Integrative Processes in Utterance Resolution

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This study investigates how listeners integrate spoken utterances into a discourse representation. We covary discourse focus (whether the discourse structure foregrounds a particular protagonist), pragmatic inference, and type of anaphoric expression, using a cross-modal naming task where subjects hear a short discourse followed by a sentence fragment. Immediately at the offset of the fragment, a visual probe word is presented. This probe is either an appropriate or inappropriate continuation of the fragment, depending on how the sentence fragment has been interpreted in its discourse context. Naming latencies to the visual probe show that all three factors (pragmatic inference, discourse focus, and type of anaphor) can effectively link utterances to discourses, and that the language comprehension system is highly flexible in its use of different kinds of processing information. We discuss the implications of these findings for Fodor's modularity hypothesis. © 1993 Academic Press, Inc.

The successful interpretation of spoken language requires the integration of each new utterance into the listener's mental representation of the current discourse. What are the factors that influence this process of integration, and how do these factors interact with each other over time? In investigating these issues, we assume that the processing of the speech input is, at all times, conducted with reference to the listener's mental representation of the discourse context in which it occurs (Crain & Steedman, 1985; Johnson-Laird, 1983; Marslen-Wilson & Tyler, 1980, 1987; Sanford & Garrod, 1989). From the first word of an utterance, listeners integrate together constraints derived from the specific discourse context and from their knowledge of the world, with their analysis of the linguistic properties of the utterance itself. The representation which results from the integration of these different sources of information provides a framework with respect to which subsequent words are analyzed.

In considering, therefore, the way in which an utterance is processed, we need to take into account the organization of this prior discourse representation. Some aspects of the discourse representation will be more prominent than others, reflecting the current topic or focus of the discourse (Grosz, 1981; Marslen-Wilson, Levy, & Tyler, 1982; Karmiloff-Smith, 1980, 1985). Given this discourse framework, and these potential variations in prominence, what are the types of information and the types of process that operate on-line to integrate utterance and discourse? These questions involve, on the one hand, specific linguistic devices for establishing and maintaining
these relations and, on the other, modes of integration that depend on more general processes of pragmatic inference.

The specific linguistic devices which we examine in this experiment are certain types of anaphoric expression which serve to maintain referential continuity in a discourse. We choose these referential devices because of their special properties. Anaphors (such as pronouns and definite noun phrases) can be clearly located in the local and global structure of a text, so that one can determine what the listener has to do in order to make a successful link with the appropriate antecedent in the discourse. In addition, certain forms of anaphoric devices—zero anaphors—enable us to examine the role of pragmatic inference in integrating utterances into the existing discourse context. What we mean by "pragmatic inference" here is the process of interpreting an utterance with respect to real world knowledge of how entities and events function in the world. Although this process is generally accepted as being involved in language comprehension, its exact role is open to dispute. The controversy centers around whether pragmatic inference is involved in the immediate, first-pass analysis of an utterance (Tyler & Marslen-Wilson, 1982a, 1982b; Marslen-Wilson & Tyler, 1987), or whether it plays a secondary role, occurring only after the initial linguistic analysis has taken place. This latter view is based on the assumption that pragmatic inference is necessarily complex and unconstrained, and therefore comes into play later than other processes involved in language comprehension (cf., Fodor, 1983; Garnham & Oakhill, 1985).

Our general view of the utterance resolution process is that none of these factors—discourse structure, type of anaphor, pragmatic inference—can be considered in isolation. They all interrelate in the process of integrating each new utterance into the prior discourse. Even when an anaphor is unambiguous, reference assignment may still require a concurrent inferential check on the pragmatic plausibility of the proposed antecedent (Marslen-Wilson et al., 1982). To evaluate the contribution of these different factors to the process of integrating an utterance into its discourse context, we need to consider them as they work together. This is what we try to do in the present study where we covary discourse focus, type of anaphor, and pragmatic inference in order to determine the role of each in the process of integrating utterances into their discourse contexts.

1. Discourse Focus

What is the role of discourse focus in language comprehension? When an entity is focused by the discourse structure, how does this affect subsequent reference to that entity? A number of studies have shown that discourse focus does have consequences for processing of later input, although the exact definition of discourse focus varies across experiments. If, for example, a protagonist is highly focused in the discourse, referential access seems faster than when the referent is not topicalized. Subjects read sentences more rapidly if they contain references to protagonists which are most focused in the prior discourse (e.g., Anderson, Garrod, & Sanford, 1983; Clifton & Ferreira, 1987; Gernsbacher, 1989; Hudson, Tanenhaus, & Dell, 1986). Moreover, it is possible to refer to an antecedent with a less explicit anaphor when that antecedent is topicalized in the discourse (Marslen-Wilson et al., 1982).

In the present experiment, we operationally define discourse focus by keeping a particular entity in subject position throughout the discourse—in effect, making that entity the thematic subject of the current discourse (Karmiloff-Smith, 1980). The first utterance of the discourse mentions two protagonists, with one in subject position. We foreground the subject protagonist: in subsequent utterances by only
mentioning this protagonist and not mentioning the other one. We then pretest (see Method) to ensure that our manipulations have successfully topicalized our chosen antecedent. This then provides the basis for an experimental investigation of how discourse focus functions in the on-line process of utterance resolution, and of how it interacts with other constraints on discourse interpretation.

2. Pragmatic Inference

It is generally agreed that pragmatic inference is an integral part of the comprehension process. What is controversial, however, is when pragmatic inference comes into play during the process of comprehending an utterance. Much of the research on language comprehension appears to show that processes based on inference are complex and time-consuming. In the AI literature, for example, it is generally assumed that inferences are costly in terms of time and resources and are liable to combinatorial explosions unless the inferencing search space is highly constrained (e.g., Sidner, 1979; Charniak, 1972). Similar claims have long been made in the psychological literature. Clark and Haviland (1977), for example, found that bridging inferences increase the difficulty of comprehending a text. Other studies have shown that if inference is required to resolve pronominal reference, reading times are slower (e.g., Caramazza, Grober, Garvey, & Yates, 1977; Garnham & Oakhill, 1985).

Some of our earlier research, however, challenges this view (Tyler & Marslen-Wilson, 1982a). In this study, we constructed short discourses consisting of an initial context sentence (1 below). This context sentence mentioned two protagonists, and was followed, in different conditions, by one of two alternative continuation sentences (2a or 2b). These, in turn, were followed by one of three continuation fragments, as in 3a, 3b, and 3c below:

(1) As Philip was walking back from the shop he
saw an old woman trip and fall flat on her face
in the street.
(2a) He only hesitated for a moment.
(2b) She seemed unable to get up again.
(3a) Philip ran toward . . .
(3b) He ran toward . . .
(3c) Running toward . . .

Each of these three fragments contained an anaphoric device linking them to the preceding discourse. In fragment (3a) the device is the name of some individual previously mentioned. In (3b) it is an unambiguous personal pronoun, while in (3c), an example of a zero anaphor, there are no explicit lexical cues at all. In each case, to interpret the fragment, it is necessary to determine who is the agent of the action denoted by the verb, and to evaluate this with respect to the preceding discourse. In (3a) and (3b) the agent is directly lexically specified ("Philip," "he"), and can be unambiguously related to possible antecedents just on the basis of this lexical information. The situation is different in (3c), where there is no lexically specified anaphor to guide the assignment of reference. Here, we assumed, agency could only be assigned on the basis of differential pragmatic inference. The listener would need to infer who is most likely to be running towards whom, by matching the properties of "Running toward . . ." to the properties of the potential antecedents in the discourse.

The purpose of the intervening sentences (2a, 2b) was to manipulate the structure of the discourse by foregrounding one of the potential antecedents for the anaphor. In (2a), we make Philip, who is the appropriate antecedent of the subsequent anaphors, the focus of the discourse by only mentioning him and not mentioning the old woman. In contrast, (2b) is intended to bring the old lady into the foreground. The main purpose of this was to ensure that any effects we obtained in the zero anaphor condition could not be ascribed simply to discourse focus effects. If Philip is chosen as agent in (3c) when it follows (2b), then this should
not be because he is in focus and the old lady is not.

To measure the timing and the outcome of anaphoric linkage in these three conditions, we used a speeded naming technique, which we will also use in the present study. The subjects heard the context sentences (1 and 2a or 2b), together with one of the three continuation fragments. At the acoustic off-set of the fragment (e.g., at the end of "to-ward") a visual probe word was presented to them, which they had to name as quickly as possible. For the example given above, the probe word would have been either HIM or HER. For each case, HER is a more appropriate continuation than HIM. The critical experimental question was whether the size of the expected preference effect (slower naming of inappropriate probes) would be the same for all three continuations. In fact, we found a significant appropriateness effect for all three conditions, with no significant differences between the three types of anaphor.

This result showed that utterances are immediately integrated with their discourse contexts, since the appropriateness or inappropriateness of the probe word depends on the relationship between the discourse properties of the antecedent and the properties assigned to that antecedent in the continuation sentence. It turned out, however, that we could not rule out the possibility that the effects in the zero anaphor condition were due to discourse focus rather than on-line pragmatic inference. This was because—as we determined in post-tests—the foregrounding manipulation (sentences 2a and 2b) had not been successful in foregrounding the protagonist who was not in subject position in the first sentence. With only one intervening sentence, the first mentioned protagonist still remained readily accessible for anaphoric reference, even when the anaphor was zero. In the example, sentence (2b) is not sufficient to bring the old lady into focus, and the listener still assumes, when the zero anaphor is encountered, that the Philip character is intended as the agent.

The consequence of this is that it remains ambiguous whether pragmatic inference does play a role in on-line discourse integration processes, and how it relates to factors such as discourse focus. In this new experiment we will covary constraints provided by discourse focus with constraints provided by the verb in the continuation fragment. Can pragmatic inference determine reference assignment even in the absence of support from discourse factors? When inference and focus conflict, which has the greater weight?

3. Anaphors

Most research on anaphor resolution has focused on the effectiveness of different kinds of anaphors and on the time-course of anaphoric reference. A number of studies, first, have found that anaphors vary in their effectiveness as referential devices as a function of their explicitness—i.e., the extent to which the properties of the intended antecedent are explicitly coded in the anaphor. A repeated proper name or a definite description, for example, is a more explicit anaphor than a personal pronoun. Various studies have shown that explicit anaphors are more effective in establishing or maintaining reference to the appropriate antecedent (e.g., Gernsbacher, 1989; Dell, McKoon, & Ratcliff, 1983). However, in our earlier experiment (Tyler & Marslen-Wilson, 1982a) we did not find this. When we compared proper names, unambiguous pronouns and zero anaphors, we found that they were all equally effective in accessing the appropriate antecedent in the prior discourse, as measured in the speeded naming task.

This discrepancy may arise partly from the differences in tasks being used, and partly from a tendency to overlook the fact that different types of anaphor are naturally used in different discourse contexts. In language production, it is clear that the lexical
specificity of an anaphor decreases as the constraining context increases (Marslen-Wilson et al., 1982). Speakers use a less specific anaphor when the referent is highly presupposable from the discourse structure. Definite descriptions and proper names are typically used to reintroduce protagonists who are not in focus, whereas pronouns typically refer to focused protagonists. In our earlier study (Tyler & Marslen-Wilson, 1982a), the results suggest that, given the appropriate contexts of use, zero anaphors can be just as successful as more explicit anaphors in accessing the appropriate antecedent. The effects of explicitness cannot be considered in isolation from the constraints provided by the discourse context.

The other main thrust of earlier research on anaphors was the time course of anaphoric reference, asking whether an anaphor is immediately linked to its antecedent. The research on this issue has mostly focused on pronouns, and does not present a coherent picture (Sanford & Garrod, 1989). Some studies suggest that reference assignment on the basis of pronouns is always delayed (e.g., Gernsbacher, 1989; MacDonald & MacWhinney, 1990), whereas other studies indicate that it can be immediate (e.g., Cloitre & Bever, 1988; Leiman, 1982; Nicol, 1988). This lack of consensus is not surprising, given the variation between studies in modality of presentation (spoken vs written), type of task (probe recognition, cross-modal lexical decision, etc.), and type of material (ranging from two-clause sentences to complete discourses).

In the present study, we are primarily concerned with the effect on reference assignment of various types of anaphors. Our study does not specifically address the issue of the immediacy of anaphoric resolution and we do not probe into the resolution process immediately after the anaphor has been heard. Instead, we probe after the verb, one or more words downstream of the anaphor. This is because our primary interest here is in how the listener integrates the different kinds of information that determine the relationship between an utterance and its discourse contexts, and where explicit anaphoric devices are just one of these sources of constraint. In the experiment reported below, we enter anaphor type (pronoun or zero), as an additional covariate, into a design where discourse focus and pragmatic inference are also being covaried. The details of these experimental contrasts are laid out in the next section of the paper.

**Method**

Subjects heard short stories which ended in an incomplete fragment. At the end of each fragment there was a timing pulse (which the subject could not hear) which initiated both a visual probe and a timing device. Subjects had to name the probe as rapidly as possible and their latency to do this was measured by means of a voice operated relay (VOR).

**Materials**

The materials consisted of four different types of short story, with 12 instances of each story type. Each story had the same general structure, consisting of three context sentences followed by a sentence fragment. For all four types of story, the first context sentence set the scene by mentioning two protagonists (which differed in gender) and the general situation. For story types 1, 2 and 3, the second and third context sentences established and maintained one of these protagonists as the discourse topic. For example (references to foregrounded protagonist emphasized):

1. Because Liz was very late for her train, she couldn’t stop to help the crippled soldier sitting by the entrance. She was in a big hurry. She didn’t want to miss her train.

For the fourth type of story both protagonists were referred to in the second and
third context sentences, so that the discourse did not bias towards either one of them. For example:

2. As usual Suzy and Tommy were fighting about who could play in the treehouse first. They were always arguing about it. This time they really got cross.

Following on from the three context sentences there was a continuation fragment. There were three different types of fragment, each of which had the same general structure—an anaphor in subject position followed by a verb phrase. These continuation fragments differed in the type of anaphor and in the type of verb they contained. The subject anaphor was either a personal pronoun referring to one or the other protagonist (the two were always of different gender and could therefore be unambiguously referred to by either he or she), or it was a zero anaphor. The meaning of the verb either implicated, via a process of pragmatic inference, one or the other protagonist as the agent of the action it denoted (types 1 and 3), or else it was neutral with respect to the agent (types 2 and 4). The protagonist implied by the verb could either be in conflict with the protagonist preferred by the discourse bias (as in story type 3), it could be consistent with it (type 1), or the verb could be neutral (types 2 and 4). Across story types, finally, the subject pronouns in the continuation fragments either conflicted or not with the discourse bias and with the verb bias.

Table 1 summarizes the relationship between the three variables (discourse bias, subject anaphor, and type of verb) in the four different story types. The letter A or B in each column indicates the protagonists initially mentioned in first (A) or second (B) position in the first context sentence. Zero refers to the case where both protagonists are equally preferred and there is no bias towards either one of them.

When all sources of constraint converge on the same protagonist as agent of the fragment, the other protagonist is the preferred recipient of the action. Thus, in 1.1, where all three constraints converge on protagonist A, there should be a strong appropriateness effect in favor of protagonist B in object position. Naming latencies to an object pronoun consistent with B should therefore be faster than responses to a pronoun consistent with A. When there is a conflict of bias as in, for example, 1.2, the question is which source of constraint will be most effective in determining the agent and patient of the action. Will naming latencies follow discourse bias or the lexical properties of the anaphor?

Note that we can expect, a priori, some differences in the relative weighting of the two sources of constraint. The discourse focus constraint, in particular, is not designed to be an absolute one. The second protagonist will still be available for anaphoric reference in each story type. The preference for the first mentioned protagonist can, therefore, be no more than a preference. The subject anaphor constraint, in contrast, is potentially more rigid. If the lexical properties of a pronoun do not match those of a potential antecedent, then that antecedent can in principle be excluded. Constraints due to pragmatic inference are likely to be intermediate; more de-
terminate than discourse focus, but less all-or-none than personal pronouns. We will now go through an example of each story type in turn, showing how they instantiate different experimental contrasts.

**Type 1: Discourse Bias with Verb Bias in Same Direction**

After the surgeon had examined the 12-year-old girl with the badly broken leg, he decided he would have to take immediate action. He'd had a lot of experience with serious injuries. He knew what he had to do next.
1. He quickly injected . . .
2. She quickly injected . . .
3. Quickly injecting . . .
 [probes A, B: HER, HIM]

In this example of story type 1, the discourse and verb are consistent with each other and both bias towards the surgeon as the agent of the continuation fragment. The surgeon is mentioned first in the initial context sentence and remains in subject position for the subsequent two context sentences. At the same time, the meaning of the verb *inject* in the continuation fragment is clearly pragmatically consistent with the assignment of the surgeon as agent and the girl as patient, and not vice versa. This interpretation is, in turn, consistent with the lexical properties of the subject anaphor in continuation (1), but not in (2). In continuation (3), where there is no overt subject anaphor, both discourse focus and verb bias point to the same outcome.

Conditions 1.1 and 1.3 here are replications of the (3b) and (3c) conditions in our earlier experiment (Tyler & Marslen-Wilson, 1982a), as described above. Subjects should respond faster here to probe A (HER)—i.e., to the probe in object position which is consistent with the instantiation of protagonist A (the surgeon) in subject position. The conflict, in condition 1.2, between the anaphor and the other two sources of constraint, allows us to begin to evaluate the relative weighting of each information source in the on-line resolution process. Here probe B (HIM) is consistent with the instantiation of protagonist B (the girl) in subject position, as indicated by the gender of the pronoun, but is inconsistent both with discourse focus and with the pragmatic implications of the verb in the context set up by the preceding discourse. Depending on which source of constraint is dominant, responses will be faster to either probe B or probe A.

**Type 2: Discourse Bias with Neutral Verb**

As Bill was buying popcorn at the movies, he saw an old girlfriend get in line for a ticket. He had arrived at the movies especially early. He'd wanted to be sure of getting a good seat.
1. He waved at . . .
2. She waved at . . .
3. Waving at . . .
 [probes A, B: HER, HIM]

Here the verb is neutral with respect to each protagonist as agent of the action in the continuation fragment. It is pragmatically perfectly appropriate for both Bill and his girlfriend to be waving. There are only two sources of constraining information here; the discourse which sets up Bill as the focus, and the pronouns which in continuation (1) unambiguously index Bill and in (2) unambiguously index the girlfriend. This allows us, first, to determine the relative weighting of discourse and anaphor factors (in conditions 2.1 and 2.2), and, second, to determine whether discourse bias alone can be sufficient to determine the interpretation of the continuation fragment when there is no overt subject anaphor (condition 2.3).

**Type 3: Discourse Bias with Opposing Verb Bias**

Mary lost hope of winning the race to the ocean when she heard Andrew’s footsteps approaching her from behind. She was slowed down by the deep sand. She had trouble keeping her balance.
1. She overtook . . .
2. He overtook . . .
3. Overtaking . . .
 [probes A, B: HIM, HER]

In type 3 the agent of the continuation fragment suggested by the discourse (Mary) is in conflict with the agent consistent with
the verb phrase (Andrew). In 3.1 the subject pronoun, which is unambiguous, refers to Mary, and is therefore consistent with the discourse bias but not the verb bias. In 3.2 the pronoun refers to the agent preferred by the verb but not by the discourse. These two conditions, comparable to 1.1 and 1.2, allow us to evaluate the relative weighting of, in particular, the subject anaphor and pragmatic inference. In 3.3 there is no lexically specified anaphoric information, so that discourse bias and verb bias are in direct conflict. This condition tests for the effectiveness of pragmatic inference under conditions where the only other source of constraint, discourse focus, is working in the opposite direction. Probe A here is appropriate with respect to the discourse, which indicates that protagonist A should be in subject position, but it is inappropriate with respect to the verb, which is consistent with protagonist B as subject.

**Type 4: Neutral Discourse and Neutral Verb**

Paul and Jenny were having a violent argument and there were lots of threats being exchanged. They had been having more and more arguments recently. They both had very suspicious minds.

1. She heatedly accused . . .
2. He heatedly accused . . .
3. Heatedly accusing . . .

[probes A, B: HIM, HER]

Here, both the discourse focus and the pragmatic implications of the verb are consistent with either protagonist as the subject of the continuation sentence. Therefore, it is only the gender of the pronoun which can determine reference assignment (in 4.1 and 4.2). In condition 4.3, where there is a zero anaphor, all three types of information are consistent with either protagonist as subject.

**Pretesting**

The final set of 48 test stories was selected from an original set of 72. These 48 stories were chosen on the basis of extensive pretests, designed to ensure that both the discourse bias and the verb bias manipulations were successful.

The purpose of the first pretest was to ensure that the discourse successfully biased towards one protagonist in story types 1, 2, and 3, and was neutral in type 4. We constructed a written version of the materials consisting of the 72 test stories, plus 40 fillers. The test stories were presented up to, but not including, the final sentence of each story (i.e., excluding the sentence fragments 3a, 3b, and 3c). The filler stories varied between one and four sentences in length. The subject's task was to write down a sentence which would form a coherent continuation of the story.

We tested nine subjects, and scored their responses according to which protagonist they placed in subject position in their continuation. Type 1, 2, and 3 stories were considered successful if eight out of nine subjects continued the story with the protagonist preferred by the discourse (i.e., protagonist A as defined here). This did not mean that protagonist B could not appear in subject position in the continuation sentence, or that the discourse would be unnatural if he or she did so. Both protagonists are still available for anaphoric reference, even though there is an expectation, reflected in the pretest, that it is protagonist A who will appear in subject position. Type 4 stories, in contrast, were successful either if responses were split between the two protagonists so that neither one was clearly preferred or if both protagonists were consistently evoked.

At the same time, we ran another written pretest on a different group of nine subjects, to test whether the verb manipulation had the intended properties of bias and neutrality in different story types. In this pretest, each story consisted of all three context sentences and the zero anaphor continuation fragment. Once again, subjects were asked to write down a sentence which formed a natural continuation of the story. This was a way of evaluating, in an off-line task, how verb bias was affecting the
choice of subject, in the absence of a pronoun, and in different discourse contexts. This test was especially important for story type 3, where verb bias was intended to conflict with discourse bias. Responses were evaluated on the same basis as in the first pretest, with an 80% hit-rate required. Some of the stories which were unsuccessful in the first round of pretesting were modified and subjected to new rounds of the same two kinds of pretest. From this set of four pretests we obtained 48 test stories which satisfied the criteria (these test stories are listed in Appendix A).

For each story, we chose two probe words. These were object pronouns, each of which unambiguously indexed one of the two protagonists mentioned in the first context sentence. One probe was an appropriate continuation of the fragment, and the other was inappropriate. So, in the example of a type 1 story given above, the appropriate probe was HER and the inappropriate probe was HIM. We used a selection of different pronouns—such as HIM, HER, THEM—and equalized the number of times, across the 48 test sentences, that each pronoun functioned as an appropriate or inappropriate probe. This was to control for word length effects and the differential sensitivity of the VOR.

We constructed 55 filler stories to obscure the regularities of the test stories. Thirty-five of these filler stories had the same general structure as the test stories (i.e., three context sentences followed by one of three types of continuation sentence). However, they differed from the test stories in the following ways. First, the probe never occurred immediately after the verb phrase in the continuation fragment (as in the test stories), but rather at a later point in the fragment. Second, some of the continuation fragments had either a proper name or generic term in the subject position in the continuation fragment (instead of pronoun or zero form). Another 20 fillers had the probe occurring in the second or third sentence of the story.

Probe words for the filler stories varied considerably in their grammatical category in order to reduce the subject’s expectations that the probe word would be a pronoun on every trial. Half of the filler probes were appropriate and half were inappropriate continuations of the stories.

Design and Procedure

Three versions of the materials were constructed, such that only one type of continuation (1, 2, or 3) appeared with each story in one version. Each version consisted of the 48 test sentences interspersed with the fillers.

A mixed design was used. Story type was nested within stories, with 12 stories of each of the four types. The other variables were fully crossed with each other. Each of the three types of continuation was paired with each of the two visual probes. This produced a 3 (anaphor) by 2 (probe type) design, yielding six experimental conditions. The three experimental tapes were crossed with two probe sequences such that, across subjects, each sequence appeared with both probes.

These materials were recorded at a normal conversational rate by a female native speaker of American English. After recording the stimuli, timing pulses were placed on the nonspeech channel of the tape 20 ms before the offset of the speech. This pulse served to trigger both a timing device and to open a shutter on a slide projector such that a probe word appeared on a screen in front of the subject. The presentation of the probe word and the offset of the fragment occurred simultaneously.

Subjects were tested individually in a quiet room. The stories were presented over headphones as a monaural signal, and the visual probe was projected onto a screen in front of the subject. Subjects were asked to name the visual probe as rapidly as possible, and then to write down whether the probe was a good or bad continuation of the fragment. This second task was intro-
duced to ensure that subjects would listen to the sentences.

**Subjects**

Thirty-seven subjects were tested in the experiment. They were all students at MIT, and native speakers of American English. They were paid for their participation.

**RESULTS**

Seven subjects were dropped, because of high error rates and/or very slow response times. A further 4.4% of the data was discarded, because the VOR failed to trigger (2.9%), or because of subject error (0.7%), or very slow responses (0.8%). These data points were replaced with the mean naming latency for the condition in question.

We then computed two ANOVAs on the entire data set, one with subjects and the other with items as the random variables. The subjects analysis used a between-subjects design, in which subjects were crossed with story type (1–4), anaphor (congruent, incongruent, zero) and probe type (A, B). In the item analysis, items were nested within story type and crossed with anaphor and probe type.

These ANOVAs were used to calculate the MinF* statistic. We used the error term from the MinF* analyses to compute Newman–Keuls post hoc comparisons between naming latencies to the two visual probes in each condition. In addition, we computed two ANOVAs (subjects and items) on each type of story independently. The mean naming latencies for each condition are given in Table 2.

In the overall ANOVAs the three main factors of probe type, anaphor, and story type were not significant. Naming latencies to probes occurring in each of the four story types was essentially the same (MinF* < 1). Mean naming latencies ranged from 505 ms in story type 2 to 515 ms in story type 1. Similarly, there was no overall difference in naming latencies to Type A (512 ms) and Type B (511 ms) probes (MinF* < 1), nor to type of anaphor (MinF* < 1). Differences emerge, however, when we examine the interactions between these variables and type of anaphor. This is shown in the three-way interaction between story type, anaphor, and probe type ($F[6,174] = 3.456, p < .01$; $F[6,88] = 3.102, p < .01$), but (MinF*[6,225] = 1.63, $p > .05$).

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>MEAN NAMING LATENCIES (ms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Condition</td>
<td>Probe A</td>
</tr>
<tr>
<td>Type 1: Discourse bias and congruent verb</td>
<td></td>
</tr>
<tr>
<td>(1.1) Congruent pronoun</td>
<td>481</td>
</tr>
<tr>
<td>(1.2) Incongruent pronoun</td>
<td>532</td>
</tr>
<tr>
<td>(1.3) Zero anaphor</td>
<td>500</td>
</tr>
<tr>
<td>Type 2: Discourse bias and neutral verb</td>
<td></td>
</tr>
<tr>
<td>(2.1) Congruent pronoun</td>
<td>472</td>
</tr>
<tr>
<td>(2.2) Incongruent pronoun</td>
<td>527</td>
</tr>
<tr>
<td>(2.3) Zero anaphor</td>
<td>496</td>
</tr>
<tr>
<td>Type 3: Discourse bias and opposing verb</td>
<td></td>
</tr>
<tr>
<td>(3.1) Congruent pronoun</td>
<td>511</td>
</tr>
<tr>
<td>(3.2) Incongruent pronoun</td>
<td>549</td>
</tr>
<tr>
<td>(3.3) Zero anaphor</td>
<td>530</td>
</tr>
<tr>
<td>Type 4: Discourse neutral and neutral verb</td>
<td></td>
</tr>
<tr>
<td>(4.1) Congruent pronoun</td>
<td>483</td>
</tr>
<tr>
<td>(4.2) Incongruent pronoun</td>
<td>537</td>
</tr>
<tr>
<td>(4.3) Zero anaphor</td>
<td>520</td>
</tr>
</tbody>
</table>

*Note.* Probe A is the probe consistent with protagonist A in subject position; vice versa for probe B.
To interpret this interaction, we will consider the results for each story type in turn, conducting separate two-way subject and item ANOVAs for each type, in each case with the two factors of anaphor and probe type. In doing so, we will evaluate the contribution of the different variables to the process of utterance integration. When discussing the results, we will not refer to the visual probes as being either "appropriate" or "inappropriate" in advance, since for many conditions the appropriateness of a given probe was itself the question at issue. Instead, we will follow the convention, adopted above, of referring to probe A and probe B. Probe A is always the probe which is consistent with the instantiation of protagonist A in subject position.

**Story Type 1**

In this type of story, the discourse was biased towards one protagonist and the verb was consistent with that bias (see Table 1). These two together are congruent with the pronoun in continuation 1.1, but not for 1.2. In continuation 1.3, verb bias and discourse bias work together.

When the subject pronoun in the continuation sentence refers to the biased protagonist, naming latencies are 54 ms faster ($p < .01$) to the visual probe which is congruent with the agent as protagonist (probe A). However, when the subject pronoun is not congruent with the discourse and verb bias (probe B), the pattern is reversed. Naming latencies are faster by 26 ms ($p < .01$) to the visual probe which is consistent with the anaphor rather than with the discourse and verb bias. This was reflected in a significant anaphor by probe type interaction ($\text{Min} F[2,57] = 5.98, p < .001$). This crossover effect can be seen in Fig. 1.

When there is an zero anaphor in subject position, naming latencies are 36 ms faster to the visual probe which is consistent with the discourse and verb bias ($p < .01$). This condition is functionally equivalent to condition 1.1, where there is an explicit and unambiguous pronoun in subject position. These are the same effects as we obtained for the comparable conditions in our earlier study (Tyler & Marslen-Wilson, 1982a).

These results suggest that when the discourse, subject pronoun, and verb semantics all converge on the same interpretation, listeners are able to immediately integrate these different sources of information together. This results in faster naming latencies to a visual probe which is consistent with this interpretation. However, the subject pronoun in the continuation sentence is clearly dominant. Lexical information carried by the pronoun can outweigh the constraints provided by the discourse and by the semantics of the verb in the continuation fragment (1.2). But there is not a full crossover. The effects for 1.2 are not the perfect mirror-image of those for 1.1, with an "appropriateness" effect of only 26 as opposed to 54 ms. This difference, although not significant on post hoc tests, is at least suggestive that verb and discourse biases are counterbalancing to some extent the constraints carried by the anaphor.

**Story Type 2**

In these stories, the discourse biases towards one protagonist as agent while the
semantics of the verb are neutral and designed to be equally compatible with both potential antecedents. This allows us to measure, in condition 2.3, the effects of discourse bias when no other cues are available.

This type of story produces a similar but stronger pattern of results as for story type 1 (see Fig. 2). When the visual probe is consistent with the discourse bias and the congruent pronoun (condition 2.1), naming latencies are faster to probe A (56 ms; \( p < .01 \)). There is a complete switch in favor of probe B when the incongruent pronoun is heard (60 ms; \( p < .01 \)). When there is a zero anaphor, naming latencies are faster to the visual probe consistent with the discourse bias (46 ms; \( p < .01 \)). This pattern also produces a significant anaphor by probe interaction (MinF[2,78] = 24.19, \( p < .01 \)).

The results again illustrate the importance of the subject pronoun in the continuation sentence. When the pronoun and the discourse are inconsistent, the pronoun overrides the discourse bias and exerts the major influence on the interpretation of the utterance. This suggests that the incomplete crossover in condition 1.2 was due to conflicting verb semantics, rather than discourse bias. It also shows that protagonist B is still readily available for anaphoric reference, despite the focus on protagonist A.

The results for the zero anaphor condition (2.3) show that discourse focus alone is sufficient to control the assignment of reference. In this condition, the only constraint determining the antecedent of the anaphor is provided by the discourse. Nonetheless, the size of the appropriateness effect is just as large as in condition (1) where the congruent pronoun is also present.

**Story Type 3**

Here verb bias is in conflict with discourse bias. This enables us to evaluate the relative weighting of these two types of processing information when they are pitted against each other. The zero anaphor condition is particularly important in determining whether verb semantics can be interpreted on-line to select the pragmatically appropriate antecedent.

Once again (Fig. 3), we find a significant anaphor by probe interaction (MinF[2,66] = 4.02, \( p < .02 \)). When the subject pronoun is consistent with the discourse bias but inconsistent with the verb bias (condition 3.1), latencies to both visual probes are essentially the same (511 and 506 ms) and do not differ statistically. This is a similar condition to condition 1.2, where the subject pronoun was also in conflict with verb and discourse bias. The fact that the pro-

**Fig. 2.** Story type 2. Mean naming responses (ms) to probes A and B by continuation type. Congruent = continuation 1 (subject pronoun congruent with probe A); incongruent = continuation 2 (subject pronoun incongruent with probe A); zero = continuation 3 (zero anaphor).

**Fig. 3.** Story type 3. Mean naming responses (ms) to probes A and B by continuation type. Congruent = continuation 1 (subject pronoun congruent with probe A); incongruent = continuation 2 (subject pronoun incongruent with probe A); zero = continuation 3 (zero anaphor).
noun fails to override the verb in 3.1 suggests that verb bias is stronger here than in 1.2, and that under the appropriate conditions pragmatic inference can be as important as pronoun information in determining how an utterance should be integrated with its discourse context.²

In condition 3.2, the continuation sentence contains a pronoun which refers to the protagonist which is inconsistent with the discourse bias but consistent with the verb. Here, verb and pronoun constraints combine to give a very strong appropriateness effect of 67 ms (p < .01).

In condition 3.3, the verb and the discourse are the only sources of information constraining the assignment of agency. The results show that when the verb and discourse are pitted against each other, the verb wins. Naming latencies to a visual probe which is consistent with the pragmatically preferred protagonist are 47 ms faster (p < .01) than those to a visual probe which is consistent with the protagonist set up by the discourse.³

² Verb bias is likely to be stronger for type 3 than for type 1 stories. In order to pass the verb-bias pretests, the verbs in type 3 had to bias towards one protagonist and against the other sufficiently effectively to override discourse bias. In type 1, the verb bias works with the discourse bias, and may not need to be as strong as in type 3.
³ In a recent critique of our earlier research, Fodor, Garrett, and Swinney (1992) point out that some of the stimulus sets in Tyler and Marslen-Wilson (1982a) would allow lexical selection restrictions to decide between potential antecedents in the zero anaphor case, without the involvement of pragmatic inference. We have reexamined the stimulus sets here from this perspective. The only cases where this claim could be made are for some of the type 3 sets (3.6, 3.8, and 3.12 in Appendix A) where the second protagonist is non-human (a car, a parrot, and a dog), and indexed by the object pronoun IT. We make two points here. The first is that removing these three items from the analysis does not affect the results, reducing the appropriateness effect by only 5 ms. The second is that in none of these cases would lexical selection restrictions plausibly be sufficient to choose between antecedents. In 3.6, for example, the reason that Michael can be rejected as the agent of "honking noisily" is because he is crossing the street and not sitting in a car. This is a matter of discourse-based pragmatic inference, not lexical selection restrictions.

Story Type 4

Stories in this set consisted of a neutral discourse and neutral verb, so that the subject pronoun now acts alone. The results for 4.1 and 4.2, consistent with the strong pronoun effects for the other story types, show that the pronoun alone can determine the selection of an appropriate antecedent, with a full crossover in the results (see Fig. 4). In 4.1 the difference of 52 ms is significant (p < .01) as is the difference of 58 ms in the opposite direction in 4.2 (p < .01). When the anaphor does not uniquely select an antecedent (as in the zero anaphor case in 4.3), then there is no preference and naming latencies are the same to both visual probes (520 ms vs 527 ms; p > .05). It is possible that the use of singular targets is slightly unnatural here, leading to a general elevation in RTs for the zero condition.

Discussion

These results show that pragmatic inference, operating alone, can link utterances to discourses as effectively as pronouns, confirming the claims made by Tyler and Marslen-Wilson (1982a). The crucial evidence comes from condition 3.3, where the pragmatic implications of the verb conflict with the discourse bias, ruling out any possibility of a confound with discourse ef-
ffects. Here we see an appropriateness effect of 48 ms, consistent with verb bias. Consider the sample type 3 story in the Introduction, where the discourse sets up the character Mary in discourse focus. In our pretests of this context, subjects produced continuation sentences that kept Mary in focus as subject and main actor. In the experimental materials, however, the verb in the continuation fragment (overtaking) is pragmatically inconsistent with the listener’s mental model of the relationship between Mary and her competitor Andrew. Mary is in no position to be overtaking someone, and it is this that determines whom the listener instantiates as agent of the action. Probe B (HER) is treated as appropriate, and not the probe that is consistent with the discourse bias. The size of the effect is similar to cases like 1.1 and 2.1, where a congruent pronoun is present as well. Pragmatic inferencing seems just as effective as the apparently more direct mapping between an antecedent and an unambiguous pronoun.

The results also show that discourse focus on its own can control the on-line interpretation of utterance fragments. Discourse bias is the weakest of the three variables, and its effects are usually obscured by the two other sources of constraint. But when these other sources are neutralized (as in condition 2.3), there is a clear discourse-based appropriateness effect (of 46 ms), which is just as strong as the effects produced in other conditions by pronouns alone (the 52 ms effect in 4.1) or by verbs alone (the 48 ms effect in 3.3). Agency is being assigned under conditions where there is no sentence-internal syntactic basis for making the decision. It is only in the listener’s representation of the current discourse that any basis exists for choosing between one protagonist or the other as subject of the verb in the continuation fragment.

The effect of discourse bias in 2.3 demonstrates, in addition, that these assignment processes take place as the continuation fragment is being heard, and before the presentation of the visual probe. If an assignment of agency had not already been made before the subject saw the visual probe, there would not have been any appropriateness effect. The effects in 2.1 and 2.2 show that the assignment of either protagonist as agent is equally acceptable here. The probe HER is named just as rapidly after He waved at as the probe HIM after She waved at. Equally, there is nothing about the sequence Waving at him (with the female actor as agent) that makes it any less appropriate in the given discourse context than Waving at her (with the male as the subject).

To explain the fact that there are, nonetheless, strong appropriateness effects in condition 2.3, we have to assume a particular ordering of processing events. At the moment when the continuation fragment starts, the manipulation of discourse focus has led to the expectation that the actor in focus will continue in subject position. Unless the subject pronoun is inconsistent with this expectation (as in 2.2), and unless the semantics of the verb select the other protagonist (as in 3.3), the listener will go ahead and assign agency on this basis. Listeners can do this as soon as the information becomes available that the verb is pragmatically consistent with this assignment. Evidence from other studies (e.g., Marslen-Wilson & Tyler, 1980; Tyler & Wessels, 1983; Zwitserlood, 1989) suggests that this occurs while the verb is still being heard. Thus, by the time the visual probe appears, a commitment has already been made to the discourse mapping of the continuation fragment. Given this assignment, probe B is responded to as inappropriate. On the contrary story, where agent assignment is delayed until the object pronoun disambiguates—as argued, for example, by Fodor et al. (1992) in a recent critique of this research—responses should have been equally fast to both probes.

More generally, we assume that these processes of pragmatic inference, mapping
the semantics of the verb onto the appropriate discourse interpretation, are always part of the on-line process of utterance resolution. Whether the subject anaphor is a personal pronoun or a zero, whether the discourse focus points to one potential antecedent rather than another, it is always the case that the properties predicated of these potential antecedents in the new utterance need to be checked for pragmatic coherence with their already established properties in the listener’s mental model of the discourse (Hobbs, 1978). It is this standard on-line process of pragmatic checking that not only forms the basis for subject assignment in condition 3.3, but also leads to the conflicts with the subject anaphor observed in 3.1 and 1.2, and which permits the antecedent consistent with discourse focus to go through in condition 2.3. Pragmatic inference, on this account, is central to the normal operations of the language comprehension process.

Implications for Modularity

This experiment was designed, in the first instance, to investigate questions about the nature of utterance interpretation in discourse context. The results, however, also bear on the “modularity hypothesis” (Fodor, 1983; Marslen-Wilson & Tyler, 1987). This is a view of language comprehension which distinguishes a modular, highly constrained, and automatized input system from the supposedly diffuse, unconstrained, and scientifically intractable central processes which relate the output of the modular input system to the listener’s knowledge of the world and of the discourse context. Pragmatic inference, potentially bringing to bear anything and everything the perceiver knows on the interpretation of the speech input, is for Fodor the paradigmatic central process, and it is crucial for the modularity hypothesis that (a) processes based on pragmatic inference should be demonstrably slower and less efficient than automatized noninferential module–internal processes and (b) that these module–internal processes should be encapsulated—that they should never be controlled, in first-pass processing, by constraints derived from pragmatic inference.

The current research certainly shows, consistent with much other work (Marslen-Wilson & Tyler, 1987; Sanford & Garrod, 1989), that processing decisions based on pragmatic inference need not be measurably slower than decisions based on apparently more constrained operations, such as table look-up. More importantly, this research also bears on the encapsulation issue, and seems to show direct top-down effects on syntactic (and therefore intramodular) representations. First, the appropriateness effect in condition 3.3 depends on the infernal of agency, and to the extent that this leads to the top-down filling of the empty subject slot in the argument structure of the verb, then central processes, employing pragmatic inference, can specify on-line the actual content of a representation within the linguistic input system. Second, the results for condition 2.3 show that discourse focus on its own can also control the on-line interpretation of utterance fragments. Once again agency is being assigned under conditions where the parser could have no basis for doing so on purely module–internal grounds. In both cases, if the effect is on the assignment of predicate–argument relations in logical form, then this is evidence against a crucial prediction of the modularity hypothesis.

The overall results, in conclusion, reveal a pattern of dependencies between the discourse model and the current utterance that is difficult to handle within a system based on the kinds of rigidly bottom-up communication paths that characterize the modularity hypothesis. The results are suggestive of a system that is highly flexible in its use of different kinds of processing information to achieve the perceptual goal of relating an utterance to its discourse context. We see that all three types of constraint—pronoun constraint, discourse bias, and
 pragmatic coherence—are equally capable, under the right conditions, of controlling the outcome of this process.

APPENDIX A

Test Materials

Type 1: Biased Context with Verb Bias in Same Direction

1.1 After the surgeon had examined the 12 year old girl with the badly broken leg, he decided that he would have to take immediate action. He'd had a lot of experience with serious injuries. He knew what he had to do next.
   (a) He quickly injected . . .
   (b) She quickly injected . . .
   (c) Quickly injecting . . .

1.2 Merlin the magician thanked the elderly lady for volunteering to come up on stage and asked her to lie down on the couch. He immediately went into his usual routine. He pulled his watch out of his pocket.
   (a) He quickly hypnotised . . .
   (b) She quickly hypnotised . . .
   (c) Quickly hypnotising . . .

1.3 The smooth-tongued old salesman explained to the naive young housewife just why she had to buy the vegetable chopper. He really knew how to do his job.
   He loaded the machine with carrots.
   (a) He convincingly showed . . .
   (b) She convincingly showed . . .
   (c) Convincingly showing . . .

1.4 Because Cynthia was very late for her train, she couldn’t stop to help the crippled soldier sitting by the entrance. She was in a big hurry. She didn’t want to miss her train.
   (a) She rushed past . . .
   (b) He rushed past . . .
   (c) Rushing past . . .

1.5 As Philip came out of the shop, he saw an old lady trip and fall flat on her face in the street. Philip had been doing some late night shopping. He realised that the street was practically deserted.
   (a) He ran toward . . .
   (b) She ran toward . . .
   (c) Running toward . . .

1.6 Ingrid was a very considerable young lady and every Sunday she went to visit her blind old grandfather in Brooklyn. She always went there by car. Although it was quite a drive, she managed to arrive soon after lunch.
   (a) She usually read to . . .
   (b) He usually read to . . .
   (c) Usually reading to . . .

1.7 As part of her nurses’ training, Jane spent a lot of time looking after a group of paralysed patients. She carried out her duties very conscientiously. It was important to her to be a good nurse.
   (a) She carefully fed . . .
   (b) They carefully fed . . .
   (c) Carefully feeding . . .

1.8 Alex hated going to the zoo because he couldn’t bear the sight of all those animals behind bars. His last visit had really upset him. He has sworn never to go again.
   (a) He felt sorry for . . .
   (b) They felt sorry for . . .
   (c) Feeling sorry . . .

1.9 Janet was drifting down the river in her canoe when she saw Brian leaning over the railings of the bridge. She’d been on the river all morning. Now she was feeling like a bit of company.
   (a) She paddled towards . . .
   (b) He paddled towards . . .
   (c) Paddling towards . . .

1.10 A gang of terrorists quietly broke into the embassy building last night while the ambassador was all alone. They were a very professional bunch. They got past the burglar alarm without any difficulty.
   (a) They kidnapped . . .
   (b) He kidnapped . . .
   (c) Kidnapping . . .

1.11 Robert enjoyed going to beauty contests and gazing at all the pretty girls in bikinis. He went whenever he had the chance. He always sat in the front row.
   (a) He often whistled loudly at . . .
   (b) They often whistled loudly at . . .
   (c) Often whistling loudly at . . .

1.12 While Caroline was cleaning out the closet she came across an ugly little spider. She had spent all morning spring cleaning. By now she was in a bad temper.
   (a) She ruthlessly squashed . . .
   (b) It ruthlessly squashed . . .
   (c) Ruthlessly squashing . . .

Type 2: Biased Context with Unbiased Verb

2.1 Bruce had been a social worker for a long time, and he had a lot of experience working with older people. He had to visit the nursing home every day. He usually arrived just after lunch.
   (a) He talked to . . .
   (b) They talked to . . .
   (c) Talking to . . .

2.2 Marvin paced up and down his livingroom all day worrying about Clara’s audition. He knew that the
decision would be made that afternoon. By 4 o’clock he could hardly wait any longer.
(a) He finally phoned . . .
(b) She finally phoned . . .
(c) Finally phoning . . .

HER/HIM

2.3 As Bill was buying candy at the cinema, he saw an old girlfriend get in line for a ticket. He had arrived at the cinema especially early. He had wanted to be sure of getting a good seat.
(a) He waved at . . .
(b) She waved at . . .
(c) Waving at . . .

HER/HIM

2.4 As Jack came out of the clothes shop, he ran into Marie coming down the street. He was feeling very pleased with himself. He looked quite smart in his new jacket.
(a) He immediately invited . . .
(b) She immediately invited . . .
(c) Immediately inviting . . .

HIM/HER

2.5 When Peter came into the factory canteen, he went over to a group of friends sitting by the door. He had been working a very exhausting shift. He was tired and wanted to sit down for a while.
(a) He asked . . .
(b) They asked . . .
(c) Asking . . .

THEM/HIM

2.6 When the three boys left school, they went to see the personnel officer at the local factory. They were there all afternoon. They had lots of questions.
(a) They talked to . . .
(b) He talked to . . .
(c) Talking to . . .

HIM/THEM

2.7 Karen’s divorce had just been finalised when she ran into her ex-husband at a cocktail party. She’d had a hard time getting up the nerve to come to this party alone. Now that she was there, she wanted to have a pleasant evening.
(a) She studiously avoided . . .
(b) He studiously avoided . . .
(c) Studiously avoiding . . .

HIM/HER

2.8 After parking the car, Thomas ambled back to the garden party to look for his wife. He was in no big hurry. He stopped to admire the magnificent display of roses.
(a) He finally met up with . . .
(b) She finally met up with . . .
(c) Finally meeting up with . . .

HER/HIM

2.9 Emma was delighted to see her whole family waiting for her at the airport. Even though she had thoroughly enjoyed her holiday in Europe, she had been lonely. It was the first time she’d been away from home.
(a) She affectionately kissed . . .
(b) They affectionately kissed . . .
(c) Affectionately kissing . . .

THEM/HER

2.10 Bill thought it was unwise to expand the store’s selection of sports equipment but he knew Marjorie disagreed. He was afraid that windsurfing was just a passing craze. He didn’t want to take any unnecessary risks.
(a) He pointed out to . . .
(b) She pointed out to . . .
(c) Pointing out to . . .

HER/HIM

2.11 Since Jane didn’t come to Boston very often, she was surprised to recognise the man sitting opposite her in the subway. She’d finished shopping for the morning. Now she was on her way to have some lunch.
(a) She smiled at . . .
(b) He smiled at . . .
(c) Smiling at . . .

HIM/HER

2.12 Andrew hadn’t visited his mother for several weeks so he was relieved to find her in a good mood. He had a very demanding schedule this semester. He was glad that he’d managed to keep this weekend free.
(a) He warmly hugged . . .
(b) She warmly hugged . . .
(c) Warmly hugging . . .

HER/HIM

Type 3: Biased Context with Verb Bias in Opposite Direction

3.1 Bill was sleeping soundly and didn’t wake up even after Sally called him a second time. If he didn’t get up soon, he’d be late for work. He had to catch the bus at 7.30.
(a) He roughly shook . . .
(b) She roughly shook . . .
(c) Roughly shaking . . .

HER/HIM

3.2 After mowing the lawn and trimming the hedge, Giles went to the back door to tell the landlady that he had finished the job. He was a very good worker. He had left the garden looking immaculate.
(a) He gratefully paid . . .
(b) She gratefully paid . . .
(c) Gratefully paying . . .

HER/HIM

3.3 Since Alice couldn’t read the French words on the menu, she asked the handsome young waiter for help. There were some foods she was very allergic to. She didn’t want to get sick on this vacation.
(a) She gladly translated for . . .
(b) He gladly translated for . . .
(c) Gladly translating for . . .

HIM/HER

3.4 Mary lost hope of winning the race to the ocean when she heard Andrew’s footsteps approaching her from behind. The deep sand was slowing her down. She had trouble keeping her balance.
(a) She overtook . . .
(b) He overtook . . .
(c) Overtaking . . .

HIM/HER
3.5 The young soprano's choice of songs was all wrong for the occasion and she could feel the audience getting restless. As her nervousness increased, she started missing more notes. Her voice got worse and worse.
(a) She eventually booted . . .
(b) They eventually booted . . .
(c) Eventually booping . . .

3.6 As Michael started to cross the road, he suddenly noticed a car racing towards him. He hadn't bothered to look. As usual he was in a hurry.
(a) He honked noisily at . . .
(b) It honked noisily at . . .
(c) Honking noisily at . . .

3.7 After Theo had finished his prison sentence, he was escorted to the front gate by the two officials. This was the day he'd been waiting for. He had been locked up for a long time.
(a) He formally released . . .
(b) They formally released . . .
(c) Formally releasing . . .

3.8 Robert thoroughly regretted buying the shabby old parrot from the pet shop down by the harbor. He couldn't have been thinking straight that afternoon. He was always so gullible.
(a) He noisily screeched at . . .
(b) It noisily screeched at . . .
(c) Noisily screeching at . . .

3.9 After the car accident Mary went into hystericcs and had to be treated by the ambulance men. She had been badly frightened by the crash. It had really shaken her up.
(a) She sedated . . .
(b) They sedated . . .
(c) Sedating . . .

3.10 This was the first time Kate had ever been climbing and she was having difficulty keeping up with the more seasoned mountaineers. She had made it through the first hour quite easily. But now she began to get into difficulty more and more often.
(a) She expertly helped . . .
(b) They expertly helped . . .
(c) Expertly helping . . .

3.11 Emma was a timid little girl and the other children were nasty to her when she started at the new school. She spent a lot of time crying. She had never changed school before.
(a) She spitefully teased . . .
(b) They spitefully teased . . .
(c) Spitefully teasing . . .

3.12 As Susan was walking down the street one evening, she spotted a skinny little dog behind some boxes. She was on her way to the school building around the corner. Every Thursday evening she had to go to teacher's meetings there.
(a) She barked at . . .
(b) It barked at . . .
(c) Barking at . . .

Type 4: Unbiased Context with Unbiased Verb

4.1 Rita and Bobby sat in the grass outside and discussed Shakespeare's sonnets. They both loved poetry. They each knew several passages by heart.
(a) She recited to . . .
(b) He recited to . . .
(c) Reciting to . . .

4.2 Mr Adams and Mrs Scott were both planning to visit relatives in Vermont, but they couldn't decide which bus to take. They didn't want to take the first bus, because it left so early. They didn't like the next one either.
(a) He finally agreed with . . .
(b) She finally agreed with . . .
(c) Finally agreeing with . . .

4.3 As usual, Suzy and Tommy were fighting about who could play in the treehouse first. They were always arguing about it. This time they really got cross.
(a) She angrily pushed . . .
(b) He angrily pushed . . .
(c) Angrily pushing . . .

4.4 The Spanish senorita timidly took another peek at the good-looking blond tourist who was pretending to look the other way. They had come to Seville on the same bus that morning. Now they were waiting for the bus to pick them up again.
(a) She surreptitiously flirted with . . .
(b) He surreptitiously flirted with . . .
(c) Surreptitiously flirting with . . .

4.5 George and Margaret enjoyed the solitude of the park together in the evenings after they got off work. They both worked in the same over-crowded office building. It was a relief for them to leave the noise behind at the end of the day.
(a) He often strolled with . . .
(b) She often strolled with . . .
(c) Often strolling with . . .

4.6 Thomas wanted to go to the West Indies for Christmas, but Judy said she preferred wintersports. They looked through the travel brochures again and again. They argued about it for several days.
(a) He finally convinced . . .
(b) She finally convinced . . .
(c) Finally convincing . . .

4.7 Since they both had very strict parents, Will and Sally had much in common. They both understood what it was like to grow up in an old-fashioned family.
Sometimes they talked about the problems they had as children.

(a) He sympathised with . . .  
(b) She sympathised with . . .  
(c) Sympathising with . . .  

4.8 Anne and Steven always enjoyed their weekly meetings at the dancing club in Medford. They hardly had any other evenings free together. So Friday night was their special night.

(a) She usually danced with . . .  
(b) He usually danced with . . .  
(c) Usually dancing with . . .  

4.9 Paul and Jenny were having a violent argument and there were a lot of threats being exchanged. They had been having more and more arguments recently. They both had very suspicious minds.

(a) She heatedly accused . . .  
(b) He heatedly accused . . .  
(c) Heatedly accusing . . .  

4.10 The newlywed couple spent five lonely months living in separate parts of the world. In a short time they would be together again. Even with this knowledge, they found the last few weeks of separation hard to bear.

(a) He frequently wrote to . . .  
(b) She frequently wrote to . . .  
(c) Frequently writing to . . .  

4.11 Mary and Jack were having one of their serious conversations in the library. They always went there to get things straightened out. The quiet surroundings seemed to make it easier for them to talk.

(a) She solemnly promised . . .  
(b) He solemnly promised . . .  
(c) Solemnly promising . . .  

4.12 Yesterday afternoon, Martin and Caroline were playing one last game of hide-and-seek in the old cherry orchard before coming in to tea. They expected to be called inside any minute. They didn’t really care much about the game anymore.

(a) He easily found . . .  
(b) She easily found . . .  
(c) Easily finding . . .  

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