thus for a main effect of Plausibility. The first point at which this might become apparent was the target verb, although given the results of earlier eye-tracking experiments effects are expected only in late measures or in larger regions.

There were 20 experimental items. These were used to form 4 experimental lists in a within subjects design. Each list also contained 20 filler passages, identical to those used in the previous on-line experiments (Appendix E), and mixed randomly with the experimental items under the constraints mentioned previously. The order of presentation was fixed for experimental and filler passages. Sixteen of the 20 fillers and 12 of the 20 experimental items were accompanied by straightforward comprehension questions. Half of these had a *yes* answer and half a *no* answer.

The positioning of the target regions in the presentation of passages was again carefully controlled. To avoid noise associated with the initial fixations on a line the beginning of the target sentence was placed at least one word from the start of the line. For any item the number of words separating the target and start of line was held constant across conditions. In addition, in each material the whole target sentence was presented unbroken on a single line.

8.2.1.2. Apparatus

The apparatus used was identical to that described in Eye-Tracking1.

8.2.1.3. Subjects

Data from 24 subjects was collected and analysed, 6 for each experimental list. Some subjects were rejected prior to running as accurate calibrations could not be obtained. Data preprocessing revealed that for 7 of the initial 24 subjects more than 4 experimental items (i.e. 25%) suffered from loss of track in the target regions, meaning no data was collected. These were replaced by new subjects.

All volunteers came from the University of Glasgow community, had English as their first language, and were able to read from the VDU without glasses. They were paid £5. None had participated in any of the other experiments reported here.

8.2.1.4. Procedure

The Procedure was identical to that described for Eye-Tracking 1.

8.2.1.5. Data Preprocessing

The two stage data preprocessing procedure reported in Eye-Tracking1 was repeated here. At the preprocessing stage some items for some subjects were deleted from further analysis due to tracker loss. This led to the loss of 28 data points, i.e. less than 6% of the data.

8.2.2. Results

The predicted main effect of Plausibility is significant in both regressions measures for regressions to the verb. However, it is not significant in any of the RT measures. There is an unexpected effect of Reference. This is significant in the F1 analysis for first pass RT over the target sentence. It also interacts with Plausibility, giving a marginal interaction with the Right Bounded RT measure at the verb. Details are given below.

8.2.2.1 . The verb region and pronoun plus verb region

Initial analysis was carried out on the verb of the target sentence alone, where the prediction is for a main effect of Plausibility. Given earlier results this was expected to emerge in the analyses of total time and of regressions. The region was then expanded to include the preceding pronoun (see (6.5.2.1) for motivation). Two, 2 way ANOVAs were performed for each measure in each regions division, one by subjects and one by items.

There were no first pass main effects (all Fs < 1.) For the Plausibility variable, what absolute difference there is in fact shows longer RTs to the Plausible passages, with a mean of 35.0 ms/character comparing with 34.6 ms/character for Implausible versions in the verb region,

and 29.5 ms/character comparing with 28.3 ms/character when the pronoun is included. The interaction was also non-significant. However, while the pronoun plus verb region gave Fs of less than one, the verb alone showed a weak trend towards a cross over, with MC, Plausible passages having longer FP RTs than MC, Implausible, see Table ET4.1. Whilst in the by subjects analysis this gave an $F < 1$, for the by items analysis there is a non-significant trend, $F2(1,19) = 2.179$, $MSe = 257$, $p > .15$. Means comparisons were performed for the Plausibility conditions with SC reference, but this was shown not to approach significance: $F1 < 1$; $F2(1,19) = 1.046$, $MSe = 123$, $p > .31$.

Table ET4.1 Verb region, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**36.7**	17.1	3.5
MC, Implausible	**34.0**	16.8	3.4
SC, Plausible	**33.3**	17.0	3.5
SC, Implausible	**35.3**	15.5	3.2

There were 66 zero-ms data points in the verb data, i.e. 15%, with 14 in the MC, Plausible condition, 15 in the corresponding Implausible, 21 in the SC, Plausible, and 16 in the Implausible. With the pronoun included the overall number falls to 18, or 4%, distributed 4, 7, 5, 2, respectively, across these conditions. The pattern of zeros thus corresponds to that for RT; however as illustrated below, the trend towards an interaction is maintained where there is a smaller, or no, difference in the number of zero-ms data points between conditions.

For the regression inclusive measures, right bounded and restricted right bounded, there are again no main effects (for Plausibility all Fs <

1; for Reference, at the verb all Fs less than 1, at the pronoun plus verb region RB gives F1(1,23) = 1.480, MSe = 17251, p > .23; F2(1,19) = 1.047, MSe = 18023, p > .31, RRB gives F1(1,23) = 1.354, MSe = 57, p > .25; F2 < 1) The interactions show the same cross-over pattern as in the FP analysis. For the RB measure analysis of the verb alone, see Table ET4.2, again gives a non-significant trend in F1 (F1(1,23) = 2.685, MSe = 42844, p > .11), but reaches significance in F2 (F2(1,19) = 4.600, MSe = 45999, p < .05).

Table ET4.2 Verb region, right bounded: Interaction

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**319.9**	173.2	35.4
MC, Implausible	**296.0**	125.2	25.6
SC, Plausible	**288.4**	143.1	29.2
SC, Implausible	**349.0**	222.1	45.3

Means comparisons for the Plausibility effect with SC reference showed this as a trend in the by subjects analysis, F1(1,23) = 2.762, MSe = 44066, p > .11, but as significant by items, F2(1,19) = 5.00, MSe = 50027, p < .04. Including the pronoun produced the same pattern, but effects were slightly weakened, and similarly for the RRB measure.

The predicted main effect of Plausibility in total time does not occur. At the verb, the direction of difference in the mean values, a 3.8 ms/character advantage to the Plausible conditions, see Table ET4.3, has reversed the trend found in FP to that expected, but this does not approach significance (F1 < 1; F2(1,19) = 1.451, MSe = 298, p > .24).

Table ET4.3 Verb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**49.3**	25.7	3.7
Implausible	**53.1**	23.6	3.4

A 2.4 ms/character advantage to the Plausible conditions when the region includes the pronoun gives Fs < 1. The interaction is not significant: for the verb region alone, F1 < 1, F2(1,19) = 1.989, MSe = 396, p > .17; for the pronoun plus verb region F1 < 1, F2(1,19) = 1.603, MSe = 233, p > .22). However, although the interaction is not significant the means show a much larger difference between the Plausibility conditions when Reference is to the SC rather than the MC; though the MC conditions no longer reverse the predicted direction of effect. Table ET4.4 shows the results for the verb region.

Table ET4.4 Verb region, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**51.8**	27.8	5.7
MC, Implausible	**52.6**	28.2	5.8
SC, Plausible	**46.7**	23.7	4.8
SC, Implausible	**53.6**	18.5	3.8

A means comparison shows the Plausibility effect with SC reference here to be a non-significant trend in F1 (F1(1,23) = 2.029, MSe = 570, p > .16) and marginal in F2 (F2(1,19) = 3.469, MSe = 691, p < .078). Results when the pronoun is included in the region follow the same pattern, but significance is further weakened.

There are no effects of Reference in total time for either of these regions divisions. There are still some zero-ms data points, 32 (7%) for the verb alone (9 in both Plausible conditions, 8 in MC, Implausible and 6 in SC, Implausible); 6 (1%) when the pronoun is included (3 for the SC, Plausible condition, 1 in each of the others).

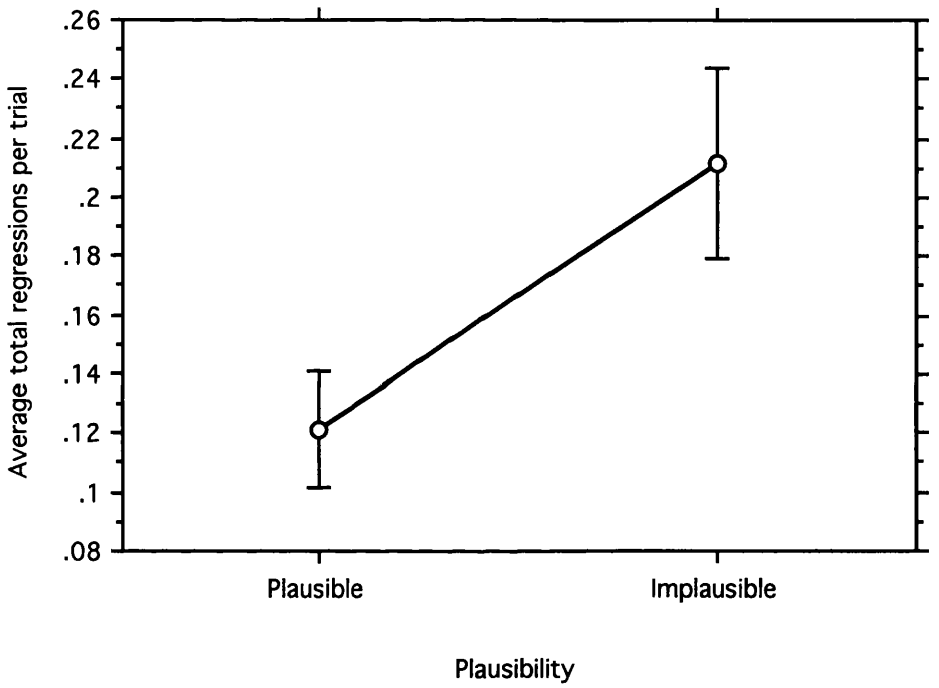
The regressions analysis produced results more clearly in line with the experimental predictions, at least for regressions to the verb. For regressions from the verb, leading edge regressions showed no significant effects (all Fs < 1) while total time regressions showed a series of non-significant trends. There was a strong trend for Reference (with more regressions in the SC conditions, an average of .168 regressions per trial as against .122 with MC reference, giving $F1(1,23) = 2.130$, MSe = .052, $p < .02$; $F2(1,19) = 2.433$, MSe = .044, $p < .02$) and a weaker trend for Plausibility (an average of .125 regressions per trial for Plausible conditions comparing to .166 for Implausible, giving $F1 < 1$, $F2(1,19) = 1.690$, MSe = .036, $p > .20$). For the interaction there was a larger Plausibility effect with SC reference (.131 regressions per trial, Plausible, against .206, Implausible) than with MC reference (.119 regressions per trial against .125) but this did not approach significance ($F1(1,23) = 1.140$, MSe = .029, $p > .29$; $F2(1,19) = 1.194$, MSe = .027, $p > .28$).

For regressions to the verb the predicted main effect of Plausibility is significant in both measures. Leading edge regressions are illustrated in Table ET4.5 and Figure ET4.1, this contrast in means gives $F1(1,23) = 6.646$, MSe = .197, $p < .02$; $F2(1,19) = 10.362$, MSe = .136, $p < .005$.

Table ET4.5 Leading edge regressions from verb: Plausibility

	Mean (average regressions per trial)	St. Dev.	St. Err
Plausible	.121	.139	.020
Implausible	.212	.223	.032

Figure ET4.1 Leading edge regressions to verb (with St. Err. bars)



Total regressions are illustrated in Table ET4.6. This contrast is again significant: F1(1,23) = 5.686, MSe = .407, $p < .03$; F2(1,19) = 5.355, MSe = .292, $p < .04$.

Table ET4.6 Total regressions from verb: Plausibility

	Mean (average regressions per trial)	St. Dev.	St. Err
Plausible	**.225**	.271	.039
Implausible	**.356**	.372	.054

Both leading edge and total regressions also show a trend towards an interaction, based on a much larger Plausibility effect with MC reference than with SC reference. The leading edge means are illustrated in Table ET4.7 ($F1(1,23) = 2.695$, $MSe = .068$, $p > .11$; $F2(1,19) = 2.484$, $MSe = .055$, $p > .13$).

Table ET4.7 Leading edge regressions from verb: Interaction

	Mean (average regressions per trial)	St. Dev.	St. Err
MC, Plausible	**.106**	.138	.028
MC, Implausible	**.250**	.242	.049
SC, Plausible	**.136**	.141	.029
SC, Implausible	**.174**	.201	.041

For total regressions the contrast was stronger (MC, Plausible, .231 regressions per trial, MC, Implausible, .444, SC, Plausible, .219, SC, Implausible, .267) but significance levels were very similar: $F1(1,23) = 2.690$, $MSe = .162$, $p < .11$; $F2(1,19) = 2.755$, $MSe = .110$, $p < .11$. The main effect of Reference showed no effect in leading edge regressions ($Fs < 1$), but a strong trend with total regressions, where a greater average regressions per trial with MC reference (.338 as against .243)

gives F1(1,23) = 2.643, MSe = .213, $p > .11$; F2(1,19) = 3.473, MSe = .171, $p < .078$.

Interpretation of the data for these regions is thus somewhat complex. The only clear results, for regressions to the verb, both leading edge and total, are as predicted by the hypothesis. However, the expected main effect of Plausibility in total RT and regressions from the verb is not apparent. Unexpectedly, given that the Reference manipulation was greatly weakened by the inclusion of only one character, there are trends towards an interaction of Reference and Plausibility, due to a larger Plausibility effect with SC reference, across the RT measures. This emerges in first pass, prior to our expectations of where a Plausibility effect could first be detected, is strongest in the regression sensitive RT measures, and weakens again in total time. The direction of the interaction trend is reversed in the case of regressions to the verb. Thus it seems that, building on a chance Plausibility effect in FP with SC reference (the means comparison with SC reference does not approach significance,) the main effect of Plausibility kicks in slightly earlier in the SC conditions, hence the stronger interaction trend and the by items significance for the Plausibility effect with SC reference in the RB measure. The MC conditions show the effect coming through in regressions to the verb from later regions. It seems likely that this difference in time course is a chance effect of this experiment, and would not be replicated.

8.2.2.2. The verb plus adverb region and full target sentence

Further analysis was carried out using these larger regions. The pronoun plus verb plus adverb region, examined in earlier experiments, was not considered given the small effects of adding the pronoun to the verb alone. Again F1 and F2 ANOVAa were calculated for each RT measure in each region.

An unpredicted main effect of Reference was apparent, in some measures, with advantage to the SC conditions. This was first evident as a strong trend in the FP data for the verb plus adverb region (mean RT for SC conditions was 29.7 ms/character, as against 31.8 ms/character for the MC conditions, giving, $F1(1,23) = 3.188$, $MSe = 111$, $p < .087$; $F2(1,19) = 2.793$, $MSe = 87$, $p > .11$). Whilst there was no such effect in the regression inclusive measures ($Fs < 1$), in total time we see a 4.2 ms/character advantage to the SC conditions (43.4 ms/character against 47.6 ms/character) giving a marginal F1 ($F1(1,23) = 2.950$, $MSe = 425$, $p < .099$) but a significant F2 ($F2(1,19) = 5.061$, $MSe = 304$, $p < .04$). For first pass RT over the whole sentence this main effect shows a contrast of 27.8 ms/character, SC reference, against 30.4 ms/character, MC reference; this is significant by subjects ($F1(1,23) = 6.375$, $MSe = 162$, $p < .02$), but marginal by items ($F2(1,19) = 3.054$, $MSe = 106$, $p < .097$). The effect disappears in all later measures over this region ($Fs < 1$). No such effect was predicted. These sentences are identical in wording, differing only in the identity of the pronominal antecedent. I have reviewed some evidence (see (4.3.)) that MCs are more readily accessed as pronoun antecedents than SCs; however this is in the case when potential antecedents are competing in the same context, and, most

importantly, predicts the opposite direction of results. There is no evident principled explanation of this effect.

The interaction effect which appeared inconsistently in the analysis of the verb region is a very weak presence in this data. For total time in the verb plus adverb region a contrast of 41.3 ms/character for the SC, Plausible condition against 45.4 ms/character for the SC, Implausible, compares with near identity for the Plausibility conditions with MC reference (47.6 ms/character against 47.5 ms/character). However, this interaction shows up as no more than a weak trend in the inferential statistics ($F1(1,23) = 1.223$, $MSe = 104$, $p > .28$), but marginal by items ($F2(1,19) = 1.192$, $MSe = 146$, $p > .28$). Note that there a no zero-ms data points here. For the whole sentence, all Fs for the interaction are less than one.

The predicted main effect of Plausibility does not emerge. For the verb plus adverb region, all Fs are less than one. Across the whole sentence there is no hint of an effect in early measures (again $Fs < 1$). In total time there is a weak trend: the mean for Plausible conditions is 40.4 ms/character, for Implausible conditions 42.6 ms/character, this gives $F1(1,23) = 1.812$, $MSe = 114$, $p > .19$, $F2(1,19) = 2.183$, $MSe = 71$, $p > .15$.

8.2.3 Discussion

The results from Eye-Tracking 4 were more complex than expected. Reference has a marked effect, both as a main effect and through interaction with Plausibility, where we had expected none. The predicted main effect of Plausibility gives a clear result in the regressions data, but does not show up clearly as a main effect in any

RT measures. However, from this evidence, it does seem reasonable to conclude that retrospective attribution of an atmosphere statement to a character introduced after it is possible. In addition to the regressions data, we see some RT evidence for a Plausibility effect, if only with SC reference (there is a significant F2 and marginal F1 for a means comparisson of Plausibility with SC Reference in the RB measure at the verb region). While the relevance of Reference here is not clear, the presence of any Plausibility effect signals that attribution can occur in these circumstances.

8.3. The two character context: theoretical predictions

The design of the following experiments returns to the logic Off-Line 4: i.e. the introduction of the atmosphere sentence splits that of the two characters. However, the materials were based on those used in the on-line experiments, SPR1, ET3, etc., the only alteration being to swap the second and third sentences to realise this design. This means that in every case the target sentence refers to an action performed by the character that was introduced in the third sentence of the passage, i.e. after the atmosphere statement. In the following example alternatives are shown inside curly brackets and the target sentence is italicised, a full list of materials is given in Appendix K.

(2) A MATINEE PERFORMANCE
{An usher/ Paul} settled himself in a seat by the stairs. The show was {tedious/very funny}. {Patricia/ A woman} sat in the row behind. *She yawned noisily several times.* The performance was well attended.

My prediction is that we will see evidence for an interaction between Reference and Plausibility, with a strong Plausibility effect only with MC reference, just as in the standard passage ordering. Note that this has implications for our theories of the mechanisms underlying the MC attribution effect.

The SC reference cases are straightforward. The context for the target sentence can be schematised as follows (remembering that the SC character in these cases will always follow the atmosphere statement): MC introduction -> atmosphere statement -> SC introduction. If we recall the two mechanisms proposed as underlying the attribution effect in (7.1.), we can see that under either of these explanations, top-down or bottom-up, we would expect preferential attribution of atmosphere information to the MC, and hence, with target sentence reference to the SC here, that there would be no, or at least a very weak, Plausibility effect. With MC reference the context can be schematised as follows (remembering that in these cases it is the MC character that will follow the atmosphere statement): SC introduction -> atmosphere statement -> MC introduction. Thus, a Plausibility effect here - indicating attribution to the MC - would favour a top-down mechanism: whilst encountering an atmosphere statement may lead to attribution to any character in the context, as the bottom-up explanation implies, a later MC will at the least cue a further attribution to itself. It will be recalled that this integration of both mechanisms was my conclusion from Off-Line 4 (8.1.). Note, in addition, that while I have previously seen a top-down explanation as compatible with the minimalist theory, this is not the case here[54]. Since the MC is not part of the reader's context when the atmosphere statement is first read, it

cannot be readily available information at this point. If we suggest instead taking the atmosphere statement as readily available information, then we have no reason to expect attribution to the following MC in this case, but not to the following SC in the SC reference conditions.

Given our interpretation of Eye-Tracking 2 and 3 in the light of a previous, successful, SPR experiment, it was decided to precede the eye-tracking study of these materials with an SPR study.

8.4. SPR 4

A self-paced reading experiment was thus conducted, using materials such as the example above. My main prediction was that, using materials in which one character is introduced following the atmosphere sentence, there will still be a MC attribution effect, indicated by repetition of the interaction between Reference and Plausibility found with the standard ordering.

8.4.1. Method

8.4.1.1. Materials and Design

The design was identical to that used in SPR 1, Eye-Tracking 3, etc, with 4 conditions, formed by crossing Reference and Plausibility, presented within subjects via 4 experimental lists. An example material is given in (8.3) above (and see Appendix K). There were 20 experimental items, based on those used in SPR1 and ET3, but with the order of sentences 2 and 3 reversed. The same fillers were also used (Appendix E); and again one half of the passages were followed by straightforward *yes/ no* answer comprehension questions. A

random presentation order was used, i.e. a new random ordering of materials and fillers was constructed for each subject.

8.4.1.2. Subjects and Procedure

The procedure followed that used in SPR 1, with identical equipment.

Twenty four subjects participated in the experiment, each received a payment of £3. All were undergraduates at Glasgow University and none had participated in any of the preceding experiments.

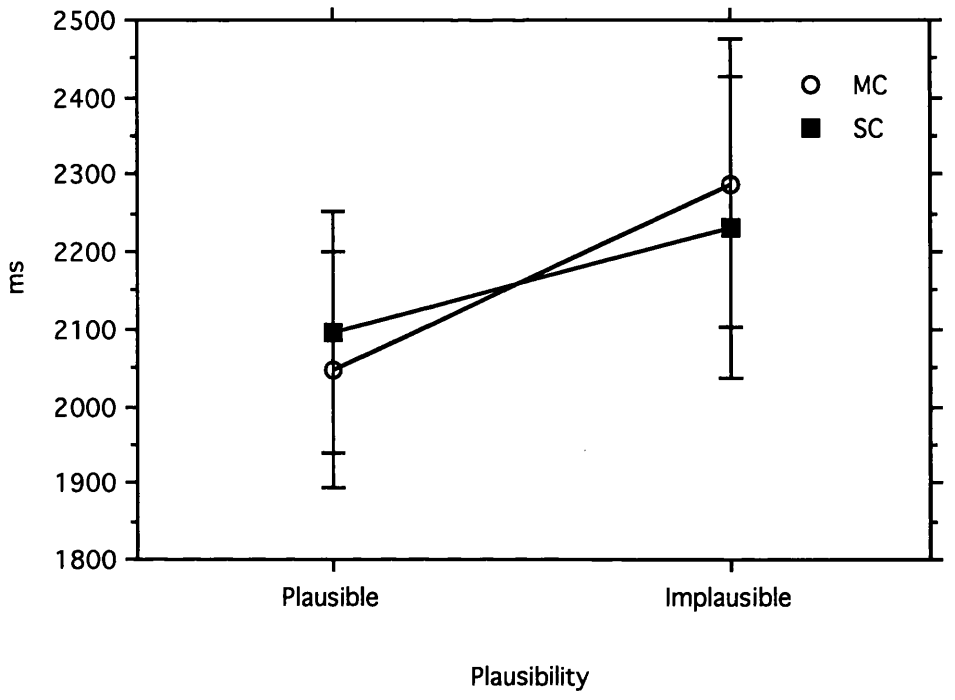
8.4.2. Results

Due to a malfunction of the button box a very small amount of data was lost from the calculation of subject and item means. This affected just 4 data points (i.e. 0.625% of the data). Two 2 way ANOVAs were performed on the data following the removal of these items, one by subjects and one by items. The results, reported in Table SPR4.1 and illustrated in Figure SPR4.1, show that the means tended towards the expected direction of interaction, however this did not approach significance ($F1(1,23) = 1.087$, $MSe = 65,582$, $p > .30$; $F2 < 1$).

Table SPR4.1 Reference x Plausibility

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	2047	743	152
MC, Implausible	2289	910	186
SC, Plausible	2096	769	157
SC, Implausible	2233	959	196

Figure SPR4.1 Reference x Plausibility



There was a main effect of Plausibility, though this was not as clear as in the previous SPR experiments. There were faster RTs to Plausible materials (mean = 2072 ms; St Err = 108) than to Implausible ones (mean = 2261 ms; St Err = 134). The 189 ms difference gave a significant by subjects result ($F1(1,23) = 6.021$, MSe = 859,621, $p < .025$) but significance fell just outside the standard level in the by items analysis ($F2(1,19) = 4.228$, MSe = 650,739, $p < .054$). Means comparisons, performed on the interaction to separate out the effects of Plausibility at each of the Reference levels, showed the effect to be slightly stronger when the MC was target agent. In the by subjects analysis Plausibility was significant with MC reference ($F1(1,23) = 11.605$, MSe = 700,036, $p < .002$) and marginal with SC reference ($F1(1,23) = 3.733$, MSe = 225,166, $p < .066$). In the by items analysis, neither case reached significance (MC reference:

F2(1,19) = 2.285, MSe = 569,570, p > .14; SC reference: F2 < 1). There was no main effect of Reference (all Fs < 1).

As in SPR 2, given the unpredicted direction of results a further analysis was performed in which outliers were removed, in case rogue data points were masking the true pattern of the data. For each subject, data points more than 2.5 standard deviations from the mean were altered to the value of the subject mean plus 2.5 standard deviations, calculated after the outliers exclusion (there were no outliers 2.5 SDs less than the mean.) This affected 16 data points (i.e. 3.35% of the data). The resulting means are shown in Table SPR 4.2.

Table SPR4.2 Reference x Plausibility (with outlier corrections)

	Mean (ms)	St. Dev.	St. Err
MC, Plausible	**1977**	591	121
MC, Implausible	**2181**	666	136
SC, Plausible	**2030**	591	121
SC, Implausible	**2134**	641	131

As can be seen the pattern of results was identical to the original analysis. The interaction was again non-significant (F1(1,23) = 1.194, MSe = 59,978, p > .28; F2 < 1). In this case the main effect of Plausibility (where Plausible, mean = 2003 ms; St Err = 84; Implausible, mean = 2157 ms; St Err = 93) was significant both in F1 and F2 (F1(1,23) = 5.198, MSe = 570,949, p < .04; F2(1,19) = 8.077, MSe = 459,192, p < .01).

8.4.3. Discussion

The principal prediction made for this experiment, of an interaction between Reference and Plausibility, indexing a MC attribution effect has not been upheld. The absence of an interaction seems to be due to Plausibility producing an effect regardless of the Reference condition: there is a main effect of Plausibility, and a trend towards significance in the means comparison for Plausibility under SC reference. I shall return to the theoretical significance of these results after describing those for the same materials presented via the eye-tracking paradigm.

8.5. Eye-Tracking 5

8.5.1 Method

8.5.1.1. Materials and Design

The 20 experimental materials were identical to those used in SPR4 (Appendix K). An example is given in (8.3). There were 4 conditions, formed by crossing Reference and Plausibility, and these were presented in a within subjects design via 4 experimental lists. It will be recalled from SPR1 that these materials were pretested to ensure a strong contrast in Plausibility between the conditions (note the atmosphere and target sentences were unchanged for this experiment) which is tied to the verb. Each list also contained 20 filler passages, identical to those used in the previous on-line experiments, and mixed randomly with the experimental items under the constraints mentioned for the earlier eye-tracking experiments. The order of presentation was fixed for experimental and filler passages. Sixteen of the 20 fillers and 12 of the 20 experimental

items were accompanied by straightforward comprehension questions. Half of these had a *yes* answer and half a *no* answer.

The positioning of the target regions within the passages was again carefully controlled, so as to avoid noise associated with the initial fixations; see (6.5.1.1) for details.

8.5.1.2. Apparatus

The apparatus used was identical to that described in Eye-Tracking1.

8.5.1.3. Subjects

Initially data was collected and analysed from 24 subjects. A number of non-significant trends were found in the data and so it was decided to run an additional 12 subjects to see if significant results could be secured. Thus in all 36 subjects were run, 9 in each experimental list. Some subjects were rejected prior to running as accurate calibrations could not be obtained. Data preprocessing revealed that for 7 of the initial 36 subjects more than 4 experimental items (i.e. 25%) suffered from loss of track in the target regions, meaning no data was collected. These were replaced by new subjects.

All volunteers came from the University of Glasgow community, had English as their first language, and were able to read from the VDU without glasses. They were paid £5. None had participated in any of the other experiments reported here.

8.5.1.4. Procedure

The procedure was identical to that described for Eye-Tracking1.

8.5.1.5. Data Preprocessing

The two stage data preprocessing procedure reported in Eye-Tracking1 was repeated here. At the preprocessing stage some items for some subjects were deleted from further analysis due to tracker loss. This led to the loss of 30 data points, i.e. 4% of the data.

8.5.2. Results

There is no strong evidence for any effects. The predicted interaction appears in first pass in the verb plus adverb region, but this is not significant, giving a marginal F1, and is earlier than we expected. Details are given below.

8.5.2.1. The verb region and pronoun plus verb region

Initial analysis was carried out on the verb of the target sentence.. The main prediction was for an interaction effect, emerging in the analyses of total time and of regressions. The region was then expanded to include the preceding pronoun (see (6.5.2.1) for motivation). As these results were similar to those for the verb alone, the two a reported together. Two, 2 way ANOVAs were performed for each measure in each regions division, one by subjects and one by items.

Across the all RT measures there was no sign of the predicted interaction (all Fs <1). The means for total time to the verb alone - where we predicted an effect to emerge - are shown in Table ET5.1.

Table ET5.1 Verb region, total time: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**41.3**	12.1	2.0
MC, Implausible	**44.3**	17.6	2.9
SC, Plausible	**38.7**	17.9	3.0
SC, Implausible	**42.5**	14.8	2.5

The only indication of an interaction comes in the regressions analysis. Means for leading edge regressions from the verb are shown in Table ET5.2, and Figure ET5.1.

Figure ET5.1 Leading edge regressions from verb (with St. Err. bars)

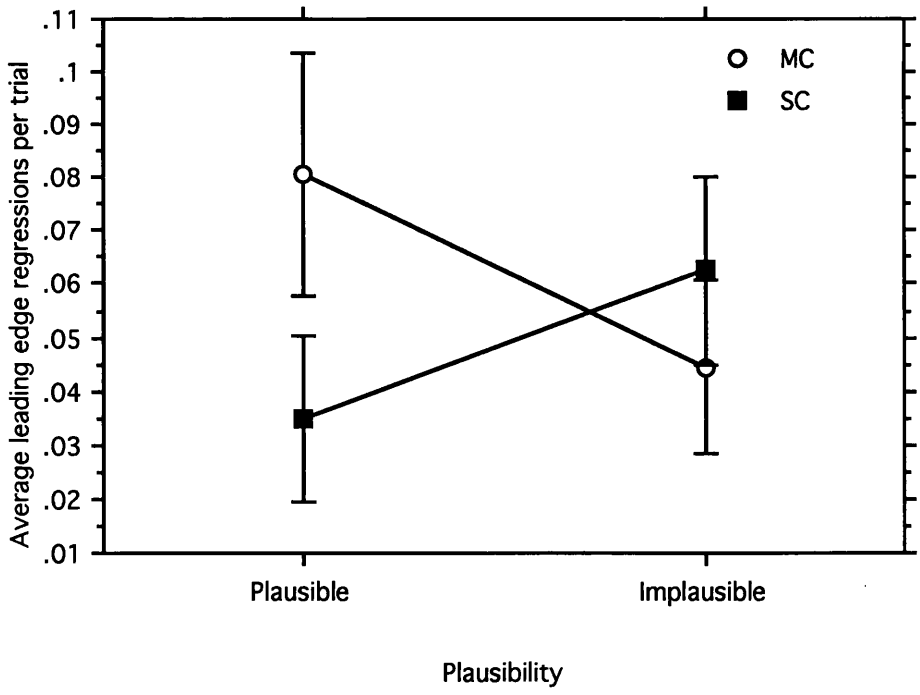


Table ET5.2 Leading edge regressions from verb: Interaction

	Mean (average regressions per trial)	St. Dev.	St. Err
MC, Plausible	**.081**	.137	.023
MC, Implausible	**.044**	.097	.016
SC, Plausible	**.035**	.092	.015
SC, Implausible	**.063**	.107	.018

As can be seen the interaction produces a cross-over effect, but in the reverse direction to that predicted: a larger number of regressions, indicating processing difficulty, occurs with the Plausible conditions following MC reference. This gives a marginal result in both statistical analyses: $F1(1,35) = 3.011$, $MSe = .037$, $p < .092$; $F2(1,19) = 3.024$, $MSe = .017$, $p < .099$.

The absolute numbers here are small. The average total regressions gives much higher values, and continues the overall pattern (with MC reference Plausible conditions give a mean for average regressions per trial of .444, Implausible .417, with SC reference, Plausible give .333, Implausible, .417). However this interaction does not approach significance ($Fs < 1$).

There is a marginal main effect of Plausibility in total times at the verb. Means are illustrated in Table ET5.3; these gave $F1(1,35) = 3.106$, $MSe = 425$, $p < .087$; $F2(1,19) = 2.986$, $MSe = 258$, $p < .100$.

Table ET5.3 Verb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**40.0**	15.2	1.8
Implausible	**43.4**	16.2	1.9

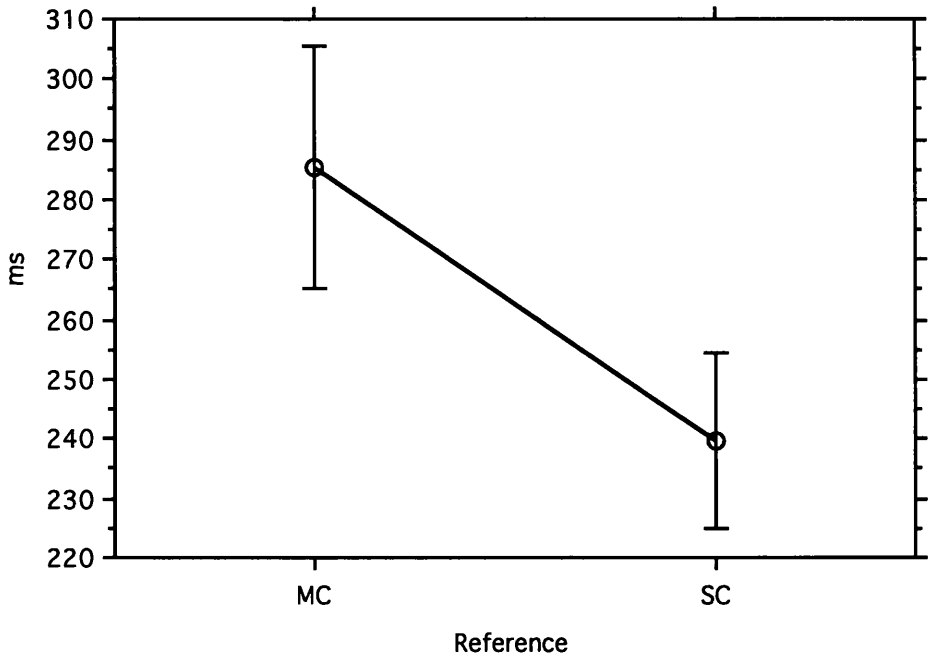
This weakens slightly if the pronoun is included in the region: a 2.2 ms/character advantage to the Plausible conditions gives F1(1,35) = 2.476, MSe = 164, $p > .12$; F2(1,19) = 1.670, MSe = 102, $p > .21$. The effect is not apparent in any other RT measures (Fs < 1)

An unpredicted main effect of Reference is also apparent. For the verb region a trend in the FP results (a 2.9 ms/character advantage to the SC conditions gives F1(1,35) = 2.320, MSe = 305, $p > .137$; F2(1,19) = 2.195, MSe = 144, $p > .155$) strengthens in the regression inclusive measures. Means for right bounded RT are given in Table ET5.4 and illustrated in Figure ET5.2; these give F1(1,35) = 6.251, MSe = 75,485, $p < .02$; F2(1,19) = 4.466, MSe = 40,461, $p < .05$.

Table ET5.4 Verb region, right bounded RT: Reference

	Mean (ms)	St. Dev.	St. Err
MC	**285.4**	169.9	20.0
SC	**239.6**	124.3	14.7

Figure ET5.2 Verb region, right bounded RT: Reference (with St. Err. bars)



The effect was weaker with the pronoun included in the region (a 37.7 ms advantage to SC reference giving F1(1,35) = 4.284, MSe = 51,031, $p < .05$). Similarly, the restricted right bounded showed the same pattern, but here significance was marginal (at the verb alone an advantage of 3.4 ms/character gives F1(1,35) = 2.901, MSe = 398, $p < .097$. There is no sign of this effect in total time (Fs < 1).

Both these regions contain a number of zero-ms data points. Their distribution is summarised in Table ET5.5.

Table ET5.5 Zero-ms data point distribution

	Verb		Pro + Verb	
	FP	TT	FP	TT
MC, Plausible	34	18	18	6
MC, Implausible	42	16	29	8
SC, Plausible	47	23	25	6
SC, Implausible	46	19	22	5

As can be seen the pattern is not consistent, and does not correspond closely to the RT differences found.

8.5.2.2 . The verb plus adverb region and full target sentence

Further analysis was carried out using these larger regions. As in Eye-Tracking 4, the pronoun plus verb plus adverb region was not considered, given the small effects of adding the pronoun to the verb alone.

Evidence for the predicted interaction is feint. In the verb plus adverb region there are signs of an interaction in the predicted direction, but this is strongest in first pass, somewhat earlier than we are expecting the effect to appear. The means are shown in Table ET5.6. The by subjects analysis shows a marginal interaction effect ($F1(1,35) = 3.346$, $MSe = 127$, $p < .076$)), which is weaker by items ($F2(1,19) = 2.242$, $MSe = 73$, $p > .15$).

Table ET5.6 Verb + adverb region, first pass: Interaction

	Mean (ms/chr)	St. Dev.	St. Err
MC, Plausible	**27.5**	8.9	1.5
MC, Implausible	**30.8**	11.9	2.0
SC, Plausible	**29.5**	9.5	1.6
SC, Implausible	**29.1**	11.1	1.8

There are similar hints of an interaction in the restricted right bounded measure; here a Plausibility effect of 3.3 ms/character with MC reference and a reversed effect of 0.1 ms/character with SC reference again gives a marginal F1 result ($F1(1,35) = 3.197$, $MSe = 96$, $p < .083$) which weakens in F2 ($F2(1,19) = 2.013$, $MSe = 62$, $p > .17$). There is no sign of such an effect in right bounded RT ($Fs < 1$), or in total time ($F1(1,35) = 1.112$, $MSe = 66$, $p > .29$; $F2 < 1$). Similarly, for the target sentence as a whole, where we would predict the interaction showing in first pass, there is no such effect in any of the RT measures (all $Fs < 1$).

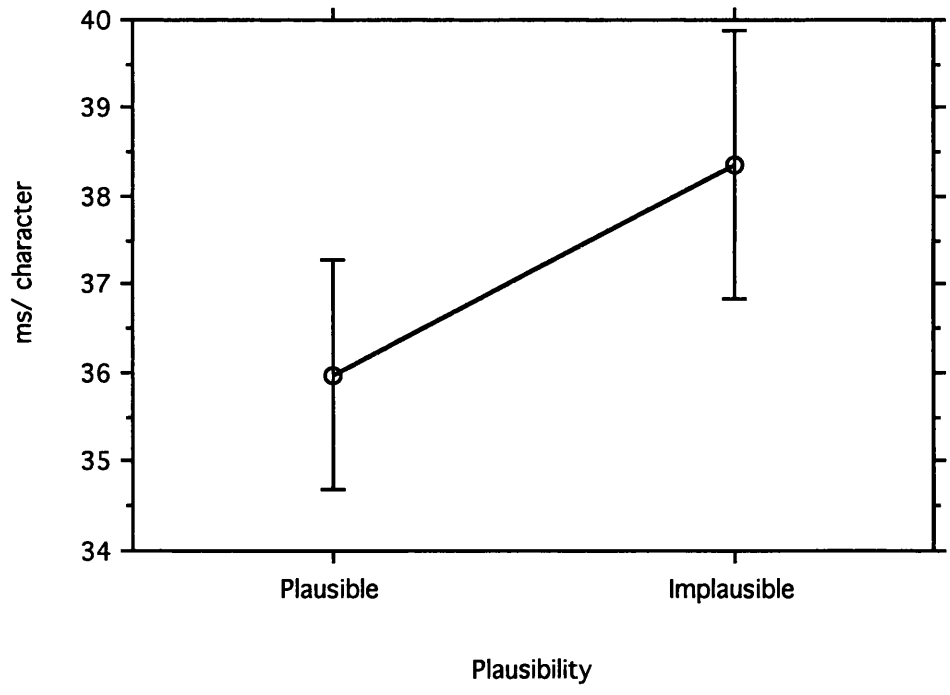
For the main effect of Plausibility the means show a slight advantage to the Plausible conditions in early measures for the verb plus adverb region, but nowhere does this approach significance. The strongest effect is with the restricted right bounded measure, where a 1.8 ms/character difference (Plausible conditions have a mean RT of 30.7 ms/character, Implausible 32.5 ms/character) gives $F1(1,35) = 1.826$, $MSe = 112$, $p > .18$; and $F2(1,19) = 1.392$, $MSe = 78$, $p > .25$. However, for total time in this region there is a stronger, though still not clearly significant, effect. The means are shown in Table ET5.7, and illustrated in Figure ET5.3. The by subjects analysis gives a

significance value just above the .05 level (F1(1,35) = 4.082, MSe = 204, $p < .051$) but this weakens when analysis is by items (F2(1,19) = 2.350, MSe = 129, $p > .14$.

Table ET5.7 Verb plus adverb region, total time: Plausibility

	Mean (ms/chr)	St. Dev.	St. Err
Plausible	**36.0**	11.0	1.3
Implausible	**38.4**	13.0	1.5

Figure ET5.3 Verb plus adverb region, total time: Plausibility (with St. Err. bars)



This main effect does not show significance across the target sentence as a whole (all Fs < 1, except for TT, F1, where a 1 ms/character advantage to the Plausible conditions gives F1(1,35) = 1.646, MSe = 38, $p > .20$).

In contrast to the smaller regions divisions, the verb plus adverb region shows no main effect of Reference (all Fs < 1). The target sentence, however, shows a trend towards an effect in first pass, but, as can be seen from the means in Table ET5.8, this is in the opposite direction to that found at the verb, with a faster mean RT to the MC conditions ($F1(1,35) = 3.274$, $MSe = 115$, $p < .079$; $F2(1,19) = 1.892$, $MSe = 67$, $p > .18$).

Table ET5.8 Target sentence, first pass: Reference

	Mean (ms/chr)	St. Dev.	St. Err
MC	**28.7**	8.6	1.0
SC	**30.5**	10.6	1.2

This effect does not give a significant contrast in any other measures for the region (all Fs < 1).

There were a small number of zero-ms data points with these regions divisions (for verb plus adverb 15 in FP, 3 in TT; for the target sentence 3 in FP, 1 in TT). But there were no contrasts in their distribution of more than 3 zero-ms data points between conditions.

8.5.3. Discussion

The experiment provides only very weak support for my main prediction of an interaction between Reference and Plausibility, as an indicator of a main character attribution effect. The strongest hint of such an effect come in the verb plus adverb region, where the first pass RT shows a marginally significant result in the by subject analysis. However, this is an earlier point in the time course of processing than previous research leads us to expect a result. Moreover, there are also contradictory signs that Plausibility has most impact on processing when reference is to the SC. Leading edge regressions to the verb show a marginal interaction effect in the opposed direction to that predicted: with MC reference there are more regressions, indicating greater processing effort, in the Plausible passages; while with SC reference there is a standard Plausibility effect. According to my theoretical model, MC controlled attributional inference relates the atmosphere statement only to this character, hence only with MC reference should the information on which the Plausibility effect depends be accessible. When we consider the total RT result for this region, which includes the time spent following the regressions back to it, there is no interaction, but a marginal main effect of Plausibility (as there is when the verb is considered alone.) This repeats the main finding of SPR5, using the same materials.

No predictions were made for the manipulation of Reference. The pattern that emerges is inconsistent, and not amenable to any clear post-hoc theoretical explanation.

8.6. General Discussion

These on-line experiments have demonstrated the limits of the main character attribution effect. For characters introduced following the atmosphere statement I have been unable to obtain clear evidence for preferential attribution of atmosphere information to the MC; i.e. a stronger Plausibility effect for a target sentence, which is either compatible or incompatible with the given atmosphere, when this refers to the MC. However, this has not been the result of a total failure of attribution leading to the absence of a Plausibility effect. There is a main effect of Plausibility in SPR 4, and evidence from the verb and verb plus adverb regions for a similar effect in ET 5. Rather, the Plausibility effect with MC reference has failed to be significantly stronger than that with SC reference (recall that this was the case in SPR 1, where the interaction was significant, but so were means comparisons of the Plausibility conditions at both levels of the Reference factor.)

What explanations can be made for this? It might be that the atmosphere information remains unassigned to any character, and in focus within the discourse representation, leading to a Plausibility effect whoever is the agent of the target sentence (as suggested for action statements). However, the absence of assignment to the preceding MC in the SC reference cases (where the passages have the structure, MC introduction -> atmosphere statement -> SC introduction) would be in direct contradiction of the earlier on-line results. The alternative is to postulate that inferential assignment can be made to the late introduced character, regardless of its status. The argument would be as follows. When the atmosphere statement

is first encountered, an attributional inference is made to any character in the context, following the idea of a bottom-up cue, and supported by the evidence of Off-Line 4. However, the information remains in focus and hence when a further character is introduced a second attributional inference is made, relating the information to this character. Since it is the atmosphere information whose availability licenses the inference within this framework, the status of the second character is irrelevant. Notice that this is a bottom-up explanation compatible with that which I presented in (7.1.). These are not, however, identical, as on the evidence here we do not know whether the retention of the atmosphere information in focus and attributional inference to the following character are functions of its special characteristics (the need for a perceiver, the lack of an explicit agent) or whether this would be true for any background sentence. The former would be in line with our findings in Chapter 7, but the evidence here is inconclusive. Notice that this leaves the result compatible with minimalism, as outlined in (2.1.) above, since it is seen to follow from the atmosphere information being readily available at the point of reaching the following character.

How can this explanation fit with the results for Off-Line 4, where attribution to the late introduced characters showed a clear effect of character status. This is a similar pattern to that found for action statements in Chapter 7, with selective MC attribution off-line but not on-line. I argued there, (7.4.), that it is unlikely that attribution of action information is made to both characters during reading, but that to the SC is later retracted. I proposed instead that the action statement information was simply not attached to any character on-line, but can occur in response to specific questions in the off-line

task; a position given some backing by the relatively low number of affirmative answers to questions about action statement attribution, regardless of character, in Off-Line 2 and 3. Above I have suggested that for this case attribution does occur on-line, both to the early introduced characters, and also to those that follow the atmosphere statement. However, the question-answering paradigm will further increase the number of trials on which an attribution occurs. This will probably occur when the information is being retrieved to answer the question. It is this secondary attribution, I suggest, which is affected by character status, since both characters, and their relative status, are available from the representation now that the whole passage has been read. This then leads to the off-line result.

Chapter 9
Conclusions

9.1. Theoretical issues

9.1.1. The control of inference

In my introductory chapter I discussed the centrality of inference to our processes of discourse comprehension. Turning specifically to the comprehension of written discourse, I noted that a reader will understand far more from a text than is explicitly stated, and that this richer comprehension will result from the construction of inferences[55]. Within discourse psycholinguistics, therefore, what inferences are made by readers, and at what point during processing, have been central research topics.

A central question is that of inferential control. Given the limited capacity of human working memory (Baddeley, Thompson and Buchanan, 1975) and the infinite potential for inferences constructed from a text, the cognitive resources used in interpretation will need to be focused on what is important. A strong potential candidate for exerting such control on the location of inferential effort is the rhetorical structure of the text itself. This hypothesis has received little empirical attention, but intuitive examples do seem to support it. For instance the strength of the *Moses effect* varies depending on the rhetorical Focussing of elements in the text (see (3.2).)

In this thesis I have concentrated on one particular element of rhetorical structure, and its effectiveness as a controller of inference: the marking of one character in a narrative as the main character

(MC). There is intuitive support for Sanford and Garrod's (1981) claim that the MC controls the scenario active in working memory, see my *drunk kitchen assistants* examples, (8) and (9) in (3.3.2). Moreover, a number of existing empirical studies support the idea that inferences are made that relate to the MC: O'Brien and colleagues' work demonstrates global consistency checks around MCs (see (3.3.1); while Gernsbacher and colleagues' work on emotional states shows readers deducing emotional consequences of actions for MCs (see (2.4)). However, none of these studies have explicitly manipulated character status as an experimental variable, to see if this produces consequences on the inferential interpretation. An exception to this absence is the experiments reported in Garrod and Sanford (1988) relating to the inferential phenomenon they termed *the main character attribution effect*.

These authors examined the processing of a particular class of statements, what they called *psychological atmosphere statements*. These are found in narrative texts and describe the context in which events occur. However, they are distinguished from other background sentences in implying that they describe a subjective experience of the situation, whilst not being explicit about whose experience it is. Hence *The atmosphere was hot and sticky* implies an experiencer, but does not state who this is. As we might expect, the authors found evidence that readers make an attributional inference which links such subjective information to the characters in the narrative.

More interestingly, however, they found that this attributional inference did not relate to all characters in the narrative, or at least

not equally. Rather it was biased in a predictable way. This was apparent in an off-line question answering task. Subjects read short passages that introduced two characters (one marked as the main character by being introduced using a proper name) and which also contained a psychological atmosphere statement describing some aspect of the context of events. After reading each passage subjects were asked a question about the perception of the atmosphere information. The reference of this question was systematically varied: it could be about the MC or the alternative character (the secondary character, SC). It was found that subjects asked whether it was the MC that noticed the context described in the atmosphere statement were significantly more likely to answer "Yes" than if they were asked the same question of the SC (full details of on and off-line evidence for the MC attribution effect is given in (3.3.3).)

Thus it appeared that character type had an important impact on readers' inferential processes: attributional inferences were made to MCs, but not SCs. I noted that we could employ Garrod's (1995) terminology to characterise the MC as the topic, or *locus*, of the attributional inference.

The empirical work described in Part 2 of the thesis was designed to confirm the role of the MC as a controller of inference, specifically this kind of attributional inference, and to look in more detail at how it effects mental processing during discourse comprehension.

9.1.2. Defining the Main Character

Such claims for the impact of characterhood on processing necessarily set up a further theoretical question: How is the notion of an MC to be

formally defined. This was considered in Chapter 4. I concluded that our definition must be tightly restricted. The character that controls the location of inference during the processing of a text fragment may not be the character involved in other text processing functions.

This is an area ripe for further investigation: I presented a number of intuitive illustrations which could be tested experimentally. Can attribution be shown to occur to characters not the causal protagonist under Trabasso's definition? Can attribution be shown to occur to characters who are not the holders of perspective, or to characters that are not retained across time shifts?

9.1.3. The minimalist debate and discourse processing

One further set of theoretical issues addressed in Part 1 of the thesis, and explored through the empirical work of Part 2, arises from the debate between proponents of minimalist and constructionist theories of inference. The constructionist position proposes that the reader's mental representation of a text is a mental model, structured by the reality of the situation described, and suggests extensive inference during reading to construct this. The minimalist position, in contrast, proposes a propositional model, and tight constraints on the inferences made on-line. It is important to note that neither of these is primarily an account of discourse processing: both start out with claims about the nature of discourse representation (a mental model, a propositional network) and then derive processing consequences from this. Such a secondary role for processing leads to weaknesses in both theories' consideration of inference. As I noted in Chapter 2, neither theory can deal with the inferences that interpret ambiguous input, since both simply assume the completion of this level of

processing. Similarly, neither easily accounts for the controlling effect of rhetorical structure on inference, my central concern, since this is an aspect of the input to processing, not its outcome.

In Chapter 3 I consider the implications of the main character attribution effect for each of these theories in more detail. I note that constructionism assumes that a reader's discourse representation is a mental model structured by the reality of the situation described. This makes no allowance for the representation being effected by the rhetorical structure of the text. In contrast, I see this rhetorical structure as influencing processing, and hence being reflected in the representational outcome: the MC is the locus of inferencing, and hence the final representation encodes an attributional inference linking the MC to the atmosphere information. It is not the case that this conflicts with constructionism, but simply that this theory is inadequate to explaining the MC attribution phenomenon. The situation is similar with minimalism. This can account for selective attribution to the MC, if the MC, and the MC alone, is taken as being readily available information. However, whilst the theory is at some level consistent with the attribution data, there is nothing in it which would have predicted selective attribution. Only a processing account that takes into consideration the structure of the text will makes such a prediction.

Below I note how the processing account I advanced was adapted in the light of empirical results.

9.2 Empirical Research

The empirical work described in Part 2 was designed, first of all, to confirm the role of the MC as a controller of inference, in both on and off-line studies. I went on to consider the micro-structure of the MC attribution effect. I tested materials using different kinds of background statement, and different orderings of input information, to determine the relative role of the background statement and the MC in producing the effect. This led to some adaptations of the processing account which I have outlined above. A summary of the conclusions from the experimental studies follows.

9.2.1. The main character attribution effect

The first finding of my empirical work was that the main character attribution effect proposed by Garrod and Sanford (1988) is a real and robust phenomenon. It was tested in a number of paradigms: off-line, through the question-answering task pioneered by Garrod and Sanford; on-line, through a self-paced reading study, and also through eye-tracking studies. Off-line and SPR studies gave unequivocal evidence of the phenomenon; the eye-tracking data was supportive, but more complex. I finish this section by looking at the value of eye-tracking in experiments using this type of material.

9.2.1.1. Off-Line (Off-Line 1, 2 and 3)

In the off-line task my prediction was for a replication of the earlier author's results: subjects are more likely to answer *Yes* if asked whether the Main Character perceived the state described in a psychological atmosphere statement, than if asked the same question of the alternative character. This prediction follows from the

hypothesis that the MC controls inferential processing, and hence in this case is the locus of an attributional inference. See (3.3.3) for a description of Garrod and Sanford's findings.

The prediction was upheld in several experiments, as illustrated in Table 9.1 below. Note that for Off-Line 2 and 3a, the results for atmosphere passages only are reported. Significance means the p value for the inferential statistic gave a value > .05.

Table 9.1: Main Effect of Reference in Off-Line 1, 2 and 3a

Experiment	Question Reference		Difference	Significance	
	MC	SC	(MC - SC)	F1	F2
Off-Line 1	63%	41%	22%	Yes	Yes
Off-Line 2	80%	67%	13%	Yes	Yes
Off-Line 3a	64%	47%	17%	Yes	Yes

Note that Off-Line 3a used the same materials and procedure as Off-Line 2, but included the *Don't Know* response option (as did off-line 1, though this used different materials and techniques). Whilst offering this additional option lowered the overall number of *Yes* answers it did not alter the effect of question reference. We can conclude that the effect is not dependent on the response alternatives offered. The advantage to MC questions in Off-Line 2 did not result from subjects being uncertain, but tending to convert this uncertainty into a *Yes* answer with MC questions, since when uncertainty can be registered through a *Don't Know* answer, as in Off-Line 3 the advantage to MC questions remains.

In Off-Line 2 and 3 I made a secondary hypothesis: that the use of a proper name to pick out a character, in a context where others are

introduced through NP descriptions, is enough to mark the character as MC, and that this will dominate any effect of order of mention. This prediction was also confirmed. The effect of question referent remained (that is there were more *Yes* answers to the MC, or named character, than to the SC, or role described character) regardless of which character had been introduced first. In neither experiment was there a main effect of order of mention, or an interaction with question reference.

9.2.1.2. Self-Paced Reading (SPR1)

The replication of Garrod and Sanford's results was extended to on-line studies (see (3.3.3) for a description of their self-paced reading study). The materials used sought to improve on those of Garrod and Sanford in two ways. Firstly, I replaced the manipulation of the presence or absence of an atmosphere statement supporting the target with the contrast between plausible and implausible conditions. This sharpened the contrast within the independent variable, and ensured all passages were of the same length. Secondly, I manipulated reference by changing which character was named rather than by altering the pronoun in the target sentence. This prevented the confounding of characterhood with role, and kept the target sentence constant (see (6.2)).

Again, the replication was successful. The effect of plausibility was much greater when target sentence reference was to the MC, indicating that only in this condition was the atmosphere information immediately available, due to an attributive inference having been made during reading. The greater plausibility effect with MC reference gave an interaction between Reference and Plausibility

significant to $p < .02$ in F1 and F2 (see 6.2.2); in fact the direction of the plausibility effect was reversed with SC reference.

9.2.1.3. Eye-Tracking (Eye-Tracking 1, 2 and 3)

The results from eye-tracking studies were complex. Evidence supporting the on-line main character attribution effect, demonstrated in SPR, was found using this paradigm, but not always where predicted. A discussion of the lessons of my research for other eye-tracking studies of discourse processing, in terms of the use of various reading time and regressions measures, and the division of regions for analysis, is given below.

9.2.1.4. Eye-Tracking 1

The experimental logic of SPR 1 took as an assumption that a cross-sentential anomaly would produce a longer reading time: my interest and predictions related to how this would be effected by manipulating character type (via the antecedent of the target sentence's subject pronoun). Given the absence of previous eye-tracking studies employing such cross-sentential plausibility manipulations, it was decided to examine how these would be registered in the eye-tracking record, and only then to run designs such as SPR 1, where predictions are for an interaction of plausibility with character type. For a discussion of the dimensions of data analysis available in eye-tracking see (6.4) and (6.5.2.1).

This exploration of the impact of plausibility formed the basis of Eye-Tracking 1, the manipulation of plausibility here being localised to the verb of the target sentence. It was predicted that implausibility would produce longer RTs and more regressions, but there were no

expectations about where and when in the eye-tracking record these would emerge.

The predicted main effect of plausibility was found, but fairly late in the processing of the target sentence. For first pass, FP (summing the fixations made in a region prior to exiting it, either by a rightward eye-movement to new material or a regressive leftward movement) a trend in the expected direction was apparent as soon as the verb was encountered. However, it was necessary to extend the region to include the whole target sentence for the effect to reach significance. That is, to find a reliable effect it was necessary to include processing occurring some time after the verb has first been encountered. This can be seen in Table 9.2.

Table 9.2: ET1, Effects of Plausibility in First Pass (ms/chr)

Region	Plausibility		Difference	Significance	
	Plaus	Implaus		F1	F2
V	30.1	32.4	2.3	No	No
Pronoun + V	25.0	25.7	0.7	No	NO
V + Adv	28.1	30.2	2.1	Marg	No
Pro + V + Adv	25.9	28.3	2.4	Marg	Marg
Sentence	28.2	32.5	4.3	Yes	Yes

Two regression inclusive measures were also calculated: Right bounded, RB, summing all fixations made prior to exiting a region by a forward eye-movement, and therefore including fixations following regressions from the target region to earlier material; and restricted right bounded, RRB, again terminated only by a forward saccade out of the region under consideration, but here summing only those fixations falling on the region itself. However, differences in means

using these measures did not reach significance in more localised regions than FP. For the full target sentence the RRB measure showed significance in the F1 and F2 analyses, while RB was significant in the F1 analysis but marginal in the F2.

Total time results, TT, summing all fixations made in a region at any point during a subject's reading of the passage, showed a significant effect of Plausibility across all regions. This is illustrated in Table 9.3.

Table 9.3: ET1, Effects of Plausibility in Total Time (ms/chr)

Region	Plausibility		Difference	Significance	
	Plaus	Implaus		F1	F2
V	41.2	51.4	10.2	Yes	Yes
Pronoun + V	34.2	41.6	7.4	Yes	Yes
V + Adv	36.4	43.5	7.1	Yes	Yes
Pro + V + Adv	33.4	39.5	6.1	Yes	Yes
Sentence	33.7	39.0	5.3	Yes	Yes

Given the TT effect localised to the verb, and the FP effect across the whole target sentence it seems that Plausibility is impacting on eye-movements through regressions to the verb area from later in the sentence. For the implausible condition, compared with the plausible condition, there are significantly more total regressions to the verb (an average of 1.854 against 1.167). There is also a significant effect of plausibility in regressions from the verb (0.792 against 0.333) and from the verb plus adverb (2.208 against 1.208). Again these figures are for total regressions, with leading edge regressions showing no differences. Thus the impact of plausibility again seems to occur fairly late in processing.

9.2.1.5. Eye-Tracking 2

Following Eye-Tracking 1, we were able to examine data from experiments which use the same logic as SPR1, but now with strong expectations about where a Plausibility effect can emerge, and hence where we can expect character type to show interactive effects with it. Eye-Tracking2 used a similar design to SPR1, but with one main difference: rather than creating Implausible conditions by having a clear contradiction between the atmosphere described and the action in the target, here there was simply no relation between the two, so the target described an unmotivated action. I thus used the term Congruity to describe this independent variable, rather than Plausibility. The manipulation was thus closer to that used in Garrod and Sanford's (1988) SPR study, though here the inclusion of a neutral atmosphere statement in the Incongruous condition, rather than simply leaving out any context description, means the passages are of the same length. As in my own SPR experiment, SPR1, manipulation of character type was achieved by changing the means of introduction of characters, rather than the pronoun in the target, the method used by Garrod and Sanford. I term this independent variable Reference.

My main prediction was thus for an interaction of Reference and Congruity, paralleling SPR1, and resulting from an attribution of the atmosphere information to the MC. With these materials the Congruity effect was not tied specifically to the verb (*mopping* has not relation to being hot, only *mopping ones brow*), so predictions about where the interaction can be expected to emerge are less precise. However, in the light of Eye-tracking1 we might broadly predict first pass (and RB and RRB) results across the whole target

sentence, total time results in narrower regions, and regressions results only with total regressions.

The early measure did not show an interaction, even over the whole target sentence. There was, however, a main effect of Congruity in FP over the full sentence, with Congruous sentences read 3 ms/character faster (30.1 ms/chr versus 33.1 ms/chr). The results for TT are shown in Table 9.4. As can be seen, the interaction is apparent but fragile, and concentrated on the verb.

Table 9.4: ET2, Interaction of Reference and Congruity in Total Time (ms/chr)

Region	MC		SC		Significance	
	Plaus	Incon	Plaus	Incon	F1	F2
V	46.5	50.6	50.6	45.1	Yes	No
Pronoun + V	39.9	42.8	44.9	39.4	Marg	Marg
V + next word	43.8	47.6	47.7	47.9	No	No
Pro + V + next	39.6	42.8	44.7	42.9	No	No
Sentence	39.2	42.2	42.3	41.6	No	No

Similarly, in the regressions analysis the only significant effect was the predicted interaction, emerging in total regressions from the verb (this was significant in F1 and marginal in F2).

In summary, the predicted interaction is found, but the effect is fragile. It emerges late in the eye-tracking record: the first sign of an effect of Congruence is a main effect in FP over the full target sentence, with character type not influencing this significantly until TT measures.

9.2.1.6. Eye-Tracking 3

This experiment used the identical materials to SPR1, but tested using eye-tracking. It will be recalled that with these materials the Plausibility manipulation was tied to the verb. The prediction was thus for an interaction of Reference and Congruity, paralleling SPR1, and resulting from an attribution of the atmosphere information to the MC. Given the results of eye-tracking1 we would predict FP (and RB and RRB) results across the whole target sentence, total time results in narrower regions, and regressions results only with total regressions.

The most striking feature of the results was an interaction, but one that was present only in the first pass data, and which was in the reverse direction to that predicted. FP results are shown in Table 9.5, the asterisked results indicate an unpredicted direction of result.

Table 9.5: ET3, Interaction of Reference and Plausibility in First Pass (ms/chr)

Region	MC		SC		Significance	
	Plaus	Incon	Plaus	Incon	F1	F2
V	33.6	35.3	34.4	38.0	No	No
Pronoun + V	27.9	28.3	29.6	28.4	No	No
V + Adverb	32.0	31.4	31.7	37.7	Yes*	Yes*
Pro + V + Adv	28.5	28.9	30.2	32.1	No	No
Sentence	30.0	30.4	30.8	33.8	No	No

As can be seen this was early (indeed earlier than we would expect a plausibility effect to register) and it was not significant in the RB and RRB measures over the verb plus adverb region. Moreover, as Table 9.5 shows the direction of interaction reverses to that predicted,

though it is non-significant, when larger regions are considered. However, there were no significant results for the predicted interaction in any RT measures. Plausibility showed as a main effect in TT for the verb plus adverb and full target sentence regions, but there was no sign of an interacting influence of character type.

My prediction did receive some clear support from the regressions data. Here the only significant effect was for the interaction, in the predicted direction, in total regressions from the verb (a .625 average total regressions per trial advantage to the Plausible condition with MC reference, compares with a .084 disadvantage with SC reference.)

Overall the eye-tracking results support those of SPR1, demonstrating the MC attribution effect occurring on-line. However, the evidence is weaker than I had hoped, with trends failing to reach significance, and, in Eye-Tracking3, some extraneous factor dominating the RT results.

9.2.1.7. Eye-tracking measures for experimental designs based on cross sentential anomaly between context and action

The extra dimensions of analysis offered by eye-tracking did not prove particularly useful for these studies. It became apparent from Eye-Tracking 1 that RT effects with this type of cross sentential anomaly would only show in late measures (probably total time, the regression contingent measures provided no useful data in these experiments) or over large regions (the entire target sentence), a finding backed by ET2 and ET3. There was thus no possibility of localising the trigger for the anomaly effect - a TT effect at the verb cannot be localised to this word since this will include regressive

fixations to the verb when later information has been read. (In fact this localisation was not of great interest anyway - my concern was with the processing that occurred when the atmosphere sentence was read, the target's anomaly was merely used as a diagnostic for this.)

Regressions data was useful in providing further evidence for the predicted effect. However, again this evidence was in the later measure - total regressions from the verb.

The pattern of results, demonstrating the main character attribution effect on line, was clearer in SPR1 than ET2 or ET3. It is only possible to speculate as to the cause of this, but it may be due to deeper processing of each sentence in SPR. Sentence-by-sentence presentation may mean that the wrap-up processing usually associated with the final sentence of a paragraph may be applied to each sentence, since the reader cannot tell if there is more information to come. This might not only accentuate the anomaly effect, due to extra processing at the target, but also increase the differentiation in status of the characters, through careful reading of the sentences in which they are introduced, and hence sharpen the interaction.

9.2.2. Main Character attribution and discourse processing

It will be recalled that I introduced the main character attribution effect as an example of the way that a text's rhetorical structure can control inferential processing: here main characterhood determines the locus of attributional inference. Following the above demonstrations of the reality of the basic phenomenon, I pursued a series of studies using the same experimental paradigms, but with

various alterations to the structure of the materials. My aim was to determine exactly what inputs are necessary from the text if selective attribution is to occur. The results from these studies led me to a new processing account of the effect.

Below I review the results for each of the main structural changes in turn: first, the replacement of the atmosphere statement with an action statement; second, a change in the order of introduction of characters and background statement. I then discuss how these results can be interpreted within a new processing explanation, and also how they relate to the minimalist theory of inference.

9.2.2.1. Action statements and Main Character Attribution

This line of research considered the generality of the Main Character attribution effect, specifically with regard to another kind of context descriptive statement in narrative: action statements. These, like atmosphere statements, describe the background to the causal chain of the narrative. However, unlike atmosphere statements they do not need a perceiver for full interpretation, and have an explicit agent. An example would be, *Some young boys were throwing in litter* in a story about a woman taking her son to a pond.

Discussing empirical work on atmosphere statements, my own and others, I claimed that the distinction of an MC acts as a rhetorical device controlling inference. More particularly, the MC functions as the locus of attributional inferences, giving rise to a differential attribution of context describing information to the different characters in a narrative - the result found in the main character attribution effect. Given these claims about the inferential control

function of the MC, I went on to hypothesise that the MC will be the preferred locus for the attribution of other types of background information, action as well as atmosphere statements. This claim was again tested with both off and on-line techniques.

In the off-line task my prediction was that action statements would show the same pattern of preferential attribution to the MC as atmosphere statement; this preference indicated by subjects being more likely to answer *Yes* if asked whether the MC perceived the described context, than if asked the same question of the alternative character.

The prediction was upheld in two experiments, Off-Line2 and Off-Line3a, as illustrated in Table 9.6, below. Off-Line3a differed from Off-Line2 in offering a *Don't Know* response alternative, as described above. In neither case was there an interaction of statement type and reference, while in both experiments there was a significant effect of Reference (with more *Yes* answers to the MC) for both statement types.

Table 9.6: Main Effect of Reference for different statement types in Off-Line 2 and 3a

	Statement Type	Question Reference		Difference (MC - SC)	Significance	
		MC	SC		F1	F2
Off-Line 2	Atmos	80%	67%	13%	Yes	Yes
	Action	71%	59%	12%	Yes	Yes
Off-Line 3a	Atmos	64%	47%	17%	Yes	Yes
	Action	50%	36%	14%	Yes	Yes

Data demonstrating on-line selective attribution was sought in two self-paced reading studies, SPR2 and SPR3 (these differed in the type

of anaphor used in the target sentence, see Chapter 7). The predicted interaction between Reference and Plausibility did not occur in either of these experiment. Rather there was a significant main effect of Plausibility, with means comparisons showing this to be significant with both MC and SC reference. It thus appeared that there had been no preference for attributing the action information to the MC during reading.

9.2.2.2. Character order and Main Character Attribution

In these experiments the position of the atmosphere statement was altered: rather than following two introductory sentences, each one introducing one of the two characters in a passage, it was inserted between these, so that one character was introduced after the atmosphere statement. As before, the status of this following character could be altered by using either a name or a role description for its introduction.

I took as my hypothesis that the alteration in position would not effect the MC attribution effect; i.e. selective attribution would be apparent even for characters introduced after the atmosphere statement itself. This prediction was based on the assumption that meeting an MC would in itself be sufficient to trigger an attributive inference, linking it to previously mentioned material, while this would not occur with an SC.

This hypothesis was tested in Off-Line4. Here questions about the perception of the atmosphere could refer to either the main or secondary character, and this could be introduced either before or after the atmosphere statement itself. The results supported the

prediction that selective attribution would be unaffected by the position of characters relative to the atmosphere statement. There was no interaction of these two factors, while in a means comparison the advantage to MC reference questions, over those to the SC, was significant, whether these preceded or followed the atmosphere statement. This can be seen in Table 9.7, where character position is relative to the atmosphere statement.

Table 9.7: Effect of Reference for different sentence ordering in Off-Line 4

	Character Position	Question Reference		Difference (MC - SC)	Significance	
		MC	SC		F1	F2
Off-Line 4	Before	89%	80%	9%	Yes	Yes
	After	79%	63%	16%	Yes	Yes

However, as with action statements, data from on-line experimentation showed no evidence of selective attribution. In SPR 4 and Eye-Tracking 5 the target sentence pronoun took as its antecedent the character introduced after the atmosphere statement, and, as in the earlier experiments, this could be either the MC (if introduced by naming) or the SC (if introduced by a role description). As before, this was combined with a manipulation of the plausibility of the target sentence in relation to the atmosphere information. Thus, given the hypothesis that there will be a selective attribution of this information to the MC, even with the character introduced after the atmosphere statement, I predicted a larger plausibility effect with MC reference than with SC reference, and hence an interaction of Reference and Plausibility.

In the self-paced reading experiment there was a main effect of Plausibility, but no interaction with Reference. In the eye-tracking experiment neither RT or regressions measure showed a significant interaction.

9.2.2.3. Implications for the discourse processing model

Two lessons are immediately apparent from the failure of my prediction in the on-line paradigms.

First, the off-line effect may result from processing occurring in response to the question being posed, not during reading. This is the simplest explanation of the success in finding an effect in the off-line paradigm when it is not apparent on-line.

Second, my original processing explanation of the effect is inadequate. It is not the case that selective attribution of background information results solely from the presence of a character marked as the MC. From the failure to obtain an on-line effect with action statements it is apparent that the nature of atmosphere statements themselves must play a role in the original phenomenon. In other words, as I concluded in Chapter 7, the particular qualities of these statements (the need for an experiencer) is a bottom-up cue for an inference to be made. It is only when an inference has been triggered in this way that character status will come into play, determining that the MC is the site of attribution. The results from SPR 4 and Eye-Tracking 5, where the ordering of background and character information was inverted, point in a similar direction: the attributional inference is cued by the atmosphere statement, a character which is introduced after this, as in these materials, will

not, therefore, have the opportunity to control this inference (the exact interpretation of these results is complex, I go into more detail in Chapter 8).

I further noted in Chapter 7 that this new processing model is incompatible with minimalism. Minimalism allows only two circumstances in which inference can occur (for the preservation of local coherence, and when immediately available information is employed) but this kind of bottom-up cue by the statement type can be subsumed under neither of these conditions. As I stressed earlier, accounts of inference coming from theories based on the output representation from processing - whether this be minimal or maximal - are inevitably inadequate. A full understanding of inference during reading demands careful attention to the textual inputs to the computational processes.

Note that the appeal to the "need for an experiencer" in atmosphere statements, as an explanation of why an attributional inference is made for these, introduces a semantic element. Processing occurs in this way because of the meaning of this type of sentence. Up until this point I have tried to avoid this type of explanation, in particular describing attributional inference as a mechanical linking between background information and character, not the explicit addition to the reader's representation of a semantic element of the type *character X perceived that the atmosphere was hot and sticky.*

The motivation for this was to maintain a separation between the notion of the attribution of information to a character, and the idea of information being seen from a character's perspective, as with the

statement of perception above. I noted in Chapter 4 that perspective is a complex concept, and there are good reasons to believe that the MC, as I have defined it, and the holder of perspective will not necessarily be identical at a particular point in the narrative.

However, the action statement results compel a rethinking of this position, since it is now apparent that the need for a perspective on the information is an important cause of the attribution effect with atmosphere statements. This does not provide a great problem in terms of the separation of perspective holder and MC, since we can instead assume that a matrix perspective holder for a section can adopt the perspective of a temporarily focused character, the MC. Note also that if the content of background sentences effects their processing with respect to characters then a number of further interesting issues are raised. Is the attribution dependent on the relevance of the background information to the particular character: e.g. the heat of a restaurant may be more pertinent to a diner who has just entered than to a waiter who is accustomed to it. This factor was controlled in my on-line experiments (since the target always referred to the same character) but could instead be investigated as an experimental factor. Further, it may be that attribution of an action statement will occur if it provides information particularly pertinent to one character. Further research here would be productive.

Footnotes

1 With the exception of this quotation from *Macbeth*, all examples in this section are taken from *The Guardian*, September, 1995.

2 Though on occasions implausibility is not noticed, see (3.2.).

3 Their exact words are: "The text provides a test for global inferences because the inconsistency should amplify the use of global information at the local level, and so responses to the test word *workout* should be facilitated relative to the Control condition." I find this difficult to understand (What exactly is amplified? Is there some notion of activation?) but the general tenor is clear.

4 Similar criticisms have been levelled at other materials used by McKoon and Ratcliff. See, for instance, Zwaan and Graesser (1993) who suggest a failure to consider whether the global causal inferences probed for in the 600 word passages described above would be made by subjects deliberately engaged in more maximal causal processing . This issue is further discussed in section (3.1.) below.

5 On automaticity, see Garnham, 1992; Singer, 1993; Zwaan and Graesser, 1993a.

6 This phrase is due to Garnham, 1992

7 The propositional representation of the text and the following coherence graph have been prepared using Kintsch (1974) and Kintsch and van Dijk (1978). The use of proposition 2 as the root of the graph is based on my intuitive sense of its importance, as with Kintsch and van Dijk's representations.

8 They do not venture as to whether or not co-reference is a necessary condition of local coherence, and hence a break in such links will necessarily lead to a bridging inference. This seems likely if we accept the Gricean maxim of relevance (Grice, 1975): if a statement has no referential connection with what has gone before, some other grounds for relevance will need to be constructed - by definition an inferential process.

9 The first of these examples, and the general thrust of the argument, is owed to Pinker, 1995.

10 McKoon and Ratcliff (in press) suggest that the advantage to the controls could be due to facilitation in these cases, following the explicit information about the character's role, rather than conflict in the experimental conditions, following inferential assignment of a scenario role. Such facilitation is possible, but off-line evidence suggests a processing problem with the role conflict in the experimental conditions: (1) there is an introspective difficulty with the conflicting conditions; (2) a continuation task showed a strong preference to use the predicted character following reading of the experimental passages up to the target.

11 These inferences would, of course, be minimal if the scenario information was easily available, but this is an unmotivated assumption.

12 In a series of experiments in Gernsbacher and Robertson (1992), the authors successfully isolate the activation of emotional state information and the activity of integrating the target sentence. Both underlie the effect.

13 Glenberg et al's findings have been the subject of debate, with McKoon and Ratcliff (1992) claiming that spatial association has been confounded with the salience of particular items in the story (the flower is seen as more important in the associated condition, and this is responsible for its foregrounding. See Glenberg and Mathew (1992) for a response.

14 For an explanation of this, using the same example as given below, see (4.5.1.).

15 Note that, following an argument implicit in McKoon and Ratcliff's work, he sees minimal inference as being internal to the language module, and hence not affected by this problem.

16 This may itself arise from a common biological endowment, or certain universal functional factors which shape the architecture.

17 Other studies have shown that under the right contextual conditions readers will not notice a variety of anomalies; see, e.g.,

Erickson and Mattson (1981), Vonk and Noordman (1990), Wason and Reich (1979).

18 Note that this finding further contradicts the minimalism hypothesis - though this time in terms of it being too liberal in licensing inferences - since inferences necessary for local coherence - or noticing local incoherence - are not being drawn.

19 These terms are taken to be identical, although Garrod and Sanford prefer Thematic Subject (Garrod and Sanford, 1988: 520). However, I shall primarily use Main Character or MC. The relation between the concepts is discussed further in Chapter 4.

20 The experimenters checked it's loss from STM against a variety of memory-restricted processing models, e.g. Fletcher and Bloom (1988), Kintsch and van Dijk (1978).

21 Inferencing will be both to maintain coherence in the character representation, and, given the endorsement of Gernsbacher et al's results, to elaborate the representation.

22 See note 14.

23 This interpretation of the data is acknowledged in Sanford and Garrod, 1994: 709.

24 *Constituent*, however, is left undefined.;

25 There is, however, some confusion between these two, that a discourse and a paragraph need not have the same topic is not always recognised in these theories. The problem is recognised by Grimes (1975: 337) when he describes conflicts between the appropriate determining level in languages which morphologically mark the discourse theme.

26 In this discussion I exclude exophoric pronouns, referring to objects outside the discourse but in the immediate context, *HE stole my pen*, and also usages within sentences where reference is determined by syntax, *Mary bought herself a present.* I use pronoun as a shorthand for anaphoric, intersentential pronoun.

27 This is the position taken by Halliday and Hassan (1976), and in linguistic treatments of intra-sentential anaphora (Sells, 1987).

28 Sidner proposes two focus mechanisms, one, that I have discussed, identifying a focus used in the resolution of non-agent pronouns, and another operative with agent pronouns. All the

examples I use in evaluating this system use pronouns in the non-agent position.

29 Grosz uses a different terminology. In (11) the discourse entity of Susan is the highest ranked Cf, or forward looking centre, of the second sentence. This corresponds to the focus context for sentence 3.

30 The pronoun assignment in the second sentence could be reversed, but the authors note that none of the subjects they asked considered this option.

31 These are the (a) and (c) conditions in Morrow's report. His additional condition was identical to (a) but had the non-protagonist participating in a motion event. Subject's preferences for these were statistically identical to the (a) condition.

32 These are my own; Fox's illustration is confusing.

33 From this point on my use of *Main Character* or *MC* can be taken to refer to the object which is both pronominal focus and the locus of non-referential inference.

34 The term Thematic Subject is adopted by Garrod and Sanford from Karmiloff-Smith (1981, 1985), who uses it to describe the main protagonist across the whole sequence of events in a narrative, rather than some temporarily salient character. Her argument is that, during one stage of children's linguistic development, the initial slot of an utterance is reserved for pronominal reference to this character.

35 In consequence I would reject the idea that this cognitive constraint underlies a universal tendency to have a single main character in a story. It may be that a survey analysis would show this simply not to be true; if it is the case I would suggest a psychoanalytic or sociological explanation might be appropriate: we conceive of ourselves as single actors in the world; while trends such as the emergence of free indirect style, the densely charactered nineteenth century novel, or the multiple narration of post-modern narrative, can be seen as reactions to social and ideological changes.

36 The evidence cited here is from Bates and MacWhinney, 1981. This is somewhat disingenuous since Bates and MacWhinney use "perspective" in a very specialised sense, and

one very different from that of Garrod and Sanford. For them perspective taking refers to the alleged tendency of speakers to start utterances with elements that the speaker consider like herself, in terms of humanity, animacy, agency etc..

37 It will be recalled that Morrow separates the category of protagonist status from prominence, i.e. focus.

38 It is not clear from Sanford, Moar and Garrod (1988: 46) whether the relation between the processing and logical properties is one of analogy, or if the latter cause the former.

39. For these materials the MC will be identical to the thematic subject. However, I will not use the later term as I am exploring only the control of attributional inference, without reference to the broader claims made for the TS, that it controls perspective, that it exhibits temporal persistence.

40 The relative importance of these cues is examined in Off-Line 2 and 3.

41 See Chapter 4, especially, (4.5.1.).

42 This type of plausibility manipulation has been used in eye-tracking studies of syntactic phenomenon, cf Traxler and Pickering, 1995

43 See Cohen et al, 1993.

44 Note that this would be predicted following Sanford, Moar and Garrod's SPR experiment, see (4.5.1) and (4.3.4.).

45 For the basic characteristics of eye movements during reading and a history of the measures used in psycholinguistic research see Rayner and Pollatsek, 1989: chapters 4 and 5.

46 These and other measures are discussed in detail in (6.5.2.1.) below.

47 See Chater, Pickering and Milward (1995) for a discussion of the computational issues in on-line syntactic and semantic processing, and for incremental interpretation.

48 The authors found strong evidence for an effect on first fixation: this was significant in an analysis including trials where the verb was skipped, but only by items in an analysis compensating for these zero-ms trials.

49 Rayner and Pollatsek, 1989: 131

50 *ibid*

51 Note that this does, of course, only apply to these specific explanations for this particular effect. As noted inferential processing initiated by a coherence break is both bottom-up and consistent with the minimalist position. Similarly my top-down explanation is consistent with minimalism only on the assumption that the MC is locally available information. In addition, note that I have used the terms top-down and bottom-up in a restricted sense, to refer to the origin of the cues initiating inferential processing: bottom-up if the cue is in the text, top-down if the cue is in the reader's mental representation. I am making no claims about the computational processes that follow.

52 Though recall that "constructionist" is being used as a label of convenience, based on the caricature alternative to minimalism given by McKoon and Ratcliff (1992), rather than referring to a coherent body of theory.

53 It might be argued that a role described character which is introduced before any other is assumed to be the MC prior to the introduction of a marked character, and hence here the early introduced SCs have MC status when the atmosphere statement is first read. The preference for preceding over following SCs could thus be interpreted within **A**. However, a means comparison of the two question reference levels with early character introduction showed that the 9% advantage to MCs was significant ($F1(1,31) = 6.458$, $MSe = .131$, $p=.016$; $F2(1,31) = 6.400$, $MSe = .094$, $p=.017$); thus it seems that subjects did recognise a difference in status between these two.

54 Again noting that this referes only to thesd particluar top-down explanations, not to this class of explanation in general.

55 See (1.1.) for a definition of inference.

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Appendices

Note that the line divisions used here do not necessarily reflect those in the experimental presentations. Materials in Off-Line 2, 3, and 4, and in the self-paced reading experiments were presented line by line, with a title or single sentence on each line. Materials in the eye-tracking studies were constrained by the 65 character-per-line limit, and the desire to place the target sentence unbroken and away from the beginning of the line - these constraints are described in, for example (6.5.1.1.).

Alternatives are represented between slashes and inside curly brackets.

Appendix A: Off-Line 1

AT A RESTAURANT
Richard took a seat and produced a newspaper from his bag. A waitress cleared a table of dirty glasses and crockery. The atmosphere was very hot and sticky. At a nearby table a child had spilled a glass of lemonade.

Did {Richard/ the waitress} find the atmosphere hot and sticky?

THE OFFICE
Angus sat at his desk in the corner. Opposite a woman bent over the photocopier. The room was cool and unfriendly. A cleaner clanked along the corridor, pushing a trolley.

Did {Angus/ the woman} feel the room was cool and unfriendly?

HILL WALKING

Malcolm took out his map. A woman examined their route. The air was beautifully fresh and clear. The sun had yet barely risen.

Did {Malcolm/ the woman} find the air fresh and clear?

THE PUB
Jonathon ordered two pints of beer. The barmaid washed a couple of glasses. The pub was unpleasantly smoky. At the nearest table an aggressive looking man had sat down with a large dog.

Did {Jonathon/ the barmaid} find the pub unpleasantly smoky?

IN THE LIBRARY
Patricia re-shelved books from her trolley. A man asked her where to find works on Scottish art. The reading room was uncomfortably chilly. Across the hall an old man had fallen asleep in front of a newspaper.

Did the library seem uncomfortably chilly to {Patricia/ the man}?

IN THE COURTROOM
Charlie stood in the dock. A juror prepared herself to deliver the verdict. The atmosphere was very tense. The judge requested silence.

Did the atmosphere seem tense to {Charlie/ the juror}?

THE SOCIAL WORK OFFICE
Brian stood waiting in the social work office. A woman asked if he knew whether she needed an appointment. The room was warm and friendly. The drone of a plane could be heard as it climbed overhead.

Did {Brian/ the woman} find the room warm and friendly?

IN THE SWIMMING POOL
Jacqueline swam a length of the pool on her back. With just his head above the surface, the boy prepared to follow. The water was freezing

cold. Two young men came out of the changing room, chasing and shouting.

Did {Jacqueline/ the boy} find the water freezing cold?

THE HIDEOUT
Michaela pointed to where her attacker had dragged her. The policeman took out his notepad. The room was scary. Torn velvet curtains flapped in the breeze from a broken window.

Did {Michaela/ the policeman} feel the room was scary?

AT THE BANK
Rosemary completed a form closing her account. A clerk tapped in her details at his keyboard. The bank was uncomfortably stuffy. Another customer entered, trailing in noises from the street.

Did {Rosemary/ the clerk} find the bank uncomfortably stuffy?

THE BAKER'S SHOP
Kevin waited his turn to be served. The assistant dropped her cap as she reached down for a paper bag. The air was rich and sweet. Out on the pavement it was beginning to rain.

Did {Kevin/ the assistant} find the air rich and sweet?

THE SUPERMARKET CHECKOUT
Matthew took a couple of plastic bags. The cashier passed his purchases over her bar-code reader. The atmosphere was very heavy and close. The noise of a police siren drifted in from outside.

Did the atmosphere seem heavy and close to {Matthew/ the cashier}?

THE HOTEL ROOM

William caught his breath after helping with the luggage. The guest sat herself on the bed. The room was bright and jolly. A few dull clunks came from the pipe work.

Did {William/ the guest} find the room bright and jolly?

ON BOARD AN AEROPLANE

Jeanette pushed a trolley down the aeroplane aisle. A passenger took his meal from her. The cabin was quite chilly. Through the window the wing tip light gave a red glow.

Did the cabin seem chilly to {Jeanette/ the passenger}?

THE PICKET LINE

Robbie addressed the picket line through his megaphone. A woman called out her support. The mood was invigorating. A police helicopter clattered overhead.

Did {Robbie/ The woman} find the mood invigorating?

THE DOCTOR'S SURGERY

Jenny sat and considered her fingernails. The doctor flicked through one of his textbooks. The consulting room was warm and terribly stuffy. From out the front, the noise of traffic broke the silence of the room.

Did {Jenny/ the doctor} find the room warm and stuffy?

THE PERFUME SHOP

Allan examined the various brands and prices on offer. The assistant neatened rows of bottles on a shelf behind her. The shop was heavy with scent. A woman in a fur coat was paying for a bottle of cologne.

Did {Allan/ the assistant} notice the shop was heavy with scent?

A LECTURE
Michelle took out her pen and note pad. The lecturer stood by the blackboard with his notes. The lecture theatre was airless and oppressive. A rumble of thunder could be heard in the distance.

Did {Michelle/ the lecturer} find the lecture theatre airless and oppressive?

A PUB BRAWL
Donnie called into his police radio for assistance. A woman looked on. The situation was frightening. A siren could be heard in the distance.

Did {Donnie/ the woman} find the situation frightening?

IN THE HOTEL LOBBY
Christina sat behind an impressive mahogany counter. A man asked her for his room key. The lobby was uncomfortably hot and clammy. Two men in dark glasses appeared from the lift and strode to the door.

Did {Christina/ the man} find the lobby uncomfortably hot and clammy?

THE FACTORY VISIT
Alexander lead the way through the engine room. The visitor put on her hard hat and followed him. The generator made an awful whining sound. The night shift was just clocking on.

Did {Alexander/ the visitor} notice the awful whining sound?

DIRECTIONS
Thomas stood by the gate to his field. A woman asked him to point out the way back to the village. The air stank of manure. The sun was just beginning to dip below the horizon.

Did {Thomas/ the woman} notice the stink of manure?

IN THE MUSEUM
Mary made her way around. An attendant sat beneath a huge English landscape polishing his cap. The gallery was gloomy and chill. The only other visitor was a shuffling, breathless old man.

Did the gallery seem gloomy and chill to {Mary/ the attendant}?

THE DENTIST'S WAITING ROOM
Patrick sat reading his newspaper. The receptionist searched through her filing cabinet. The atmosphere was unpleasantly hot and stale. Noise from the street drifted into the room.

Did the atmosphere seem unpleasantly hot and stale to {Patrick/ the receptionist}?

NEGOTIATIONS
Sebastian sat amongst the other directors. The shop steward was seated opposite with two union colleagues. The mood was friendly. A young woman came in bringing tea and coffee.

Did {Sebastian/ the shop steward} feel the mood was friendly?

ON A BUS
Vincent collected fares as the passengers boarded. A girl gave him her money. The bus was icy cold. Behind her a drunk was struggling up the steps.

Did the bus seem icy cold to {Vincent/ the girl}?

THE USED-CAR GARAGE
Raymond started the car. The customer stood with her hand on the door. The engine sounded very strange. A sudden gust of wind blew leaves across the forecourt.

Did {Raymond/ a customer} notice the engine's strange sound?

IN THE AIRPORT
Alison placed her case in the X-ray machine. The baggage inspector sat examining his monitor. The atmosphere was stifling. To one side, three armed policemen were sharing a joke.

Did {Alison/ the baggage inspector} find the atmosphere stifling?

THE BOOK PRIZE CEREMONY
Annabella chatted amongst her table of supporters. The judge cleared his throat, ready to announce the winner. The atmosphere was exciting. A hush descended on the whole audience.

Did {Annabella/ the judge} find the atmosphere exciting?

OUT IN THE NIGHT
Christopher called out for custom in his hoarse voice. A woman bought an evening paper. The night was raw with a bitter wind. The church clock began to chime midnight.

Did {Christopher/ the woman} find the night raw and bitter?

THE HOSPITAL WARD
George sat on his bed holding a towel. A nurse was doing her rounds. The ward had a nasty reek of disinfectant. At the lower end of the room the curtains were still drawn.

Did {George/ the nurse} feel the ward had a nasty reek of disinfectant?

THE SOCIAL SECURITY OFFICE

Frank waited to be called for his appointment. An assistant sat at her desk, shuffling a pile of files. The office was boiling hot. Raised voices could be heard from the neighbouring room.

Did {Frank/ the assistant} find the office boiling hot?

OUTSIDE THE NIGHTCLUB
Michael continued to refuse entry to the gang of abusive young men. A girl tried to edge her way past them. The atmosphere was intimidating. From inside the club came the beat of the music.

Did {Michael/ the girl} find the atmosphere intimidating?

A POLITICAL MEETING
Anthony gave his views on electoral reform. A woman listened carefully as he spoke. The atmosphere was enthusiastic. The audience clapped and cheered.

Did the atmosphere seem enthusiastic to {Anthony/ the woman}?

THE KITCHEN PLUMBING
Douglas poked his plunger down the sink. The woman asked when the blockage would be sorted. There was a revolting smell. A pool of water was expanding across the floor.

Did {Douglas/ the woman} find the smell revolting?

THE CLASSROOM
Richard read an extract from his copy of 'Madame Bovary'. His pupil followed the text with her finger. The classroom was absolutely freezing. The passage described Madame Bovary's boredom with provincial life.

Did the classroom seem to be freezing to {Richard/ the pupil}?

THE GARAGE
Laurence poked around under the bonnet. The woman wondered how long the MOT would take him. The garage was thick with fumes. From overhead a bare light bulb illuminated the room.

Did {Laurence/ the woman} find that the garage was thick with fumes?

THE REST STOP
Caroline made her way out of the coach. The driver opened the gate from his cab and followed. The air was refreshing. Another coach was just pulling into the lay-by.

Did {Caroline/ the driver} find the air refreshing?

A POLICE INTERVIEW
Dominic described the shooting as best he could remember. A policewoman took shorthand notes and asked an occasional question. The interview room was small and overheated. From the car park outside came the noises of a struggle.

Did the room seem small and overheated to {Dominic/ the policewoman}?

THE GREENGROCERS
Sharon searched for her purse. The assistant stood at his till. The shop was rather dirty. A lonely tinkle from the shop bell announced the arrival of another shopper.

Did {Sharon/ the assistant} feel the shop was rather dirty?

Appendix B: Off-Line 2 and 3

Action Statements

STREET LIFE
{Jenny/ A woman} was walking amongst the market stalls. {A trader/ Ben} called out for custom from his stall. At the side of the street some buskers were juggling. Saturday always brought out a lot of activity.

Did {Jenny/ the trader/ Ben/ the woman} notice the buskers juggling?

THE MUSEUM
{Mary/ A woman} was studying the seventeenth century Dutch portraits. {A tour guide/ Tom} strolled around the gallery. In one corner a student was copying an old master. The museum was unusually busy for a weekday.

Did {Mary/ the tour guide/ Tom/ the woman} notice the student copying an old master?

THE VICTORY PARADE
{Stephanie/ a girl} watched as the team bus drove slowly up the road. {Barry/ A policeman} asked the onlookers to stay behind the police line. A journalist was photographing the crowd. The scene was impressive.

Did {Stephanie/ the policeman/ Barry/ the girl} notice the journalist was photographing the crowd?

THE PIER
{Helen/ A woman} strolled up to the end of the pier with her children. {A fisherman/ Julian} sat by the railings hooking bait onto his fishing line. On a bench a young couple were eating ice-cream. The sea was looking lovely as it was lit by the setting sun.

Did {Helen/ the fisherman/ Julian/ the woman} the woman notice the young couple were eating ice-cream?

THE RIVER

{Henry/ A man} was sitting on his pleasure boat sipping a gin and tonic. {A woman/ Grace} walked along the river bank with her dog. Some children were feeding the ducks with bread crusts. It was a lovely sunny day.

Did {Henry/ the woman/ Grace/ the man} notice some children were feeding the ducks?

LUNCH TIME IN THE PARK

{Roseanne/ A woman} was eating sandwiches on the grass. {A man/ Jeremy} headed towards the shade of a tree. On the path a dog was annoying an old woman. The park always filled up around lunch time.

Did {Roseanne/ the man/ Jeremy/ the woman} notice a dog was annoying an old woman?

A HOUSE PARTY

{Matt/ The host} stood chatting with some friends. {A girl/ Eileen} was pouring herself another glass of wine. In the corner someone had started playing a guitar. The party was beginning to wind down.

Did {Matt/ the girl/ Eileen/ the host} notice that someone was playing a guitar?

BEFORE SCHOOL

{Nigel/ The janitor} had just opened up the main doors of the school. {The headmistress/ Wendy - the headmistress - }was taking her briefcase from her car. Already some children were playing football in the yard. It was a bright and clear morning.

Did {Nigel/ the headmistress/ Wendy/ the janitor} notice that some children were playing football?

TENNIS TOURNAMENT
{Susan/ The tennis player} looked furious. {The umpire/ Tom} had over-ruled the double-fault call. The crowd started shouting. The game was at match point.

Did {Susan/ the umpire/ Tom/ the tennis player} hear the crowd shouting?

BY THE POOL
{Jackie A woman} lay on her back sunbathing. {A man/ Jim} was drinking a large cocktail. Some boys were playing in the swimming pool. Everyone was relaxed.

Did {Jackie/ a man/ Jim/ a woman} notice the boys playing in the pool?

SHOPPING
{Bob/ A customer} was looking for a bottle of wine. {A sales assistant/ Hillary} suggested that the Australian wine was nice. In the aisle an old man dropped his shopping. The store was packed with weekend shoppers.

Did {Bob/ the sales assistant/ Hillary/ the customer} notice the old man drop his shopping?

ON THE MOVIE SET
{Pamela/ The actress} was preparing for her big scene. {The director/ Sam} told her to begin when she was ready. The film crew were fidgeting impatiently. It was the fourth day of filming.

Did {Pamela/ the director/ Sam/ the actress} notice the film crew fidgeting?

IN A BAR
{Jason/ The barman} rushed to bring people their orders. {The manageress/ Helen - the manageress -} was showing new customers to the empty tables. Some people had started dancing on the small dance floor. The music was infectious.

Did {Jason/ the manageress/ Helen/ the barman} notice the dancers?

IN THE HILLS
{Martin/ The hill-walker} was daunted by the long climb. {The guide/ Susanne - the guide -} had traversed the route many times. Some other campers were having trouble folding their tent. Behind the mountains the sun was rising.

Did {Martin/ the guide/ Susanne/ the hill-walker} notice the campers having difficulty?

SKIING
{Jeff/ A novice skier} was about to tackle his first slope. {The instructor/ Jo} followed behind. Colourfully clad skiers sped by. It was Christmas in two days.

Did {Jeff/ the instructor/ Jo/ the novice} notice the colourful skiers?

THE BUS FARE
{Jill/ A school-girl} protested that she was under sixteen. {The bust driver/ James - the driver -} laughed at her attempt to pay half fare. Other people in the queue were getting impatient. The bus was always late.

Did {Jill/ the driver/James/ the school-girl} notice the other people getting impatient?

A DINNER PARTY
{Rhona/ The hostess} described where she had bought her ingredients. Meanwhile {a guest/ Ronald} tucked in to the luxurious desert. From the windowsill the cat was eyeing up the food. The meal was highly enjoyable.

Did {Rhona/ the guest/ Ronald/ the hostess} notice the cat eyeing the food?

THE PHILOSOPHY LECTURE
{Dr Hill/ The lecturer} was slow to start his lecture. {A student/ Jay} was meandering through the lecture hall to find a seat. There were people already comfortably sleeping. The lecture theatre was huge.

Did {Dr Hill/ a student/ Jay/ the lecturer} notice the people sleeping?

AT THE CINEMA
{Karen/ a girl} took her seat in the cinema. {An usher/ Paul} showed people to their seats. People in the back row were arguing loudly. The film was about to start.

Did {Karen/ the usher/ Paul/ the girl} hear the people arguing?

ICESKATING
{Joyce/ A girl} skated confidently round the rink. {A boy/ Derek} had just fallen over and was getting back up. One couple was skating at an alarming speed. The ice was very wet and slippy.

Did {Joyce/ the boy/ Derek/ a girl} notice the couple skating at speed?

AT THE DANCE
{David/ A man} danced in the middle of the floor. {A waitress/ Ann} smiled at him while she cleared away some empty glasses. Another couple were doing the tango. The dance was very enjoyable.

Did {David/ the waitress/ Ann/ the man} notice the couple dancing the tango?

THE PUBLIC BAR
{Carol/ A woman} ordered a drink at the bar. {The barman/ John} poured her a vodka. Some other customers were arguing about a football match. Happy hour was about to begin.

Did {Carol/ the barman/ John/ the woman} hear the customers arguing about the football?

THE UNIVERSITY LIBRARY
{Emma/ A girl} was studying hard at a table. {A librarian/ Sharon} was reshelving some books. Someone was whispering behind the bookcase. The library was quite busy that night.

Did {Emma/ the librarian/ Sharon the girl} hear the whispering?

AT THE BEACH
{Ian /A holiday maker} was sunbathing on the beach. {A lifeguard/ James} sat in his tower watching the people in the water. A group of young men were playing a rowdy game of volleyball. The beach was busier than usual.

Did {Ian/ the lifeguard/ James/ the holiday maker} notice the men playing volleyball?

THE ITALIAN RESTAURANT
{Alyson/ A woman} chose a pasta dish from the menu. {A waiter/ Gordon} asked if she would like some garlic bread with it. Two children opposite were throwing some peas across their table. Some of them were landing on the floor.

Did {Alyson/ the waiter/ Gordon/ the woman} notice the children throwing the peas?

IN THE CHEMIST'S
{Alf/ A customer} asked if he could have something to cure his cold. {The pharmacist/ Jane} recommended Actifed syrup. Some school children were giggling at the condoms. The shop was just by the school.

Did {Alf/ the pharmacist/ Jane/ a customer} notice the children giggling?

AT THE HAIRDRESSER'S
{Cathy/ A customer} asked for a trim. {The hairdresser/ Michelle} wanted to cut her hair in a more interesting style. A child was playing with the clippings on the floor. It was almost closing time.

Did {Cathy/ the hairdresser/ Michelle/ a customer} notice the child playing with the clippings?

IN THE PARK
{Bill/ A walker} was ambling along the path with his dog. {A cyclist/ Diana} rode past him on her new mountain bike. There were children playing in the swing park area. It was a school holiday.

Did {Bill/ the cyclist/ Diana/ the walker} notice the children?

INDOOR FOOTBALL
{Kevin/ A player} dribbled the ball into a good position. {The linesman/ Charlie} watched closely from the side. In the gym next door there was noisy shouting. It was a busy night at the sports centre.

Did {Kevin/ the linesman/ Charlie/ the player} hear the shouting?

AT THE DENTIST

{Margaret/ The patient} sat in the chair during her visit. {The dentist/ Jonathon} treated a number of her teeth. Outside there was a sound of children playing. It was about 4 o'clock.

Did {Margaret/ the dentist/ Jonathon/ the patient} hear the children playing outside?

ON BOARD THE FERRY
{Hamish/ A boy} watched the waves crashing on the distant rocks. {The deck-hand/ Simon} checked the vehicles were secure. Some youths were throwing bread to the seagulls. They hungrily picked up the titbits.

Did {Hamish/ the deck-hand/ Simon/ the boy} notice the youths feeding the seagulls?

AT THE ROCK CONCERT
{Mary/ A concert goer} watched the show with interest. {A bouncer/ John - the bouncer -} was watching for gate crashers. The band were playing out of tune. It was near the end of the first set.

Did {Mary/ the bouncer/ John/ the concert goer} notice that the band were playing out of tune?

Atmosphere Statements

THE HOSPITAL WARD
{George/ A patient} sat up in his bed reading. {A nurse/ Rose} walked through on her rounds. The ward had a nasty reek of disinfectant. Visiting time would begin in half an hour.

Did {George/ the nurse/ Rose/ the patient} feel the ward had a nasty reek of disinfectant?

THE DOCTOR'S SURGERY

{Jenny/ A patient} sat and explained her symptoms. {The doctor/ Donald} put down his stethoscope. The consulting room was warm and terribly stuffy. The appearance of a nurse disrupted the consultation.

Did {Jenny/ the doctor/ Donald/ the patient} find the room warm and stuffy?

IN THE HOTEL LOBBY

{Christina/ A receptionist} sat behind an impressive mahogany counter. {A man/ Peter} asked what time dinner would be served. The lobby was uncomfortably hot and clammy. A group of businessmen were gathering by the revolving doors.

Did {Christina/ the man/ Peter/ the receptionist} find the lobby uncomfortably hot and clammy?

DIRECTIONS

{Simon/ A farmer} stood by the gate to his field. {A girl/ Alice} asked him to point out the way back to the village. There was an awful stink of manure. In another thirty minutes it would be dark.

Did {Simon/ the girl/ Alice/the farmer} notice the awful stink of manure?

IN THE GALLERY

{Mary/ A woman} made her way around the exhibition. In the centre {a man/ Gordon} sat studying a huge English landscape. The gallery was gloomy and chill. The only other visitor was a bespectacled old man.

Did the gallery seem gloomy and chill to {Mary/ the man/ Gordon/ the woman}?

THE LESSON

{Tom/ A student} read out an extract from his copy of 'Madame Bovary'. {The teacher/ Juliette} followed the text with her finger. The classroom was absolutely freezing. The passage described Madame Bovary's boredom with provincial life.

Did the classroom seem to be freezing to {Tom/ the teacher/ Juliette/ the student}?

AT THE CLINIC

{Natalie/ A woman} sat waiting and flicked through a magazine. {A man/ Brian} stood close to the door. The waiting area was warm and friendly. Just then a young secretary entered and asked for a Mrs Doherty.

Did {Natalie the man/ Brian/ the woman} find the waiting area warm and friendly?

THE USED-CAR GARAGE

{Raymond/ A salesman} started the car engine. {A customer/ Elizabeth} stood with her hand on the door. The engine smelt a little odd. Several similar models faced them across the forecourt.

Did {Raymond/ a customer/Elizabeth/ a salesman} notice the engine's odd smell?

THE GREENGROCERS

{Sandra/ A customer} searched in her bag for her purse. {The assistant/ David} stood at his till. The shop was ice cold. A lonely ring from the shop bell announced the arrival of another shopper.

Did {Sandra/ the assistant/ David/ the customer} feel the shop was ice cold?

ON BOARD AN AEROPLANE

{Helen/ A stewardess} pushed a trolley down the aeroplane aisle. {A passenger/ Bernard} took his meal from her. The cabin was quite chilly. Through the window the wing tip light gave a red glow.

Did the cabin seem chilly to {Helen/ the passenger/ Bernard/ the stewardess}?

THE LAWYER'S OFFICE
{Gavin/ A client} waited patiently to be called for his appointment. {A secretary/ Lorraine} sat at her desk shuffling a pile of papers. The office was boiling hot. In the neighbouring room someone was getting angry.

Did {Gavin/ the secretary/ Gavin/ the client} find the office boiling hot?

THE KITCHEN PLUMBING
{William/ The plumber} turned off the water supply to the sink. {The woman/ Heather} watched from the far side of her kitchen. There was a revolting smell. Everything was still damp from the leak.

Did {William/ the woman/ Heather/ the plumber} find the smell revolting?

THE DENTIST'S WAITING ROOM
{Patrick A patient} sat reading his newspaper. {A receptionist/ Linda} took out some files from her desk. The atmosphere was unpleasantly hot and stale. With a flourish the dentist entered to request the next patient.

Did the atmosphere seem unpleasantly hot and stale to {Patrick/ the receptionist/ Linda/ the patient}?

AN M.O.T.

{Paul/ The mechanic} opened up the bonnet. {Carol/ The owner} stood absent-mindedly to one side of her car. The garage was thick with fumes. A radio was blaring music in the corner.

Did {Paul/ the owner/ Carol/ the mechanic} find that the garage was thick with fumes?

A POLICE INTERVIEW

{Diane/ A witness} described the shooting as best she could remember. {A policeman/ Dominic} took shorthand notes and asked an occasional question. The interview room was small and overheated. From the car park outside came the noises of a struggle.

Did the room seem small and overheated to {Diane/ the policeman/ Dominic/ the witness}?

A NEWSPAPER STAND

{John/ A newspaper vendor} called out for custom in his hoarse voice. {A customer/ Melanie} approached and bought a paper. The morning was bitterly cold. The street was filling up with people going to work.

Did {John/ the customer/ Melanie/ the vendor} find the night bitterly cold?

NEGOTIATIONS

{Sebastian/ The chairman} sat amongst the other directors. {The shop steward/ Jean} sat beside her two union colleagues. The mood was friendly. A secretary came in with tea and sandwiches.

Did {Sebastian/ the shop steward/ Jean/ the chairman} feel the mood was friendly?

OUTSIDE THE NIGHTCLUB

{Phil/ The doorman} continued to refuse entry to the gang of young men. {A girl/ Alison} threaded her way past them. The mood was aggressive. From inside the club came the beat of the music.

Did {Phil/ the girl/ Alison/ the doorman} find the mood aggressive?

A DISCUSSION
{Robert/ A man} said he believed in an afterlife. {A woman/ Janet} shook her head vigorously. The debate was interesting. Suddenly everyone was talking at once.

Did the debate seem interesting to {Robert/ the woman/ Janet/ the man}?

AT THE RACES
{Sarah/ A woman} stretched to see the horses approach the finish. {A man/ Mark} stood next door peering through his binoculars. The mood was exciting. A cheer greeted the winner.

Did {Sarah/ the man/ Mark/ the woman} find the mood exciting?

A BOMB SCARE
{Emily/ A girl} shoved at the unyielding fire-door. {A man/ George} gave it a hard kick. The situation was frightening. At last the door gave way.

Did {Emily/ the man/ Geroge/ the girl} find the situation frightening?

A BAD PARTY
{Jennifer/ A girl} brought out a bottle of wine. {A man/ Matthew} offered her a cork screw. The party was boring. Some people had begun to watch TV.

Did the party seem boring to {Jennifer/ the man/ Matthew/ the girl}?

A LECTURE
{Michelle/ A student} took out her pen and note pad. {The lecturer/ Nicholas} stood by the blackboard with his notes. The lecture theatre was airless and oppressive. It was time the lecture started.

Did {Michelle/ the lecturer/ Nicholas/ the student} find the lecture theatre airless and oppressive?

IN THE AIRPORT
{Ellen/ A passenger} placed her case in the X-ray machine. {The security guard/ Derek} sat examining his monitor. The atmosphere was stifling. To one side three policemen were sharing a joke.

Did {Ellen/ the security guard/ Derek/ the passenger} find the atmosphere stifling?

AT THE RESTAURANT
{Richard/ A customer} took a seat and picked up the menu. {A waitress/ Caroline} approached and took his order. The atmosphere was very hot and sticky. At the neighbouring table a child was eating a mountain of chips.

Did {Richard/ the waitress/ Caroline/ the customer} find the atmosphere hot and sticky?

THE STATION WAITING ROOM
{Margerie/ A woman} sat beside a display board. {A man/ Stuart} waited quietly at the back. The room was cool and unfriendly. The train was due in another two minutes.

Did the room seem cool and unfriendly to {Margerie/ the man/ Stuart/ a woman}?

HILL WALKING

{Jack/ The guide} opened out his map to check their route. {A woman/ Charlotte} took the opportunity to re-tie her laces. The air was beautifully fresh and clear. On the horizon the sun had still barely risen.

Did {Jack/ the woman/ Charlotte/ the guide} find the air fresh and clear?

THE PUB
{Jonathon/ A customer} approached the bar and ordered two pints of beer. {The barmaid/ Samantha} filled a couple of glasses. The pub was unpleasantly smoky. A bark signalled the arrival of an aggressive looking man with a large dog.

Did {Jonathon/ the barmaid/ Samantha/ a customer} find the pub unpleasantly smoky?

IN THE LIBRARY
{Patricia/ A librarian} stood behind the issue desk sorting returned books. {A man/ Keith} approached and handed her his three books. The library was uncomfortably chilly. It was just a few minutes till closing time.

Did the library seem uncomfortably chilly to {Patricia/ the man/ Keith/ the librarian}?

ON A BUS
{Vincent/ The driver} collected fares as the passengers boarded. {A passenger/ Kirsty} gave him her fare. The bus was icy cold. A drunk man came on board cursing loudly.

Did the bus seem icy cold to {Vincent/ the passenger/ Kirsty/ the driver}?

AT THE BANK

{Rosemary/ A customer} completed a form closing her account. {A clerk/ Adrian} tapped in her details at his keyboard. The bank was uncomfortably stuffy. At the neighbouring window an angry customer was becoming abusive.

Did {Rosemary/ the clerk/ Adrian/ the customer} find the bank uncomfortably stuffy?

THE SWIMMING LESSON

{Jacqueline/ An instructor} completed a length of the pool on her back. At the edge {a pupil/ Steve} prepared himself to follow. The water was freezing cold. A lifeguard looked on dreamily from the poolside.

Did {Jacqueline/ the pupil/ Steve/ the instructor} find the water freezing cold?

Appendix C: Off-Line 4

AT THE RESTAURANT
{Richard/ A customer} took a seat and picked up the menu. The atmosphere was very hot and sticky. {A waitress/ Carloine} approached and took his order. At the neighbouring table a child was eating a mountain of chips.

Did {Richard/ the customer/ Caroline/ the waitress} find the atmosphere hot and sticky?

THE STATION WAITING ROOM
{Margerie/ A woman} sat beside a display board. The room was cool and unfriendly. {A man/ Angus} waited quietly at the back. The train was due in another two minutes.

Did the room seem cool and unfriendly to {Margerie/ the woman/ Angus/ the man}?

HILL WALKING
{Malcolm/ A guide} opened out his map to check their route. The air was beautifully fresh and clear. {A woman/ Gillian} took the opportunity to re-tie her laces. On the horizon, the sun had still barely risen.

Did {Malcolm/ A guide/ Gillian/ A woman} find the air fresh and clear?

THE PUB
{Jonathon/ A man} approached the bar and ordered two pints of beer. The pub was unpleasantly smoky. {The barmaid/ Samantha} filled a couple of glasses. A bark signalled the arrival of an aggressive looking man with a large dog.

Did {Jonathon/ the man/ Samantha/ The barmaid} find the pub unpleasantly smoky?

IN THE LIBRARY
{Patricia/ A librarian} stood behind the issue desk sorting returned books. The library was uncomfortably chilly. {A man/ Brian} approached and handed her his three books. She neatly stamped each book and handed them back.

Did the library seem uncomfortably chilly to {Patricia/ the librarian/ Brian/ the man}?

ON A BUS
{Vincent/ The driver} collected fares as the passengers boarded. The bus was icy cold. {A girl/ Kirsty} gave him her fare. A drunk man came on board cursing loudly.

Did the bus seem icy cold to {Vincent/ the driver/ Kirsty/ the girl}?

AT THE BANK
{Rosemary/ A customer} completed a form closing her account. The bank was uncomfortably stuffy. {A clerk/ Adrian} tapped in her details at his keyboard. Meanwhile, at the neighbouring window an angry customer was beginning to get abusive.

Did {Rosemary/ the customer/ Adrian/ the clerk} find the bus uncomfortably stuffy?

THE SWIMMING LESSON
{Jacqueline/ An instructor} completed a length of the pool on her back. The water was freezing cold. At the edge, {a pupil/ Stephen} prepared himself to follow. A lifeguard looked on dreamily from the poolside.

Did {Jacqueline/ the instructor/ Stephen/ the pupil} find the water freezing cold?

THE HOSPITAL WARD
{George s/ A patient} sat up in his bed reading. The ward had a nasty reek of disinfectant. {A nurse/ Rebecca} walked through on her rounds. George bade her a cheerful good-morning.

Did {George/ the patient/ Rebecca/ the nurse} feel the ward had a nasty reek of disinfectant?

THE DOCTOR'S SURGERY
{Jenny/ A woman} sat and explained her symptoms. The consulting room was warm and terribly stuffy. {The doctor/ Donald} put down his stethoscope. The appearance of a nurse disrupted the consultation.

Did the room seem warm and stuffy to {Jenny/ the woman/ Donald/ the doctor}?

IN THE HOTEL LOBBY

{Christina/ A receptionist} sat behind an impressive mahogany counter. The lobby was uncomfortably hot and clammy. {A man/ Peter} asked what time dinner would be served. She told him he would need to wait another two hours.

Did {Christina/ a receptionist/ Peter/ A man} find the lobby uncomfortably hot and clammy?

DIRECTIONS
{Thomas/ A farmer} stood by the gate to his field. There was an awful stink of manure. {A woman/ Shirley} asked him to point out the way back to the village. He explained she would need to go back to the bridge over the canal.

Did {Thomas/ the farmer/ Shirley/ the woman} notice the awful stink of manure?

IN THE GALLERY
{Mary/ A woman} made her way around the exhibition. The gallery was gloomy and chill. In the centre {a man/ John} sat studying a huge English landscape. The only other visitor was a bespectacled old man.

Did the gallery seem gloomy and chill to {Mary/ the woman/ John/ the man}?

THE LESSON
{Richard/ A student} read out an extract from his copy of 'Madame Bovary'. The classroom was absolutely freezing. {The teacher/ Juliette} followed the text with her finger. The passage described Madame Bovary's boredom with provincial life.

Did the classroom seem to be freezing to {Richard/ the student/ Juliette/ The teacher}?

AT THE CLINIC
{Natalie/ A woman} sat waiting and flicked through a magazine. The waiting area was warm and friendly. {A man/ Brian} stood close to the door. Just then a young secretary entered and asked for a Mrs Doherty.

Did {Natalie/ the woman/ Brian/ the man} find the waiting area warm and friendly?

THE USED-CAR GARAGE
{Raymond/ A salesman} started the car engine. The engine smelt a little odd. {A customer/ Elizabeth} stood with her hand on the door. Several similar models faced them across the forecourt.

Did {Raymond/ A salesman/ Elizabeth/ A customer} notice the engine's odd smell?

THE GREENGROCERS
{Sharon/ A customer} searched in her bag for her purse. The shop was ice cold. {The assistant/ David} stood at his till. A lonely ring from the shop bell announced the arrival of another shopper.

Did {Sharon/ A customer/ David/ the assistant} feel the shop was ice cold?

ON BOARD AN AEROPLANE
{Jeanette/ A stewardess} pushed a trolley down the aeroplane aisle. The cabin was quite chilly. {A passenger/ Bernard} took his meal from her. Through the window the wing tip light gave a red glow.

Did the cabin seem chilly to {Jeanette/ the stewardess/ Bernard/ the passenger}?

THE LAWYER'S OFFICE
{Frank/ A man} waited patiently to be called for his appointment. The office was boiling hot. {An assistant/ Lorraine} sat at her desk, shuffling a pile of papers. In the neighbouring room someone was getting angry.

Did {Frank/ the man/ Lorraine/ the assistant} find the office boiling hot?

THE KITCHEN PLUMBING
{Douglas/ The plumber} turned off the water supply to the sink. There was a revolting smell. {The woman/ Margaret} watched from the far side of the kitchen. Everything was still damp from the leak.

Did {Douglas/ the plumber/ Margaret/ the woman} find the smell revolting?

THE DENTIST'S WAITING ROOM
{Patrick/ A patient} sat reading his newspaper. The atmosphere was unpleasantly hot and stale. {A receptionist/ Bernadette} took out

some files from her desk. With a flourish the dentist entered to request the next patient.

Did the atmosphere seem unpleasantly hot and stale to {Patrick/ the patient/ Bernadette/ the receptionist}?

AN M.O.T.
{Michael/ The mechanic} opened up the bonnet. The garage was thick with fumes. {The car's owner/ Miriam} stood absent-mindedly to one side of her car. radio was blaring music in the corner.

Did {Michael the mechanic/ Miriam/ the owner} find that the garage was thick with fumes?

A POLICE INTERVIEW
{Catherine/ A witness} described the shooting as best she could remember. The interview room was small and overheated. {A policeman/ Dominic} took shorthand notes and asked an occasional question. From the car park outside came the noises of a struggle.

Did the room seem small and overheated to {Catherine/ a witness/ Dominic/ the policeman}?

A NEWSPAPER STAND
{Christopher/ A newspaper seller} called out for custom in his hoarse voice. The night was bitterly cold. {A woman/ Melanie} approached and bought a paper. She thanked him and set off on her way.

Did {Christopher/ the newspaper seller/ Melanie/ the woman} find the night bitterly cold?

NEGOTIATIONS
{Sebastian/ The chairman} sat amongst the other directors. The mood was friendly. {The shop steward/ Jean} sat beside her two union colleagues. A secretary came in with tea and sandwiches.

Did {Sebastian/ the chairman/ Jean/ the shop steward} feel the mood was friendly?

OUTSIDE THE NIGHTCLUB
{Peter/ The Doorman} continued to refuse entry to the gang of young men. The mood was aggressive. {A woman/ Alison} threaded her way past them. From inside the club came the beat of the music.

Did {Peter/ the doorman/ Alison/ the woman} find the mood aggressive?

A DISCUSSION
{Robert/ A man} said he believed in an afterlife. The debate was interesting. {A woman/ Janet} shook her head vigorously. Suddenly everyone was talking at once.

Did the debate seem interesting to {Robert/ the man/ Janet/ the woman}?

AT THE RACES
{Sarah/ A woman} stretched to see the horses approach the finish. The mood was exciting. {A man/ James} stood next door peering through his binoculars. A cheer greeted the winner.

Did {Sarah/ the woman/ James/ the man} find the mood exciting?

A BOMB SCARE
{Emily/ A girl} shoved at the unyielding fire-door. The situation was frightening. {A young man/ George} gave it a hard kick. At last the door gave way.

Did {Emily/ the girl/ George/ the young man} find the situation frightening?

A BAD PARTY

{Jennifer/ A girl} brought out a bottle of wine. The party was boring. {A man/ Matthew} offered her a cork screw. Some people had begun to watch TV.

Did the party seem boring to {Jennifer/ the girl/ Matthew/ the man}?

A LECTURE

{Michelle/ A student} took out her pen and note pad. The lecture theatre was airless and oppressive. {The lecturer/ Nicholas} stood by the blackboard with his notes. It was time the lecture started.

Did {Michelle/ the student/ Nicholas/ the lecturer} find the lecture theatre airless and oppressive?

IN THE AIRPORT

{Alison/ A passenger} placed her case in the X-ray machine. The atmosphere was stifling. {The baggage inspector/ Derek} sat examining his monitor. To one side, three policemen were sharing a joke.

Did {Alison/ the passenger/ Derek/ The baggage inspector} find the atmosphere stifling?

Appendix D: ET 3 and SPR 1 (including questions)

A MATINEE PERFORMANCE

{An usher/ Paul} settled himself in a seat by the stairs. {Patricia/ A woman} sat in the row behind. The show was {tedious/ very funny}. She yawned noisily several times. The performance was well attended.

Does the usher stand?

AN OPERATION

{The Surgeon/ Alexander} bent over his operating table looking for the lost scalpel. {Jane/ The nurse} searched the pockets in her uniform. The situation was {humorous/ very tense}. She giggled infectiously as she searched. The operating theatre lights illuminated everything.

LAUNCHING A LIFEBOAT

{The mayor/ Martin} made a speech mentioning the old lifeboat's many rescues. {Pamella/ A woman} listened attentively. The mood was very {sad/ happy}. She wept silently as she stared up at the sky. The new boat looked impressive on the slipway.

Was the old lifeboat busy?

THE OPENING NIGHT

{A journalist/ Jonathon} made notes for his newspaper review. {Rachel/ A woman} sat in a neighbouring seat. The play was {appalling/ entertaining}. She booed loudly at the stage. The theatre was packed out.

A CLOTHES SHOP

{The shopkeeper} Philip stood behind his till. {Louise/ A customer} took her credit card from her purse. The shop was {freezing cold/

boiling hot}. She shivered slightly under her jacket. The shop bell rang as more people entered.

Does the customer pay with a credit card?

THE LATE FILM
{A man/ Trevor} munched on a carton of popcorn. {Christina/ A woman} sat in the neighbouring seat. The movie was very {scary/ funny}. She screamed loudly as she watched. The cinema was packed out.

Is the cinema full?

A DINNER PARTY
{The host/ John} sat at the head of the table. {Heidi/ A woman} took a mouthful from her fork. The food tasted {disgusting/ delicious}. She retched violently into a napkin. The other guests showed concern.

THE COMEDY CLUB
{The manageress/ Julia} watched from the bar. {Shaun/ A man} sat in the balcony. The performance was {abysmal/ superb}. He jeered aggressively at the stage. It was the final act of the evening.

Does the club have a balcony?

THE BANK
{The teller/ Alastair} called the next customer to his window. {Margaret/ A woman} stood at the head of the queue. The atmosphere was {airless and oppressive/ airy and refreshing}. She fainted suddenly against a marble pillar. Another customer came to her aid.

Does the bank have wooden pillars?

AN ADVENTURE

{A girl/ Pippa} opened the heavy gates of the old castle. {Tom/ A boy} was carrying the picnic provisions. The castle looked truly {terrifying/ inviting}. He fled swiftly away down the drive. A little snow was falling.

A PUB BAND

{The barmaid/ Liz} was washing glasses during the performance. {Robert/ A man} sat at the bar. The music was {brilliant/ dreadful}. He cheered enthusiastically as the set ended. The pub always had a band on Wednesdays.

Does the pub regularly have a band on Wednesday?

THE COMPANY BOARD MEETING

{The chairman/ Gordon} announced that the strike was at an end. {Suzanna/ A board member} poured herself a glass of mineral water. The mood was {joyful/ very sombre}. She smiled broadly at the other directors. The strike had gone on for eight weeks.

Has the strike now ended?

THE FILM CLUB

{The projectionist/ David} operated his projector at the back of the hall. {Claire/ A woman} sat towards the front. The film was {very amusing/ tedious}. She laughed loudly throughout. The film had been made in the thirties.

Is it a recent film being shown?

A CAT IN A TREE

{A fireman/ Tim} reached out for the cat from the top of his ladder. {Joanne/ A girl} watched from the ground. The situation was {comic/ scary}. She chuckled loudly to herself. Quite a crowd had gathered.

THE LIBRARY
{The librarian/ Charles} used his date stamp to mark all the outgoing books. {Carol/ A woman} handed over her three volumes. The library was very {hot and sticky/ cold and damp}. She perspired heavily beneath her t-shirt. The books were due back that day.

Were Carol's books due back the previous week?

THE DEBATE
{The chairman/ Patrick} checked his notes during the first speech. {Sophie/ A woman} stood at the back of the hall. The speech was {entertaining/ appalling}. She clapped enthusiastically at several points. There was an excellent turnout for the event.

A HIKE THROUGH THE WOODS
{The guide/ Bill} looked at his map in a puzzled way. {Alison/ A girl} sat down on a tree stump. The situation was becoming {comic/ serious}. She grinned broadly for a while. Hopefully the rain would keep off.

Are the hikers lost?

A RIVER BOAT
{The captain/ George} started bailing out the cabin with a bucket. {Janet/ A passenger} pulled up her sleeves and helped. The situation was {frightening/ humorous}. She trembled uncontrollably as she worked. A light wind rippled the water.

Is the boat on the sea?

A TUTORIAL
{The tutor/ Jean} was talking about her own experience of writing essays. {Andrew/ A student} wrote some notes in his pad. The classroom was {boiling hot/ freezing cold}. He sweated profusely

beneath his shirt. A latecomer took a seat in the corner.

A POLITICAL CONFERENCE

{A delegate/ Alan} took his seat for the opening speeches. {Alice/ A woman} sat further along the row. The first speech was really {dreadful/ impressive}. She heckled noisily as the speech went on. The conference was usually a dull affair.

Appendix E: Fillers for On-Line Experiments

LEAVING HARBOUR
Jeannie watched the fishing boat disappear through the harbour mouth. Rain was sweeping almost horizontally across the pier. Her husband was still just visible, working at the fishing tackle.
She cried a little to herself. These mid-winter journeys were too dangerous.

COMPLAINTS
The manageress went over to the table. The posh young man moaned to her that his steak was not properly cooked. Everyone in the restaurant was now listening. She told him if he didn't like it he could get out. Some people really got on her nerves.

REHEARSALS
The actor sat at the side of the stage and glowered. The director asked how she had offended him. He screamed that his talent was being wasted. She put her head in her hands. That man's ego was too much.

SOLITUDE
Jane sat herself down by the river. The water took its slow, constant path. She couldn't believe he had left her. A tear welled down her cheek. She hoped the bastard might drown.

LAST ORDERS
A small woman struggled to keep her place at the bar. The bar-tender was rushed off his feet. A large man tried to push in from behind. She discretely elbowed him in the ribs. That did the trick perfectly.

THE HAIRDRESSERS
A middle-aged woman paid at the till. The hair dresser took the

money and wished her good day. The hair cut was a disaster. Outside, she found a scarf in her bag and covered her head. It looked like the next stop would be at the hat shop.

FINES

A student handed his books to the librarian. She noticed that they were all overdue. The student reached into his pocket for his purse. He tried to look repentant. The chances of avoiding the fine seemed remote.

HOUSE BUYING

The man had a good look around the house. The estate agent followed, chattering about the house's qualities. On the living room wall was a large brown patch. The man gave it a poke and felt the damp. No wonder the place had been on the market so long.

A FOOTBALL GAME

The referee showed a red card to the defender. The young player told him where he could stick it. The referee ordered him to go straight to the dressing room. He was appalled at being shown such disrespect. No one seemed interested in fair play anymore.

THE ORCHESTRA

The violin player stared at the floor and yawned. Spotting him, he conductor hurled abuse. The musician paid little attention. He was used to these emotional outbursts. He wondered if the conductor was getting a hard time from his wife.

A TOUR OF DUTY

The soldier backed into an alley. The crowd came in pursuit, throwing stones. The noise was overwhelming. He levelled his gun and fired. The warm smell of gun smoke was strangely reassuring.

FISHING
The boy cast his line into the river. The faint buzz of a bee came from the flowers behind. It was a glorious day. He lay back and shut his eyes. Sometimes he wished he could just float downstream.

COMPUTERS
The student approached the computer with trepidation. The tutor had promised that the first session would be easy. He entered his name and password. There was a bit of a funny smell. Suddenly flames leapt from the back of the machine.
Did the student feel trepidation on approaching the computer?

ADULTERY
Sarah couldn't believe he had treated her like this. But the evidence was complete. Now his belongings were all piled in the garden. She poured on the petrol. She hoped to burn away his memory.
Was Sarah left with any doubt about her husband's behaviour?

THE WEDDING
The bridegroom waited as the guests assembled. His mother smiled at him from across the hall. He took his new wife to lead the first dance. He was so truly happy. He didn't understand how he'd deserved this.

DEPRESSION
Johnny sat and thought. He wanted to think of one thing that he was good at. He was feeling really low just now. Everything he did seemed to fail. No, there was nothing, he was good for nothing.

A DIFFICULT TASK

The doctor looked hard at the woman. She had completed the examination and was in no doubt. How could she tell her that she was seriously ill? She looked so young and vulnerable. The doctor cleared her throat.

THE OPTICIANS

The boy attempted to read the letters from the chart. The optician made some encouraging noises. It was pleasantly quiet in the examination room. The boy was almost afraid of dropping off. Still, he managed to read the very smallest row.

THE CLASSROOM

The teacher walked amongst the class. Everyone was working hard on their story. The teacher stopped and read over one girls work. He smiled to himself. Once in a while his job was really satisfying.

SUMMER TIME

Anne hummed to herself. She always felt better when the sun shone. Last summer seemed like yesterday. But then so much had changed in the meanwhile. It was funny the way things went.

Appendix F: ET 1

A MATINEE PERFORMANCE

{An usher/ Paul} settled himself in a seat by the stairs. {Patricia/ A woman} sat in the row behind. She found the show {tedious/ very funny}. She yawned noisily several times. The performance was well attended.

AN OPERATION

{The Surgeon/ Alexander} bent over his operating table looking for the lost scalpel. {Jane/ The nurse} searched the pockets in her uniform. She saw that the situation was {humorous/ very tense}. She giggled infectiously as she searched. The operating theatre lights illuminated everything.

LAUNCHING A LIFEBOAT

{The mayor/ Martin} made a speech mentioning the old lifeboat's many rescues. {Pamella/ A woman} listened attentively. She felt the mood was very {sad/ happy}. She wept silently as she stared up at the sky. The new boat looked impressive on the slipway.

THE OPENING NIGHT

{A journalist/ Jonathon} made notes for his newspaper review. {Rachel/ A woman} sat in a neighbouring seat. She thought the play was {appalling/ entertaining}. She booed loudly at the stage. The theatre was packed out.

A CLOTHES SHOP

{The shopkeeper} Philip stood behind his till. {Louise/ A customer} took her credit card from her purse. She found the shop {freezing

cold/ boiling hot}. She shivered slightly under her jacket. The shop bell rang as more people entered.

THE LATE FILM

{A man/ Trevor} munched on a carton of popcorn. {Christina/ A woman} sat in the neighbouring seat. She found the movie very {scary/ funny}. She screamed loudly as she watched. The cinema was packed out.

A DINNER PARTY

{The host/ John} sat at the head of the table. {Heidi/ A woman} took a mouthful from her fork. She thought the food tasted {disgusting/ delicious}. She retched violently into a napkin. The other guests showed concern.

THE COMEDY CLUB

{The manageress/ Julia} watched from the bar. {Shaun/ A man} sat in the balcony. He thought the performance was {abysmal/ superb}. He jeered aggressively at the stage. It was the final act of the evening.

THE BANK

{The teller/ Alastair} called the next customer to his window. {Margaret/ A woman} stood at the head of the queue. She found the atmosphere {airless and oppressive/ airy and refreshing}. She fainted suddenly against a marble pillar. Another customer came to her aid.

AN ADVENTURE

{A girl/ Pippa} opened the heavy gates of the old castle. {Tom/ A boy} was carrying the picnic provisions. He thought that the castle

looked truly {terrifying/ inviting}. He fled swiftly away down the drive. A little snow was falling.

A PUB BAND

{The barmaid/ Liz} was washing glasses during the performance. {Robert/ A man} sat at the bar. He reckoned the music was {brilliant/ dreadful}. He cheered enthusiastically as the set ended. The pub always had a band on Wednesdays.

THE COMPANY BOARD MEETING

{The chairman/ Gordon} announced that the strike was at an end. {Suzanna/ A board member} poured herself a glass of mineral water. She felt the mood was {joyful/ very sombre}. She smiled broadly at the other directors. The strike had gone on for eight weeks.

THE FILM CLUB

{The projectionist/ David} operated his projector at the back of the hall. {Claire/ A woman} sat towards the front. She found the film {very amusing/ tedious}. She laughed loudly throughout. The film had been made in the thirties.

A CAT IN A TREE

{A fireman/ Tim} reached out for the cat from the top of his ladder. {Joanne/ A girl} watched from the ground. She thought the situation was {comic/ scary}. She chuckled loudly to herself. Quite a crowd had gathered.

THE LIBRARY

{The librarian/ Charles} used his date stamp to mark all the outgoing books. {Carol/ A woman} handed over her three volumes. She noticed that the library was very {hot and sticky/ cold and damp}. She perspired heavily beneath her t-shirt. The books were due back that day.

THE DEBATE

{The chairman/ Patrick} checked his notes during the first speech. {Sophie/ A woman} stood at the back of the hall. She thought the speech was {entertaining/ appalling}. She clapped enthusiastically at several points. There was an excellent turnout for the event.

A HIKE THROUGH THE WOODS

{The guide/ Bill} looked at his map in a puzzled way. {Alison/ A girl} sat down on a tree stump. She felt that the situation was becoming {comic/ serious}. She grinned broadly for a while. Hopefully the rain would keep off.

A RIVER BOAT

{The captain/ George} started bailing out the cabin with a bucket. {Janet/ A passenger} pulled up her sleeves and helped. She found the situation {frightening/ humorous}. She trembled uncontrollably as she worked. A light wind rippled the water.

A TUTORIAL

{The tutor/ Jean} was talking about her own experience of writing essays. {Andrew/ A student} wrote some notes in his pad. He thought that the classroom was {boiling hot/ freezing cold}. He sweated profusely beneath his shirt. A latecomer took a seat in the corner.

{A delegate/ Alan} took his seat for the opening speeches. {Alice/ A woman} sat further along the row. She considered that the first speech was really {dreadful/ impressive}. She heckled noisily as the speech went on. The conference was usually a dull affair.

Appendix G: ET 2 (including questions)

AT THE RESTAURANT
{A customer/ Richard} took a seat and picked up the menu. {Caroline/ A waitress} approached and took his order. {The atmosphere was very hot and sticky/ The restaurant smelled of fresh garlic}. She mopped her brow. At the next door table a child was throwing food on the floor.

Did the customer remain standing?

THE STATION WAITING ROOM
{A woman/ Margerie} sat beside a display board. {Angus/ A man} leant across and asked her the time. {The room was cool and unfriendly/ The board was covered in timetables}. He shivered beneath his jacket. She told him that the train was already five minutes late.

HILL WALKING
{A guide/ Malcolm} opened out his map to check their route. {Gillian/ A woman} took the opportunity to re-tie her laces. {The air was beautifully fresh and clear/ Despite recent rain the ground was hard}. She breathed deeply. On the horizon, the sun had still barely risen.

Did Gillian re-tie her laces?

THE PUB
{A man/ Jonathon} approached the bar and ordered two pints of beer. {Samantha/ The barmaid} filled a couple of glasses. {The pub was unpleasantly smoky/ The pub was still quite empty}. She wiped her eyes with a tissue. A bark signalled the arrival of an aggressive looking man with a large dog.

IN THE LIBRARY

{A librarian/ Patricia} stood behind the issue desk with her hands in her pockets. {David/ A man} approached and handed her his three large books. {The library was uncomfortably chilly/ The library was busier than normal}. He wrapped himself up in his cardigan. She neatly stamped each book and handed them back.

Did David have five books?

ON A BUS

{The driver/ Vincent} collected fares as the passengers boarded. {Kirsty/ A girl} gave him her fare. {The bus was icy cold/ The bus was a bit early}. She blew onto her hands. A drunk man came on board cursing loudly.

AT THE BANK

{A customer/ Rosemary} completed a form closing her account. {Adrian/ A clerk} tapped in her details at his keyboard. {The bank was uncomfortably stuffy/ The bank had just been redecorated}. He loosened his collar. Meanwhile, at the neighbouring window an angry customer was beginning to get abusive.

THE SWIMMING LESSON

{A teacher/ Jacqueline} completed a length of the pool on her back. At the side, {Steven/ a pupil} prepared himself to follow. {The water was freezing cold/ The water was quiet and calm}. His teeth chattered violently. Finally he pushed himself off from the side.

Did the teacher swim on her back?

THE HOSPITAL WARD

{A patient/ George} sat up in his bed. {Rebecca/ A nurse} was doing her rounds. {The ward had a nasty reek of disinfectant/ The ward was in real need of redecoration}. She wrinkled her nose. The patient bade her a cheerful good-morning.

Did the patient sit up in bed?

THE DOCTOR'S SURGERY
{A woman/ Jenny} sat and explained her symptoms. {David/ The doctor} picked up his stethoscope. {The consulting room was warm and terribly stuffy/ The consulting room was in need of a good clean}. He opened the window. The appearance of a nurse disrupted the consultation.

IN THE HOTEL LOBBY
{A receptionist/ Christina} sat behind the impressive mahogany counter. {Peter/ A man} asked her what time dinner would be served. {The lobby was uncomfortably hot and clammy/ The lobby was a bit dim, with one high window}. He wiped his palms. She told him he would need to wait another two hours.

Did Peter wipe his feet?

DIRECTIONS
{A farmer/ Thomas} stood by the gate to his field. {Shirley/ A woman} asked him to point out the way back to the village. {There was an awful stink of manure/ The sky was dyed red by the sunset}. She held her nose tight. He explained she would need to go back to the bridge over the canal.

IN THE GALLERY
{A woman/ Mary} made her way around the exhibition. In the centre {John/ a man} sat studying a huge English landscape. {The gallery was gloomy and chill/ The gallery was organised well}. He gave a shiver. The only other visitor was a bespectacled old man.

Did John study a Dutch landscape?

THE DENTIST'S WAITING ROOM

{A patient/ Patrick} sat reading his newspaper. {Bernadette/ A receptionist} took out some files from her desk. {The atmosphere was unpleasantly hot and stale/ The rain beat lightly on the window pane}. She wiped her forehead. With a flourish the dentist entered to request the next patient.

OUTSIDE THE SOCIAL WORK OFFICE
{A woman/ Natalie} sat waiting outside the social work office. {Brian/ A man} arrived and took a seat opposite. {The waiting area was warm and friendly/ The waiting area had no other furniture}. He relaxed under his formal clothes. Just then a young secretary entered and asked for a Mrs Doherty.

Does Brian remain standing?

THE USED-CAR GARAGE
{A salesman/ Raymond} started the car engine. {Elizabeth/ A customer} stood with her hand on the door. {The engine smelt a little odd/ The car was twelve months old}. She frowned seriously. Several similar models faced them across the forecourt.

A NEWSPAPER
{A newspaper/ Christopher} seller called out for custom in his hoarse voice. {Melanie/ A woman} approached and bought a paper. {The night was bitterly cold/ The street was already busy}. She buttoned up her coat. She thanked him and set off on her way.

Did Melanie refuse to buy a paper?

ON BOARD AN AEROPLANE
{A stewardess/ Jeanette} pushed a trolley down the aeroplane aisle. {Bernard/ A passenger} took his meal from her. {The cabin was quite chilly/ The cabin was almost empty}. He buttoned up his jacket. Through the window the wing tip light gave a red glow.

THE SOCIAL SECURITY OFFICE
{A man/ Frank} waited patiently to be called for his appointment. Opposite, {Lorraine/ an assistant} sat at her desk, shuffling a pile of papers. {The office was boiling hot/ The office was painted pink}. She fanned her face. In the neighbouring room someone was getting angry.

Did Lorraine fan her face?

THE KITCHEN PLUMBING
{The plumber/ Douglas} turned off the water supply to the sink. {Margaret/ The woman} watched from the far side of the kitchen. {There was a revolting smell/ Tools lay all over the floor}. She covered her nose with a handkerchief. Everything was still damp from the leak.

THE LESSON
{A student/ Richard} read an extract from his copy of 'Madame Bovary'. {Juliette/ The teacher} followed the text with her finger. {The classroom was absolutely freezing/ The classroom was in poor condition}. She put on a scarf. The passage described Madame Bovary's boredom with provincial life.

Did the class study 'Madame Bovary'

THE GARAGE
{A mechanic/ Michael} made a thorough examination under the car bonnet. {Miriam/ Its owner} stood to one side with her hands in her coat pockets. {The garage was thick with fumes/ The garage was a complete mess}. She coughed heavily. The car looked in remarkably good condition.

Did the car look in poor condition?

A POLICE INTERVIEW

{A witness/ Catherine} described the shooting as best she could remember. {Dominic/ A policeman} took shorthand notes and asked an occasional question. {The interview room was small and overheated/ The interview room was small but uncluttered}. He unbuttoned his jacket. From the car park outside came the noises of a struggle.

THE GREENGROCERS

{A customer/ Sharon} searched in her bag for her purse. {David/ The assistant} stood at his till. {The shop had an icy chill/ The shop was rather dirty}. He gave his hands a good rub. A lonely ring from the shop bell announced the arrival of another shopper.

Appendix H: SPR 2 (including questions)

THE GRAND NATIONAL
{A trainer/ Gavin} watched his horse surge in front of the competition. {Sarah/ A woman} watched the race with growing excitement. {All of the horses jumped over the last fence/ None of the horses jumped over the last fence}. {Sarah/ the woman} clapped enthusiastically. The stand was packed with spectators.

Is Sarah excited?

THE HAIRDRESSERS
{A young man/ Philip} swept the hair from the floor. {Allison/ A girl} accepted a cup of tea as she waited her turn. Three women {complained bitterly about their haircuts/ admired aloud their haircuts}. {Allison/ The girl}wondered if there would be trouble. Saturday afternoons were always hectic.

THE FARMYARD
{A girl/ Lucy} sat under a tree watching the farm bustle with activity. {Brian/ A farmer} stood at a stile. When a farm-hand whistled the dogs {rushed towards him/ ignored him}. {Brian/ The farmer} admired their obedience. Suddenly it started to rain.

Does Brian admire the dogs?

AT A CONCERT
{The manager/ Jake} stood in the wings watching the band perform. {Zena/ A girl} listened to the ballad. The lead singer {played several instruments/ could only play one instrument}. {Zena/ The girl} admired his versatility. The music blared across the stadium.

A BUSY ROAD
{A policeman/ Sam} stood directing the traffic. {Emma/ A woman} looked out of her living room window at the busy road. A car {hit a

girl as she ran across the road/ drove past as a girl crossed the road}. {Emma/ The woman} quickly called an ambulance. The traffic jam was getting worse.

Does Emma call the fire brigade?

A SUNDAY SERVICE

{The minister/ Geroge} had just finished speaking. {Fiona/ A woman} sat with a hymn book in her lap. The choir sang {in tune that week/ out of tune that week}. {Fiona/ The woman} enjoyed the singing. People began to file out of the church.

Are people just entering the church?

SHOPPING AT THE SUPERMARKET

{A shop assistant/ Edward} was stacking cereal boxes on the shelf. {Anna/ A woman} had finished her shopping. A baby was {crying in his pram/ sleeping in his pram}. {Anna/ The woman} was irritated by the noise. The store was becoming busy.

SWIMMING

{The pool attendant/ Nadia} watched everyone from the observation seat. {Jeffrey/ A man} stood next to the deep end of the pool. A couple of boys {swam a length in thirty seconds/ took more than three minutes to swim a length}. {Jeffrey/ The man} complimented them on their speed. Some kids yelled in delight as they played in the water.

PARIS IN SPRING

{A woman/ Lisa} stood on the pavement waiting for a taxi. {Pierre/ A man} was selling souvenirs to a small boy. Some tourists asked for directions in {halting French/ fluent French}. {Pierre/ The man} laughed at their attempt to speak French. The Eiffel Tower loomed in the background.

Do the tourists want directions?

THE LAUNDRETTE
{The supervisor/ Nick} emptied the money from the machines. {Pamela/ A woman} entered the laundrette. A young man {began to strip/ put his clothes in the machine}. {Pamela/ The woman} gawked in astonishment. Two old women sat on a bench gossiping.

Are there five old women gossiping?

ON THE BEACH
{A girl/ Stephanie} lay on the beach sunbathing. {Tim/ A deck chair attendant} was collecting fees for the deck chairs. Three surfers {rode the crest of a giant wave to the shore/ fell from the crest of a giant wave}. {Tim/ The deck chair attendant} was impressed by their skill.

The sun beat down on the sand. Is the girl sunbathing?

THE CASINO
{The croupier/ Chris} opened a new pack of cards. {Angela/ A woman} stood watching the players from the side of the table. A man in a blue suit {won for the fifth time in a row/ lost for the fifth time in a row}. {Angela/ The woman} was amazed by his good luck. A cheer went up from the roulette table.

Does the man in the blue suit keep losing?

A MATINEE PERFORMANCE
{An usher/ Paul} showed latecomers to their seats. {Patricia/ The woman} took her place beside the aisle. Some children were {throwing crisps and sweet wrappers/ attentively watching the play}. {Patricia/ The woman} stared at them in annoyance. The performance was well attended.

AN OPERATION

{The surgeon/ Alexander} prepared to make an incision. {Jane/ A nurse} handed him the scalpel. The patient's breathing was {highly irregular/ nice and regular}. {Jane/ The nurse} was becoming very concerned. The operating theatre lights illuminated everything.

THE COMEDY CLUB
{The manageress/ Julia} watched from the bar. {Shaun/ A man} was sitting in the balcony. The comic was {drying up completely/ getting a lot of laughs}. {Shaun/ The man} felt sorry for him. It was the final act of the evening.

Is Shaun in the balcony?

THE PUB GARDEN
{A woman/ Cathy} sat out enjoying her drink in the sun. {Brian/ A boy} cleared empties from the wooden tables. A dog was {waiting patiently for its owner to return from the bar/ wandering around growling and snapping at people}. {Brian/ The boy} praised its good behaviour. There were a fair number of customers for lunch time.

AT THE POND
{A man/ Jeremy} sat on a bench, staring out over the pond. {Claire/ A woman} held her toddler's hand at the water's edge. Some young boys were {picking out litter/ throwing in litter}. {Claire/ The woman} praised their public spirit. The fine weather had brought out a lot of people.

Are the boys picking out litter?

AT THE CIRCUS
{The ringmaster/ Jason} introduced the new juggling act. {Susan/ A woman} watched attentively from the front row. The juggler {never dropped his batons/ kept dropping his batons}. {Susan/ The woman} was impressed by his ability. The audience was small.

Is the circus packed out?

AN AMATEUR FOOTBALL MATCH
{A supporter/ Sally} cheered on from the touch line. {John/ The coach} shouted out instructions to his players. The goalkeeper had{let in five goals/ saved five goals}. {John/ The coach} was appalled by his incompetence. The pitch was reduced to a sea of mud.

Is it a professional game?

A CANAL SIDE WALK
{The guide/ Max} led the group along the tow-path. {Mary/ a woman} examined a colourful flower in the hedgerow. A man {threw his empty can into the bushes/ put his empty can into a waste bin}. {Mary/ The woman} was impressed by his thoughtfulness. Soon they would reach the locks.

Appendix I: SPR 3

THE GRAND NATIONAL
{A trainer/ Gavin} watched his horse surge in front of the competition. {Sarah/ A woman} watched the race with growing excitement. {All of the horses jumped over the last fence/ None of the horses jumped over the last fence}. She clapped enthusiastically. The stand was packed with spectators.

THE HAIRDRESSERS
{A young man/ Philip}swept the hair from the floor. {Allison/ A girl} accepted a cup of tea as she waited her turn. Three women {complained bitterly about their haircuts/ admired aloud their haircuts}. She wondered if there would be trouble. Saturday afternoons were always hectic.

THE FARMYARD
{A girl/ Lucy} sat under a tree watching the farm bustle with activity. {Brian/ A farmer} stood at a stile. The sheepdogs were {skilfully rounding up the sheep/ failing totally in rounding up the sheep}. He admired their performance. Suddenly it started to rain.

AT A CONCERT
{The manager/ Jake} stood in the wings watching the band perform. {Zena/ A girl} listened to the ballad. Each musician played {several instruments/ only one instrument}. She admired their versatility. The music blared across the stadium.

A BUSY ROAD
{A policeman/ Sam} stood directing the traffic. {Emma/ A woman} looked out of her living room window at the busy road. A car {hit two young boys as they ran across the road/ drove past as two young boys crossed the road}. She quickly called an ambulance. The traffic jam was getting worse.

A SUNDAY SERVICE
{The minister/ Geroge} had just finished speaking. {Fiona/ A woman} sat with a hymn book in her lap. The choir sang {in tune that week/ out of tune that week}. She enjoyed the singing. People began to file out of the church.

SHOPPING AT THE SUPERMARKET
{A shop assistant/ Edward} was stacking cereal boxes on the shelf. {Anna/ A woman} had finished her shopping. {A baby was crying in its pram/ sleeping in its pram}. She was irritated by the noise. The store was becoming busy.

SWIMMING
{The pool attendant/ Nadia} watched everyone from her observation seat. {Jeffrey/ A man} stood next to the deep end of the pool. A couple of boys {swam a length in thirty seconds/ took more than three minutes to swim a length}. He complimented them on their speed. Some kids yelled in delight as they played in the water.

PARIS IN SPRING
{A woman/ Lisa} stood on the pavement waiting for a taxi. {Pierre/ A man} was selling souvenirs from a stall. Some tourists asked for directions in {halting French/ fluent French}. He laughed at their attempt to speak the language. The Eiffel Tower loomed in the background.

THE LAUNDRETTE
{The supervisor/ Nick} emptied the money from his machines. {Pamela/ A woman} entered the laundrette. A young man {began to strip/ put his clothes in the machine.} She gawked in astonishment. Two old women sat on a bench gossiping.

ON THE BEACH

{A girl/ Stephanie} lay on the beach sunbathing. {Tim/ A deck chair attendant} was collecting fees. Three surfers {rode the crest of a giant wave to the shore/ fell from the crest of a giant wave}. He was impressed by their skill. The sun beat down on the sand.

THE CASINO
{The croupier/ Chris} opened his new pack of cards. {Angela/ A woman} stood watching the players from the side of the table. A man in a blue suit {won for the fifth time in a row/ lost for the fifth time in a row}. She was amazed by his good luck. A cheer went up from the roulette table.

A MATINEE PERFORMANCE
{An usher/ Paul} showed latecomers to their seats. {Patricia/ The woman} took her place beside the aisle. Some children were {throwing crisps and sweet wrappers/ attentively watching the play}. She stared at them in annoyance. The performance was well attended.

AN OPERATION
{The surgeon/ Alexander} prepared to make an incision. {Jane/ A nurse} handed him the scalpel. The visiting students {all turned pale/ took it all in their stride}. She was becoming very concerned about them. The operating theatre lights illuminated everything.

THE COMEDY CLUB
{The manageress/ Julia} watched from the bar. {Shaun/ A man} was sitting in the balcony. The comic duo was {drying up completely/ getting a lot of laughs}. He felt sorry for them. It was the final act of the evening.

THE PUB GARDEN
{A woman/ Cathy} sat out enjoying her drink in the sun. {Brian/ A boy} cleared empties from the wooden tables. Two dogs were

{waiting patiently for their owner to return from the bar/ growling and snapping at people}. He praised their good behaviour. There were a fair number of customers for lunch time.

AT THE POND

{A man/ Jeremy} sat on a bench staring out over the pond. {Claire/ A woman} held her toddler's hand at the water's edge. Some young boys were {picking out litter/ throwing in litter}. She praised their public spirit. The fine weather had brought out a lot of people.

AT THE CIRCUS

{The ringmaster/ Jason} introduced the new juggling act. {Susan/ A woman} watched attentively from the front row. The jugglers {never dropped their batons/ kept dropping their batons}. She was impressed by their ability. The audience was small.

AN AMATEUR FOOTBALL MATCH

{A supporter/ Sally} cheered her team from the touch line. {John/ The coach} shouted out instructions to his players. The defence had {let in five goals/ blocked five goals}. He was appalled by their incompetence. The pitch was reduced to a sea of mud.

A CANAL SIDE WALK

{The guide/ Max} led the group along the tow-path. {Mary/ A woman} examined a colourful flower in the hedgerow. Some young men {threw their empty cans into the bushes/ put their empty cans into a bin}. She was impressed by their thoughtfulness. Soon the walk would reach the locks.

Appendix J: ET 4 (including questions)

A Matinee Performance
The show was {tedious/ funny}. {Paul/ An usher} sat in a seat beside the aisle. He yawned noisily several times. The performance was well attended.

Does Paul stand?

An Operation
The situation was {humorous/ tense}. {Jane/ A nurse} searched for the lost scalpel. She giggled infectiously as she searched. The operating theatre lights illuminated everything.

Launching A Lifeboat
The mood was very {sad/ happy}. {Martin/ A crewman} listened to the official speeches. He wept silently as he stared out to sea. The new boat looked impressive on the slipway.

Does Martin weep?

The Opening Night
The play was {appalling/ entertaining}. {Jonathon/ A critic} watched from the stalls. He booed loudly at the stage. The theatre was packed out.

A Clothes Shop
The shop was {freezing cold/ boiling hot}. {Louise/ A customer} took her credit card from her purse. She shivered slightly under her jacket. The shop bell rang as more people entered.

Does Louise have a credit card?

The Late Film

The movie was very {scary/ funny}. {Christina/ An usher} watched from her seat in the back row. She screamed loudly as she watched. The cinema was packed out.

Is the cinema almost empty?

A Dinner Party

The food tasted absolutely {disgusting/ delicious}. {John/ The host} sat at the head of the table. He retched violently into a napkin. The other guests showed concern.

Is the food disgusting?

The Comedy Club

The performance was {abysmal/ superb}. {Shaun/ The manager} watched from the bar. He jeered aggressively at the stage. It was the final act of the evening.

The Bank

The atmosphere was {airless and oppressive/ airy and refreshing}. {Margaret/ A customer} took her place in the queue. She fainted suddenly against a marble pillar. Another customer came to her aid.

Does the bank have wooden pillars?

An Adventure

The castle looked truly {terrifying/ inviting}. {Pippa/ A girl} stood outside the heavy gates. She fled swiftly away back down the drive. A little snow was falling.

A Pub Band

The music was {brilliant/ dreadful}. {Liz/ The barmaid} propped herself against the bar. She cheered enthusiastically at the end of the song. The pub always had a band on Wednesdays.

Does the pub regularly have a band on Wednesdays?

The Company Board Meeting
The mood was {joyful/ very sombre}. {Gordon/ The chairman} poured herself a glass of mineral water. He smiled broadly at the other directors. The quarterly results were due that morning.

The Film Club
The film was {very funny/ tedious}. {David/ The projectionist} operated his projector at the back of the hall. She laughed loudly throughout. The film had been made in the thirties.
Is it a recent film?

A Cat in a Tree
The situation was {comic/ scary}. {Tim/ A fireman} reached out for the cat from the top of his ladder. He chuckled loudly to himself. Quite a crowd had gathered.

Is Tim at the bottom of the ladder?

The Library
The library was very {hot and sticky/ cold and damp}. {Charles/ The librarian} used his date stamp to mark all the outgoing books. He perspired heavily beneath his t-shirt. It was the last day before the vacation.

The Debate
The first speech was {entertaining/ appalling.} {Sophie/ The chairwoman} sat and listened. She clapped enthusiastically at several points. There was an excellent turnout for the event.

A Hike through the Woods

The situation was becoming {comic/ serious}. {Bill/ The guide} took out his map. He grinned broadly for a while. Hopefully the rain would keep off.

Does Bill have a map?

A River Boat

The situation was {frightening/ humorous}. {George/ The captain} started bailing out the cabin with a bucket. He trembled uncontrollably as he worked. A light wind rippled the water.

Is the boat on the sea?

A Tutorial

The classroom was {boiling hot/ freezing cold}. {Andrew/ A student} wrote some notes in his pad. He sweated profusely beneath his shirt. A latecomer took a seat in the corner.

Is the classroom hot?

A Political Conference

The first speech was really {dreadful/ impressive}. {Alice/ A delegate} took her seat for the opening speeches. She heckled noisily as the speech went on. The conference was usually a dull affair.

Appendix K: ET 5 and SPR 4

A Matinee Performance

{An usher/ Paul} settled himself in a seat by the stairs. The show was {tedious/ very funny}. {Patricia/ A woman} sat in the row behind. She yawned noisily several times. The performance was well attended.

An Operation

{The surgeon/ Alexander} bent over his operating table looking for the lost scalpel. The situation was {humorous/ very tense}. {Jane/ The nurse} searched the pockets in her uniform. She giggled infectiously as she searched. The operating theatre lights illuminated everything.

Launching A Lifeboat

{The mayor/ Martin} made a speech mentioning the old lifeboats many rescues. The mood was very {sad/ happy}. {Pamella/ A woman} listened attentively. She wept silently as she stared up at the sky. The new boat looked impressive on the slipway.

The Opening Night

{A journalist/ Jonathon } made notes for his newspaper review. The play was {appalling/ entertaining}. {Rachel/ A woman} sat in a neighbouring seat. She booed loudly at the stage. The theatre was packed out.

A Cat in a Tree

{A fireman/ Tim} reached out for the cat from the top of his ladder. The situation was {comic/ scary}. {Joanne/ A girl} watched from the ground. She chuckled loudly to herself. Quite a crowd had gathered.

The Late Film

{A man/ Trevor} munched on a carton of popcorn. The movie was very {scary/ funny}. {Christina/ A woman} sat in the neighbouring

seat. She screamed loudly as she watched. The cinema was packed out.

A Dinner Party

{The host/ John} sat at the head of the table. The food tasted {disgusting/ delicious}. {Heidi/ A woman} put down her knife and fork. She retched violently into a napkin. The other guests showed concern.

The Comedy Club

{The manageress/ Julia} watched from the bar. The performance was {abysmal/ superb}. {Shaun/ A man} sat in the balcony. He jeered aggressively at the stage. It was the final act of the evening.

The Bank

{The teller/ Alastair} called the next customer to his window. The atmosphere was {airless and oppressive/ airy and refreshing}. {Margaret/ A woman} stood at the head of the queue. She fainted suddenly against a marble pillar. Another customer came to her aid.

An Adventure

{A girl/ Pippa} opened the heavy gates of the old castle. It looked truly {terrifying/ inviting}. {Tom/ a boy} was carrying the picnic provisions. He fled swiftly away down the drive. A little snow was falling.

A Pub Band

{The barmaid/ Liz} was washing glasses during the performance. The music was {brilliant/ dreadful}. {Robert/ A man} sat at the bar. He cheered enthusiastically at the end of the song. The pub always had a band on Wednesdays.

The Company Board Meeting

{The chairman/ Gordon} announced that the strike was at an end. The mood was {joyful/ very sombre}. {Suzanna/ A board member} poured herself a glass of mineral water. She smiled broadly at the other directors. The strike had gone on for eight weeks.

The Film Club

{The projectionist/ David} operated his projector at the back of the hall. The film was {very funny/ tedious}. {Claire/ A woman} sat towards the front. She laughed loudly throughout. The film had been made in the thirties.

A Clothes Shop

{The shopkeeper/ Philip} stood behind his till. The shop was {freezing cold/ boiling hot}. {Louise/ A customer} took her credit card from her purse. She shivered slightly under her jacket. The shop bell rang as more people entered.

The Library

{The librarian/ Charles} used his date stamp to mark all the outgoing books. The library was very {hot and sticky/ cold and damp}. {Carol/ A woman} handed over her three volumes. She perspired heavily beneath her t-shirt. The books were due back that day.

The Debate

{The chairman/ Patrick} checked his notes during the first speech. The speech was {entertaining/ appalling}. {Sophie/ A woman} stood at the back of the hall. She clapped enthusiastically at several points. There was an excellent turnout for the event.

A Hike through the Woods

{The guide/ Bill} looked at his map in a puzzled way. The situation was becoming {comic/ serious}. {Alison/ a girl} sat down on a tree stump. She grinned broadly for a while. Hopefully the rain would keep off.

A River Boat

{The captain/ Geroge} started bailing out the cabin with a bucket. The situation was {humorous/ frightening}. {Janet/ A passenger} pulled up her sleeves and helped. She trembled uncontrollably as she worked. A light wind rippled the water.

A Tutorial

{The tutor/ Jean} was talking about her own experience of writing essays. The classroom was {boiling hot/ freezing cold}. {Andrew/ A student} wrote some notes in his pad. He sweated profusely beneath his shirt. A latecomer took a seat in the corner.

A Political Conference

{A delegate/ Alan} took his seat for the opening speeches. The first speech was really {dreadful/ impressive}. {Alice/ A woman} sat further along the row. She heckled noisily as the speech went on. The conference was usually a dull affair.