

INVESTIGATIONS INTO GRAMMATICAL KNOWLEDGE

by

James Douglas Saddy

B.A. Linguistics Simon Fraser University  
(1980)

M.A. Linguistics University of Ottawa  
(1983)

SUBMITTED TO THE DEPARTMENT OF  
LINGUISTICS AND PHILOSOPHY  
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS  
FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY IN LINGUISTICS

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
February 1991

© James Douglas Saddy 1990. Allrights reserved.

The author hereby grants to MIT permission to reproduce  
an to distribute copies of this thesis document in whole  
or in part.

Signature of the Author .....

Certified by .....  
Noam Chomsky, Institute Professor  
Department of Linguistics and Philosophy

Accepted by .....  
Wayne O'Neil, Chair  
Department of Linguistics and Philosophy

MASSACHUSETTS INSTITUTE  
OF TECHNOLOGY

JUN 06 1991

LIBRARIES

1

ARCHIVES

# **Investigations into Grammatical Knowledge**

by  
**James Douglas Saddy**

Submitted to the Department of Linguistics and Philosophy on  
October 31, 1990 in partial fulfillment of the requirements  
for the Degree of Doctor of Philosophy in Linguistics

## **Abstract**

This work presents a case study into the nature of one brain damaged individual's ability to comprehend sentences. The focus of the research is on the ability to construe quantificational scope ambiguities. Two broad results will emerge. First, we will demonstrate that the notion of comprehension as it is currently used in aphasic research is too narrow. In addition, we will argue against the position that linguistic impairments are the result of damage to an individual's grammatical knowledge. Secondly, we will demonstrate that evidence from aphasia can bear on a formal linguistic issue in an interesting way.

The aphasiological investigation (1) demonstrates that grammatical knowledge (competence) may be retained in agrammatism and (2) presents evidence of a hitherto unknown comprehension impairment that is tied to the event structure of a sentence.

The linguistic analysis of the aphasiological data argues for the existence of a syntactically active abstract argument position associated with predicates, thus providing support for an extended Davidsonian view of argument structure. This approach also provides for an alternative account of the general nature of agrammatic receptive deficits in terms of an impaired ability to distinguish the properties of such arguments and links the pattern of deficit comprehension observed to the normal range of scopal interpretations attested in languages that do not distinguish nouns and verbs at the lexical level.

The particular pattern of the comprehension deficit exposed by the research leads one to conclude that universally quantified terms are understood as binding the event position in the syntactic representations generated. Definite and indefinite phrases, however, do not. The aphasic evidence suggests that indefinites are not quantificational. Never-

theless, both wide and narrow scope readings are attested. This leads us to question whether this pattern is due to the special nature of the deficit or whether it reflects a true distinction between the quantificational properties of indefinite existential and universal expressions in natural language.

Arguments from Heim and Berman are presented that support the notion that indefinites and WH expressions have no inherent quantificational force. The special syntactic and interpretational properties of WH expressions in Bahasa Indonesia are then presented as demonstration that scoped interpretation of indefinites may be available without movement.

This result allows us to claim that in the agrammatic case the normal application of core properties of grammar to a well formed syntactic representation obtain. The pattern of comprehension in the agrammatic case follows from a merging of the distinguishing characteristics of predicate types.

Thesis Supervisor: Dr. Noam Chomsky  
Title: Professor of Linguistics

### Acknowledgements

Being a graduate student at MIT is a rare privilege. In the few years that I have enjoyed this status I have had the good fortune to meet many people who have had a profound impact on my life. I am grateful for their kindness, instruction, criticism, patience, impatience and good will. While working on my thesis I have benefitted from the support of an exceptional community of scholars both at MIT and elsewhere. My committee members, Noam Chomsky, Merrill Garrett, Ken Hale and Howard Lasnik have been remarkable. I am grateful to them for their guidance and support. I have also benefitted a great deal from my many meetings with Richard Larson and Jim Higginbotham. The other faculty members at MIT have played no small role in my development as a scholar, Morris Halle, Luigi Rizzi, Haj Ross, Jim McCloskey, Jay Keyser, and Wayne O'Neil all deserve my thanks. My fellow classmates John Lumsden, Ur Shlonsky, Michel Sigler, Carol Tenny, Hyon Sook Choe, Jenifer Cole, Steve Abney, and Steven Neale brought vitality and breadth to my graduate experience. It is true that the most intense learning takes place outside of the classroom and these people proved to be very challenging teachers. Fellow students from other classes are no less deserving of thanks. Andy Barss, Peggy Speas, Naoki Fukui, Juliette Levin, Dianne Massam, Kyle Johnson, Betsy Ritter, Lisa Cheng, Hamida Demerdache, Harry Leider, Anoop Mahajan, Janet Nicol, Juan Uriagereka, Kelly Sloan, Itziar Laka, Vivienne Deprez...its a long list. Away from MIT I benefitted from my contact with the faculty and students at the University of Arizona. Dick Oerhle, Sue Steele, Mike Hammond, Diana Archangeli, Terry Langendoen, Ken Forster, Eloise Jelinek, Ophelia Zapeta, Adrienne Leher and Dick Demers all deserve my thanks. The students at Arizona deserve special mention. I won't list them all but they are a good bunch. I want to specifically thank Husni Muadz, David Basillico and James Meyers for their special contributions to this thesis. Last but not least I want to thank my family and friends who have provided moral, financial and emotional support over the years. I could not have done this without them. Finally, I want to thank my aunt Mavis. One of my earliest recollections is of her teaching me the words to the song "woad". The peculiarities of the words to this song confused me. I am still confused...

'what's the use of wearing braces, hats and spats and shoes with laces, things like these...'





## Table of Contents

1	Introduction .....	8
2	Comprehension .....	11
2.1	Syntactic Representation .....	12
2.2	The single case study .....	15
2.3	Broca's Aphasia .....	22
3	Experimental Methodology .....	31
3.1	Act-Out Tasks .....	32
3.2	Forced Choice Sentence-Picture Matching ....	34
3.3	Sentence-Picture Matching .....	35
3.4	Grammaticality Judgments .....	35
3.5	The Insertion Task .....	36
4	Access to Syntactic Representation .....	37
4.1	Diagnostic Comprehension Profile .....	38
4.1.1	The Modified Act Out Task .....	38
4.1.2	Sentence Picture Verification .....	41
4.1.3	Agreement Battery .....	43
5	Against the Asyntactic Account .....	46
5.1	Grammaticality Judgments .....	46
5.1.1	Grodzinsky's Approach .....	51
5.2	Insertion Test .....	52
6	The Interpretation of Scopal Ambiguities .....	59
6.1	Scope Judgment Test .....	63
6.2	Schwartz, Linebarger, Saffran and Pate .....	67
7	A New Comprehension Deficit .....	72
7.1	JA's Comprehension Profile .....	80
8	The Davidsonian Representation .....	82
8.1	Higginbotham's Theta Theory .....	83
8.1.1	Salish .....	88
8.1.2	Aphasic Impairments .....	92
9	JA's Impairment .....	95
9.1	Sensitivity to Predicate Types .....	98
9.1.1	Passives .....	102
9.1.2	Relative Clauses .....	112
10	Two Problems .....	114
10.1	Relative Clauses .....	114
10.2	Wide Scope Indefinites .....	117
11	Bahasa Indonesia WH Constructions .....	124
11.1	Constraints on BI WH Movement .....	128
11.1.1	Complementizer and Focus Marker .....	132

11.1.2 Extraction from Islands .....	135
11.1.3 LF Movement Constraints .....	138
11.1.4 Evidence of Syntactic Constraints on LF Movement .....	143
11.2 WH-Quantifier Interaction .....	147
11.3 Scope without Movement .....	153
11.4 Specific Variables .....	158
11.5 Concluding Remarks .....	160
12 FIGURES .....	162
13 REFERENCES .....	181

## 1 Introduction

Investigation into the nature of language impairments has two general foci; output or production deficits and input or comprehension deficits. We are interested here in properties of comprehension deficits. The central question we will address about the nature of comprehension deficits is the extent to which they may be attributed to an impairment to grammatical knowledge as opposed to an impairment to the processing system.

In principle, either source is possible. We do, however, have the potential to determine the answer in individual cases. The results of the investigations presented here indicate that grammatical knowledge remains intact despite apparently severe language deficits. We will suggest that this is generally true.

In the discussion that follows we will make two general assumptions. First, we assume a model of language use that incorporates two autonomous components; the encoding of grammatical knowledge and the processing mecha-

nisms that exploit that knowledge. Secondly, we assume that our mechanisms of language processing are transparent to grammatical knowledge<sup>1</sup>.

A model that assumes a distinction between grammatical knowledge and the mechanisms that exploit that knowledge allows for the possibility that an impaired language processing mechanism may nevertheless reflect the underlying grammatical knowledge. In particular, if some aspect of processing, for instance short term memory, is impaired and other aspects spared, tests of language competence that rely on unimpaired abilities will show intact linguistic knowledge while tests that rely on the impaired ability will appear to show corrupted linguistic knowledge.

---

<sup>1</sup> If this transparency is not assumed then all psychological and linguistic investigations of language are rendered vacuous. The essential grist for linguistic investigation is attestation of the well formedness of an utterance. This attestation is itself a product of some individual's language processing mechanism. If we deny transparency then we deny that there is any necessary connection between an individual's linguistic judgement and the individual's internal grammar.

A model of this type is supported by the results of experiments presented here. The alternative model is one in which there are only language processing mechanisms. Under this model the formal properties of the grammar as determined by linguistic investigation are understood as abstractions over the operations of various processing modules. The two approaches make different predictions with respect to language deficits.

The alternative model would predict that it would be impossible to find instances of intact grammatical competence in an impaired system. This is because in such a model grammatical competence is derivative from the performance of the intact processing mechanisms. If some aspect of the processing mechanism is impaired then by definition the individual's grammatical knowledge is impaired.

One broad result of the aphasic investigations presented here is the demonstration of retained grammatical knowledge concomitant to language performance deficits. Such results do not reconcile well with any model of linguistic ability that does not distinguish the system of knowledge from the mechanisms that exploit it.

## 2 Comprehension

Comprehension of a sentence refers to the ability to recognize a sentence's meaning. What a sentence means is a complex combination of information types. In comprehending the meaning of a sentence we are aware of its thematic properties - who did what to whom etc., its scopal properties - the potential domains of negation, interrogation and quantification, and its truth conditional entailments. All of these things are determined by the syntactic representation associated with a given utterance. However, until this research, aphasiological investigations have examined only the ability to derive thematic properties from a sentence. All discussion of comprehension deficits in the literature are reports of failures on the part of a brain damaged individual to correctly demonstrate an understanding of the thematic relationship, usually agent-patient, that holds between the arguments expressed in a sentence. The results of our investigations into comprehension abilities demonstrate that focusing on only this aspect of comprehension has led to systematic misunderstanding of the potential nature of comprehension deficits and possibly a gross misdiagnosis of the kind of impairment suffered by such brain damaged individuals.

## 2.1 Syntactic Representation

It is commonly understood that the comprehension of a sentence or phrase must be mediated via a syntactic representation. This is exemplified by cases such as 1 and 2.

1. A friend of Bill's fed himself

2. Bill's friend fed himself

1 and 2 are synonymous except for their specificity. Yet the order of the words is different. Our ability to recognize the fact that these two sentences are synonymous must be mediated by properties of the sentences other than the linear order of their words. Our theory of grammatical knowledge tells us that a syntactic representation that encodes dominance as well as precedence plays a central role in accounting for the synonymy of these sentences.

Given our current understanding of the essential properties of linguistic knowledge, we must assume that the mechanisms of sentence processing will have as a necessary property the generation of a syntactic representation for any given utterance and this syntactic representation will mediate the comprehension of that utterance. A deficit of comprehension must then follow from one of two possible sources. Either the deficit is



due to an impairment of grammatical knowledge or the deficit is due to an impairment of the processing mechanisms that instantiate grammatical knowledge<sup>2</sup>.

(1) Suppose that we were to attribute a comprehension deficit to an impairment of grammatical knowledge. Given that we must assume the processing mechanisms to be transparent to grammatical knowledge, it follows that a defective syntactic representation is generated, one that respects the properties of the defective grammar. Since the syntactic representation encodes the meaning of the utterance, the defective properties of this syntactic representation would account for the specific nature of the comprehension deficit.

Alternatively, we could attribute the comprehension deficit to the language processing system. There are two possible scenarios associated with this approach. In both grammatical knowledge is intact.

(2) The failure in comprehension could be due to an inability to respect grammatical knowledge. Such an inability would also result in a failure to generate a well formed syntactic representation for a given utterance. This second route results in the same end state as

---

<sup>2</sup> A combination of the two is also a possibility but beyond the scope of the discussion here. From this it follows that there are three basic routes by which a comprehension deficit could be expected to arise.

the first. Both assume an ill formed syntactic representation is generated. In the first case this is due to a corruption of grammatical knowledge in this case it is due to an inability to respect grammatical knowledge.

(3) In the last scenario grammatical knowledge is intact and the processing mechanisms succeed in generating a well formed syntactic representation which the language processing system fails to properly decode.

In the research presented here two tasks can serve to distinguish these two options; grammaticality judgments and an insertion task. The grammaticality judgment task requires that the subject indicate whether they believe an auditorily presented utterance to be a well formed sentence. The insertion task requires the subject to indicate where a word (or phrase) could be inserted into a well formed sentence to yield another well formed sentence. Neither of these tasks depends upon the correct understanding of the thematic relations that hold between arguments in a sentence.

If an impairment to grammatical knowledge underlies a comprehension deficit we would expect to find a concomitant impairment to the ability to make grammaticality judgments or determine the appropriate insertion sites. If grammatical knowledge is intact and the comprehension

impairment is due to a failure to decode a well formed syntactic representation, we would predict that the ability to perform grammaticality judgments and lexical insertion would remain intact.

Grammaticality judgment tasks have been administered to aphasic subjects previously. The grammaticality judgment task reported in the present research goes beyond the scope of previously published grammaticality studies in that a systematic paradigm of extraction violations was examined, including multiple interrogation constructions involving superiority violations. The lexical insertion task, originally developed in Saddy 1983, is unique in its application in the research reported here. The lexical insertion task taps the subject's syntactic knowledge independent of the subjects ability to semantically decode a phrase or clause. The results of the present study supports the position that a well formed syntactic representation is available to the aphasic subject.

## **2.2 The single case study**

Much has been made recently of the relative merits of single case studies and large n studies (see Cognitive Neuropsychology vol.5, no.5 for a special volume devoted to the issue). The debate concerns the veracity of data collected in either case given individual variability.

It has been long recognized that the various patterns of aphasic language performance traditionally associated with damage to one or the other area of the left cerebral cortex do not result exclusively from damage to that area. In fact symptoms of either Wernicke's type or Broca's type aphasia have been reported as resulting from damage to most any area within the watershed of the distribution of the left middle cerebral artery. In electro-cortical stimulation of the left cortex Ojeman showed that stimulation in any area of the perisylvian cortex can result in aberrant language behavior. Furthermore, individuals with damage to similar regions of the left cortex will not necessarily exhibit the same patterns of deficit behavior. A glance at the traditional taxonomic charts will show that a wide range of behavior patterns are clustered under the heading 'Broca's Aphasia' or 'Transcortical Sensory Aphasia'. Those critical of large n studies point to this individual variability and point out that the very nature of large n studies suppresses the individual patterns that deviate from group performance. It is argued that it is just these deviations from group patterns of behavior on experimental measures that give insight into the structural details of the language processing mechanisms.

Those critical of single case studies cite individual variability as problematic. The fact that individual patterns of behavior on experimental measures can vary widely means that a focus on linguistic impairments identified in any given case study may be misleading. They argue that only by viewing the overall pattern of behavior in a large, reasonably homogeneous subject population is it possible to discern those aspects of deficit performance that inform us about the common aspects of language processing mechanisms.

Both points of view have merit. The issue depends, I think, upon the nature of the question being investigated and the operational assumptions in play.

Certain reasonable assumptions are necessary in order that inquiry may take place. These are common to individual case studies and large n studies alike. One such assumption is that the machinery of grammar, by that we mean the encoding of grammatical knowledge and the mechanisms available to exploit that knowledge, are common at least to speakers of the same language if not to all humans. This assumption is necessary in order that results of investigations into the nature of linguistic mechanisms and knowledge may be carried over and applied in new research. Thus we are able to assume that if some research reliably demonstrates a dissociation between

some property A and some property B in an individual, the closed or functional vocabulary versus the open or lexical vocabulary for example, that this dissociation will be found in all individuals.

Another assumption necessary to the type of research under discussion here is that the cortical substrate for language is common among humans. That is, that although there can be individual variation in the size and shape of the cortical substrate supporting language the physiological support for language is not ideosyncratic, except in special cases such as congenital neurological disorders. We know for example that in roughly 98% of the population without congenital disorders the left hemisphere of the brain plays a central role in both the expression and comprehension of language. The other 2% being composed of individuals who are truly right dominant hence left handed, eyed and footed. We therefore assume that extensive damage to the left cerebral cortex will result in some kind of language disorder in 98% of the population. It follows then that if language disturbance following left hemisphere trauma is due to either a loss of grammatical knowledge or a loss of processing abilities, those abilities are somehow served by the area of the brain damaged and that those areas of the brain serve a similar if not identical function in all humans.

In this claim we do not intend to assert any fine grained commonality across neural structures in different individuals. Rather we mean simply that portions of the left hemisphere of the brain can be reasonably assumed to be important to language in all humans.

The case study presented here takes a different focus than is traditionally adopted in aphasiological research. One central aim of the present study is to demonstrate that much more linguistic ability is or may be retained following cerebral damage than has been previously suggested. To do this we have chosen to study, in depth, the performance of an individual who has suffered extensive damage to the perisylvian area of his left cortex. This individual's performance on traditional tests of comprehension demonstrate that he would be classed as a Broca's agrammatic. Furthermore, his brain damage is so extensive that, under the common assumptions outlined above, he would be expected to have suffered loss of grammatical knowledge, loss of processing ability or both.

The results of the experimental measures reported here demonstrate preserved syntactic competence in this individual. We argue that this result challenges the traditional beliefs regarding the nature of comprehension

deficits. Furthermore, these results argue persuasively against any theory that explains comprehension deficits as resulting from loss of grammatical knowledge.

The validity of making such arguments on the basis of the results of this case study is predicated on the necessary assumptions given above.

We feel that JA's brain damage and level of impairment as measured by traditional methods are entirely consistent with other cases reported in the literature. JA suffered a left middle cerebral artery aneurysm 5 years ago at age 40. He is a right handed male with no familial history of left handedness. He has a BA and at the time of his aneurysm was manager of a retail store. The aneurysm destroyed approximately 30% of JA's left cortex involving both Broca's and Wernicke's areas. At the time of the trauma JA was globally aphasic and gradually resolved to an agrammatic Broca's, his present condition. The diagnosis of agrammatism has been made on the basis of JA's performance on tests of production and comprehension carried out by speech pathologists and his attending neurologist and has been confirmed by our own studies. The criticism directed at single case studies is based on the fact of individual variability. The claims being made on the basis of the single case study presented here could be criticized as being based on a report of aberrant



and ideosyncratic behavior of a single individual. However, in order to hold this position it is necessary to dismiss as coincidence all the properties of the case that make JA appear to be consistent with other cases of agrammatism in the literature.

JA has suffered the loss of portions of his left cerebral cortex in exactly those areas we know to be important for language in 98% of the population. The critic would have to claim that JA falls into the 2% of the population for whom language is served by the right hemisphere or is bilaterally represented. His ability to give grammaticality judgments, perform the insertion task and recognize scopal ambiguities is then explained because the brain damage he suffered did not affect his primary language cortex. This may be so but, on standard tests of language ability, JA performs exactly as is expected for a left hemisphere dominant individual suffering from extensive cortical damage in the left perisylvian region. The critic would have to maintain that JA's apparent pattern of aphasic disorders coincidentally mimics the pattern of aphasic disorder that results from damage to primary language cortex in the rest of the population. However the critic has had to claim that JA has not suffered damage to his primary language cortex in order to account for JA's apparent syntactic competence. The critic then

cannot account for the fact of JA's language impairment at all. If JA were to have an ideosyncratically organized cortex we would expect to find other types of cognitive disorders displayed in his performance. However, JA does not show any signs of apraxia or agnosia. The critic then is placed in the untenable position of claiming that JA's brain damage and language disorders are essentially unrelated. To maintain this position is to hold a position that renders all aphasiological research pointless.

### 2.3 Broca's Aphasia

Broca's aphasia is a term that refers to language disturbance characterized by halting, disfluent, effortful speech. Historically, this type of impairment is associated with damage to the supra-orbital convolutions of the left frontal lobe. This area is generally described as Broca's area, after Pierre Broca, who first associated this language impairment with damage to the left temporal lobe. Broca's research was first presented to the French Academy of Anthropology in 1861. Subsequent to Broca's early descriptions it was reported, first by Pitres in 1898, that there was a type of Broca's aphasia in which parts of speech were selectively omitted. In this condition, in addition to effortful, disfluent speech, verbs are almost always uttered in

progressive form with no apparent use of inflectional morphology, derivational morphology appears to be retained but only in nominal or adjectival form, and functional elements - determiners, complementizers, modals, prepositions and quantifiers - are noticeably lacking. This style of speech was described as agrammatic or telegraphic because the utterances lack grammatical inflection and are reminiscent of the economy of style used in telegrams. The term 'agrammatism' has come to be associated with this condition.

It was generally believed that while speech production in agrammatic Broca's aphasics was impaired, their comprehension of speech was intact; although in 1914 Salomon proposed a comprehension disorder coincident to the expressive disorder generally recognized at the time. In research reported in 1976, Zurif and Caramazza investigated comprehension deficits associated with agrammatism. Zurif and Caramazza reported that the Broca's aphasic subjects they tested could not distinguish thematically reversible object relative constructions on a sentence picture verification paradigm. That is, reversible object relatives of the form 'the girl the boy is chasing is tall' were incorrectly associated with pictures that corresponded to 'the girl who is chasing the boy is tall'. Non-reversible object relatives, on the other

hand, were correctly comprehended. Thus sentences like 'the dog the boy is patting is brown' were correctly identified.

On the basis of this performance, Zurif and Caramazza proposed that these individuals were 'asyntactic'. Zurif and Caramazza's proposal was that such individuals did not generate a syntactic representation associated with the sentence they heard at all but rather relied on extra linguistic heuristic devices, such as canonical word order and plausibility, to guess at the meaning of sentences. In the case of reversible object relatives, the application of heuristics resulted in incorrect comprehension. The canonical word order approach determined that the first mentioned NP would be the agent and, as plausibility did not contradict this conclusion, the 'asyntactic' subjects misinterpreted the sentences. In the case of the non-reversible object relatives, the canonical word order approach would assign agent to the first mentioned NP, 'the dog' in the above example, but the implausibility of a dog doing the patting rather than being patted overrode the canonical word order and a correct interpretation resulted. This proposed account of a comprehension deficit in agrammatic patients set the tone

for all subsequent approaches. The comprehension deficit is explained in terms of an impaired, in this case non-existent, syntactic representation.

Further research demonstrated what appeared to be a correspondence between the lack of functional terms in the speech of agrammatic patients and their comprehension deficits. Heilman and Scholes (1976) demonstrated that agrammatics could not distinguish between sentences of the type 'Mary showed her the baby pictures' and 'Mary showed her baby the pictures'. Since the distinction between the two sentences is marked in the position of the determiner 'the', the impaired ability to distinguish these two sentences suggested that the lack of determiners in the agrammatic's speech was accompanied by an inability to attend to determiners in comprehension. It was further demonstrated that, along with their problems in interpreting relative constructions, agrammatics also had difficulty with passive constructions. Various proposals to account for the comprehension deficits were advanced.

Saffran et al. (1980) and Schwartz et al. (1980) proposed that agrammatics map thematic roles directly onto a linear string of words. Bradley, Garrett and Zurif (1980) suggested that the normal access route to the functional vocabulary might be absent in the agrammatic. Caplan

(1983) suggested that the syntactic representation generated by agrammatics was impaired and that the use of a complex heuristic that was sensitive to thematic role assignment could account for the pattern of impaired comprehension. Caplan and Futter (1986) took a similar approach. They suggested that the syntactic representation constructed by agrammatics might consist only of projections of lexical heads.

The major difficulty encountered by most of these approaches is that they predict uniform performance on the part of the brain damaged individuals. If no functional elements are represented then all reversible passives should be consistently interpreted as active. This is because the agrammatics understanding of 'the boy was kissed by the girl' will be 'the boy.....kissed....the girl'. The canonical word order heuristic will always determine that the first NP is agent. However, the actual agrammatic performance of these is generally at chance. Similarly, the interpretation of object relatives is predicted to be systematically incorrect: 'the boy who the girl kissed held a book' becomes 'the boy ....the girl...kissed held a book'.

Once again, the canonical word order heuristic will always determine that the first NP is agent whereas the actual agrammatic performance is chance.

Grodzinsky (1984) offers a different angle on the problem of accounting for comprehension deficits in agrammatism. Grodzinsky notes that the constructions that agrammatics have difficulty understanding all involve moved constituents. Grodzinsky proposes an account that relies on the traces of movement being lacking from the linguistic representation available to the agrammatics. This approach does not exploit the open class/closed class distinction apparent in English agrammatic behavior but rather asserts that the agrammatic is incapable of representing the antecedent-trace relation. If this is so, he argues, then the thematic roles transmitted from the trace to its moved antecedent will not be retrievable by the agrammatic.

Grodzinsky invokes a heuristic to account for the thematic roles that are assigned. He suggests that thematic roles are available in hierarchical order - agent, patient, theme, goal - and that when an agrammatic encounters a linguistic representation in which a referring expression is not associated with a thematic role, then he provides it a default interpretation by assigning a thematic role, taken in order, from the hierarchy. Grodzinsky's account of passive interpretation is as follows. The sentence 'the boy was kissed by the girl' has an S-structure representation of

3. the boy<sub>i</sub> was kissed t<sub>i</sub> by the girl

However, for the agrammatic, the antecedent trace relation is not represented. The agrammatic has access to

4. the boy was kissed ... by the girl

The agrammatic's representation and grammar are otherwise intact. Since the first NP, 'the boy', is not associated with a thematic position, the heuristic provides a thematic role, agent, from the top of the list. The next NP is 'the girl'. However, the preposition 'by' is

recognized as assigning agent theta to its complement so 'the girl' is assigned agent. Now the agrammatic has a problem. There is one representation with two agent theta roles. How can this be interpreted? Grodzinsky suggests that it cannot be and so the agrammatic must guess at the correct interpretation. This results in chance performance for test of comprehension of reversible passives.

In the case of object relatives Grodzinsky tells a similar story. Relative constructions are derived by operator movement in the mapping from D-structure to S-structure. For the agrammatic, the operator variable relation will not be represented. A sentence such as

5. the boy who<sub>i</sub> the girl kissed t<sub>i</sub> held a book  
will be represented by the agrammatic as

6. the boy who the girl kissed ... held a book



Once again the first NP is not in a position to be assigned a thematic role as it is not governed by the verb 'kiss' nor by the verb 'hold'. It is thus assigned agent by default. The second NP, 'the girl', is assigned agent by the verb 'kissed' and the third NP, 'the book' is assigned patient by the verb 'held'. As in the case of passive, the agrammatic is faced with a representation including two competing agent terms. The agrammatic resolves this situation by guessing, resulting in chance performance on test of comprehension.

In the case of subject relatives, Grodzinsky's model predicts that the agrammatic will perform well on tests of comprehension but for the wrong reasons. A sentence involving a subject relative construction such as 'the boy who kissed the girl held a book' will be represented by the agrammatic as

7. the boy who ... kissed the girl held a book

In this case, as before, the first NP is not in a position to be assigned a thematic role. The heuristic, however, correctly assigns it the default role of agent.

The NP 'the girl' is assigned patient by the verb 'kissed' and the NP 'a book' is assigned theme by the verb 'hold'. The result is a correct interpretation of

the sentence but only because in this case the heuristic fortuitously assigned the correct thematic role to the first NP.

Inherent in Grodzinsky's and other accounts is the notion that there is an inadequate phrase marker of some sort underlying the comprehension deficit. This position makes testable predictions. In particular it predicts that grammaticality judgments should be impaired.

### 3 Experimental Methodology

The aim of the case study is to present an overall profile of JA's comprehension abilities and to contrast this with a demonstration of preserved competence. To achieve this, eight separate test paradigms which focus on different aspects of comprehension and competence have been administered. The general methodology employed in all the studies reported here is the repeated measures paradigm. In such a paradigm the condition being tested for is repeated within a pseudo-random presentation of fillers several times (in the cases reported a minimum of eight times). Furthermore, in order to establish the reliability of the results determined in these tests, the paradigms themselves are repeated on two or three distinct occasions. Thus, the results reported here are the results of repeated testing over a period of several months. This is to ensure the stability of the results. To measure comprehension, the types of tasks involved are: a modified act-out task, forced choice sentence picture verification and simple sentence picture verification. To measure sensitivity to syntactic properties, the types of tasks used are: a grammaticality judgment task and an insertion task.

### 3.1 Act-Out Tasks

In an act-out task the subject is presented with a set of dolls and objects that correspond to the individuals and types of objects that are mentioned in the test sentences. A sentence is read aloud to the subject and it is the subject's task to act out the scene described in the sentence. Such a task allows the investigator to see exactly how the subject has interpreted a sentence. The modified act-out task used here was developed in collaboration with Janet Nicol, Celia Jackubowitz and colleagues at the Institut de Paul Broca in Paris. It involves the placement of identifiers on a fixed template depicting two figures facing each other. The subject is presented with the template and an array of cards representing the heads of different individuals mentioned in the test sentences (Sue, Ann, Rose, Ken, John and Bill) and two cards depicting an arm engaged in one of the actions mentioned in the sentences (spraying, drying, photographing, feeding and washing). One of the cards depicts an arm reaching outward such that when it is placed on the template, one of the figures is depicted as performing the action on or to the other. The other card depicts the arm with its elbow bent such that when it is placed on the template, one of the figures is depicted as performing the action to itself. When needed, icons corresponding to

angry, happy, sad, and surprised are also available. The subject's task is to create a cartoon representation of the sentence that is read to him. In certain respects the modified act-out task is more restricted than the standard act-out task in that the format in which the sentence is to be depicted is preset. The subject need only associate the names of the players and indicate who does what to whom.

The advantage of an act-out task is that no particular type of error is anticipated by the task and supposedly any systematic miscomprehension on the part of the subject will reveal not only what constructions are miscomprehended but how they are miscomprehended. The act-out task is problematic in that it requires the subject to hold the meaning of the stimuli sentence in memory while choosing the actors and acting out the scene (see Nicol and Rapschik in progress). It is therefore possible that performance could be compromised by memory impairments. To control for this problem, constructions that are shown to be particularly problematic in the act-out paradigm are retested as sentence picture verification tasks (see below). The modified act-out task is used here to measure comprehension of various syntactic constructions.

### 3.2 Forced Choice Sentence-Picture Matching

A forced choice sentence picture matching task is one in which the subject hears or reads a sentence and is presented with two pictures, one of which accurately corresponds to the meaning of the sentence and another which departs from the meaning of the sentence in some systematic fashion. Like the modified act-out task, the forced choice picture verification task employed here was developed in collaboration with Janet Nicol, Celia Jackubowitz and colleagues at the Institut de Paul Broca in Paris. The subject indicates which of the pictures he believes corresponds to the sentence. The value of such a task is that the differences between the pictures can be tightly controlled, thereby allowing sensitivity to particular syntactic properties to be addressed. For example, in order to test whether a subject is attending to subject verb agreement one can test their comprehension of sentences involving invariant plural subjects like 'the moose climbs the hill' or 'the moose climb the hill'. The forced choice for either sentence would be between a picture in which one moose is climbing a hill and a picture in which two or three moose are climbing a hill. Since only the marking on the verb distinguishes the two sentences and the pictures are distinguished only by the number of moose, we can assume that if a subject's

performance remains stable over repeated presentations of this type that they either are or are not attending to subject verb agreement. Furthermore, the subject does not have to hold in memory the meaning of a sentence while manipulating objects, a requirement of the act-out paradigm that may result in depressed comprehension scores. The forced choice sentence picture matching task is used here to measure sensitivity to agreement and comprehension of quantifiers and demonstratives.

### 3.3 Sentence-Picture Matching

A sentence picture matching task is the simplest form of comprehension tasks. The subject is presented with one picture and hears a sentence; the task is to indicate if the sentence and the picture correspond. It is superior to a forced choice paradigm in that only one picture need be evaluated. Its drawback is that it requires twice the number of trials to determine the same information as the forced choice paradigm can provide. The sentence picture matching task is used here to determine comprehension of quantificational ambiguities and to verify a subset of the findings from the modified act out task.

### 3.4 Grammaticality Judgments

The grammaticality judgement task requires the subject to respond to the auditory presentation of a sentence. The subject indicates if the sentence is one that 'someone

could say' or not. The difficulty with this task comes in instructing the subject as to what is required. Once the point is grasped the execution of the testing goes quickly. The advantage of the grammaticality task is that it does not depend upon the output of other cognitive systems. That is, in sentence picture verification, the subject must both parse and decode the sentence and the picture he is seeing and carry out some sort of comparison. Grammaticality judgement does not rely on any systems/modules necessarily external to the language organ.

### 3.5 The Insertion Task

The insertion task, as it used here, is sensitive to knowledge of distributional properties of closed class items. The subject is presented with a well formed sentence printed in large type on a sheet of paper and a word, a functional item, also printed, that could be grammatically inserted into the sentence. The sentence and the word are read aloud to the subject twice. The task requires the subject to indicate by pointing where the word could go. An example sentence is 'The woman thinks the boy is shy', with 'that' as the word to be inserted. In order to know where the word 'that' could



go in the sentence the subject must be able to recognize that 'that' can be a complementizer and know where a complementizer could go.

#### **4 Access to Syntactic Representation**

In Chapter two we present results of tests that establish that the case subject, JA, is suffering from agrammatism and is comparable to other such cases reported in the literature. We then present the results of tests designed especially to probe for evidence of a well formed syntactic representation being available to the subject. These tests are tests of grammaticality judgment, lexical insertion and sensitivity to scopal ambiguities. We note that the subject's intact ability to perform these tasks demonstrates that JA generates a well formed syntactic representation in response to the test utterances. In the light of his performance on the preceding tasks, JA's ability to comprehend passives is re-examined using passive sentences that include universally quantified terms. JA's performance on these tasks is shown to be incompatible with contemporary accounts of agrammatic deficits.

#### 4.1 Diagnostic Comprehension Profile

In the recent literature on agrammatism, it has come to be the case that the pattern of comprehension deficits identified to be associated with agrammatic expressive disorders is taken to be part of the diagnostic of the application of the label 'agrammatic'. These diagnostic comprehension deficits are: chance or worse than chance performance on reversible passive, object relative and object cleft constructions and impaired performance on tasks that test sensitivity to agreement phenomena. Two batteries of tests that included measures sensitive to such phenomena were administered to JA. JA's performance on these batteries, the modified act-out test and its subsequent sentence-picture matching follow up and the Feature Agreement battery, demonstrates that he indeed suffers from the comprehension deficits typically associated with agrammatics.

##### 4.1.1 The Modified Act Out Task<sup>3</sup>

The modified act-out task used here was developed in col-

---

<sup>3</sup> The modified act-out task was conducted in collaboration with Dr. Janet Nicol. The assistance of Dr. Steven Rapschik, David Basilico and John D'Andrea is gratefully acknowledged. The modified act-out battery results are used here to demonstrate JA's performance paradigm on a range of familiar constructions. It is in no way intended to represent the opinions or interpretations of the other researchers involved and is not comprehensive report of JA's performance on the battery.

laboration with Janet Nicol, Celia Jackubowitz and colleagues at the Institut de Paul Broca in Paris. It involves the placement of identifiers on a fixed template depicting two figures facing each other. The subject is presented with the template and an array of cards representing the heads of different individuals mentioned in the test sentences (Sue, Ann, Lisa, Ken, Tom and Bill) and two cards depicting an arm engaged in one of the actions mentioned in the sentences. The subject's task is to create a cartoon representation of the sentence that is read to him. See @Ref{mat} and appendix @Ref{amat} for a further description and test materials.

The modified act-out task focuses on the comprehension of referential dependence. Twelve tokens of each of 26 different constructions were presented, a total of 312 test items. The test was constructed as a test battery composed of 12 test blocks of 26 items each. Four test blocks were presented on three separate occasions. The constructions tested are : simple active sentences, sentential complements, simple passive, object relatives, subject relatives, object clefts, subject clefts, raising, extraposition, object control, subject control, complex noun phrases, pronominal reference, anaphora. A sample test block showing all the construction types follows (see the appendix for the complete battery).

### Sample Modified Act-Out Task Test Block

- 1) A FRIEND OF SUE DRIED HER
- 2) KEN WASHED ROSE'S FRIEND
- 3) JOHN FORCED BILL TO BE SAD
- 4) A FRIEND OF ROSE WASHED HERSELF
- 5) ANNE BELIEVED THAT JOHN WAS AFRAID
- 6) KEN'S FRIEND DRIED HIM
- 7) SUE APPEARED TO ROSE TO BE HAPPY
- 8) HE THOUGHT THAT BILL WAS ANGRY
- 9) IT APPEARED TO ROSE THAT SUE WAS AFRAID
- 10) THE FRIEND WHO SPRAYED ROSE IS SAD
- 11) ROSE PHOTOGRAPHED HER
- 12) THE WASHED SUE
- 13) JOHN'S FRIEND SPRAYED SUE
- 14) KEN DRIED BILL
- 15) KEN THOUGHT THAT JOHN FED HIMSELF
- 16) SUE SAID THAT JOHN PHOTOGRAPHED ANNE
- 17) A FRIEND OF JOHN FED SUE
- 18) IT IS KEN WHO JOHN BELIEVES IS HAPPY
- 19) ANNE PROMISED SUE TO BE ANGRY
- 20) BILL WAS SPRAYED BY KEN
- 21) THE FRIEND WHO KEN FED IS AFRAID
- 22) SUE BELIEVED THAT SHE FED ANNE
- 23) JOHN FED A FRIEND OF ANNE
- 24) ROSE'S FRIEND PHOTOGRAPHED HERSELF
- 25) KEN PHOTOGRAPHED HIMSELF
- 26) ROSE BELIEVED THAT ANNE DRIED HER

As the following table shows, JA's performance on the Modified Act-Out comprehension battery indicates severe comprehension deficits.

#### MODIFIED ACT-OUT TASK

<u>S.TYPE</u>	<u>% CORRECT</u>
SIMPLE S	10/12 = 83%
PASSIVES	1/12 = 8%
OBJ.RELS	5/12 = 42%
OBJ.CLEFT	1/12 = 8%
SUBJ.RELS	2/12 = 17%
RAISING	5/12 = 42%
EXPLETIVE	7/12 = 58%
SUBJ.CONT	3/12 = 25%
OBJ.CONT	6/12 = 50%
EMB. S	10/12 = 83%

S.TYPE      EXAMPLE S.

SIMPLE S      Ken dried Bill  
PASSIVES      Bill was sprayed by Ken  
OBJ.RELS      The friend who Ken fed is afraid  
OBJ.CLEFT      It is Ken who John believes is happy  
SUBJ.RELS      The friend who sprayed Rose is sad  
RAISING      Sue appeared to Rose to be happy  
EXPLETIVE      It appeared to Rose that Sue was afraid  
SUBJ.CONT      Anne promised Sue to be angry  
OBJ.CONT      John forced Bill to be sad  
EMB. S      Anne believed that John was afraid

#### 4.1.2 Sentence Picture Verification

Since the tests of comprehension of scopal ambiguities rely on a Sentence Picture Verification rather than Act-Out paradigm, a sentence picture verification task was administered that was sensitive to those constructions in the modified act-out task that are considered diagnostic for agrammatism.

In a sentence picture verification task, the subject is presented with one picture and hears a sentence; the task is to indicate if the sentence and the picture correspond. The follow-up sentence picture testing confirmed the pattern of impairment that JA demonstrated in the Act-Out paradigm.

<u>VERIFICATION SENTENCE TYPE</u>	<u>% CORRECT</u>
active sentences	15/16 = 94%
reversible passives	8/16 = 50%
subject relatives	8/12 = 66%
object relatives	4/12 = 33%
subject clefts	10/12 = 83%
object clefts	6/12 = 50%

The fact that JA's performance on the sentence picture verification tasks is better than his performance on the modified act-out task demonstrates task sensitivity. This distinction in performance on tasks that ostensibly tap the same abilities can be at least partly blamed on the short term memory load requirement that distinguishes the two tasks. Other studies involving JA have demonstrated that he suffers from a short term memory deficit.<sup>4</sup> It is clear that the modified act-out task requires that the subject hold the interpretation of the sentence he is presented with in working memory for a longer period than the sentence picture verification task. In the former task it is necessary to decode the sentence, decide upon a picture that will match his understanding and also to plan the actions that will result in the subject depicting the meaning of the sentence in a cartoon. In the latter the subject need only decode the sentence and make a decision as to whether the picture he is looking at matches his understanding of the sentence.

---

4 See Nicol and Rapschik (in progress) for a discussion of the role of short term memory effects in task performance including a discussion of JA's short term memory abilities.

The results of the modified act-out task and the follow-up sentence picture verification task suggest that JA suffers from a widespread comprehension deficit that interferes with his understanding of sentences involving syntactic dependencies. We will not discuss the underlying nature of the deficit at this point<sup>5</sup> but note that JA shows a severe comprehension deficit in the pattern typical to agrammatics as reported elsewhere.<sup>6</sup>

#### 4.1.3 Agreement Battery

The Agreement Battery is a forced choice sentence picture matching task that examines the subjects comprehension of number agreement in NPs, person agreement on the verb and quantified expressions. The subject is presented with two pictures that are distinguished, in this case, only by the plurality of the item presented in the stimuli sentence. A stimuli sentence is presented and the subject is asked to choose which of two pictures corresponds to the sentence. The tests for number agreement distinguish between number marking that is encoded on the noun, i.e. 'the/a goat climbed the hill' versus 'the goats climbed the hill' and number marking encoded in the specifier, i.e. 'that moose climbed the hill' versus

---

5 See Saddy 1990 for a detailed discussion of the nature of JA's impairment.

6 See Kean (1985) for an overview of data and issues.

'those moose climbed the hill'. Note that the verb is always past tense and therefore invariant for all these items. The test for person agreement uses invariant plurals in subject position and varies the marking on the verb, i.e. 'the deer climb the hill' versus 'the deer climbs the hill'. The test of interpretation of quantified expressions contrasts the, a, some, few and many, i.e. 'many goats crossed the stream' versus 'few goats crossed the stream'. Sensitivity to number agreement in NPs in both subject and object positions are also tested. Sixteen repetitions of each contrast were conducted in a pseudo-random battery presentation. The battery was presented twice; once with spoken presentation of the sentences and once with sentences presented in written form. The testing was spread over five test sessions. See appendix @Ref{afb} for a complete listing of the Feature Battery.

The results of this test are as follows:



Written Presentation		Spoken Presentation	
Agreement	Correct	Agreement	Correct
those N	13/16 = 81%	those N	13/16 = 81%
that N	10/16 = 68%	that N	13/16 = 81%
the N(s)	13/16 = 81%	the N(s)	14/16 = 88%
a N	13/16 = 81%	a N	15/16 = 94%
some N	7/16 = 44%	some N	12/16 = 75%
many N	11/16 = 69%	many N	14/16 = 88%
few N	13/16 = 81%	few N	13/16 = 81%
V agr.	6/16 = 38%	V agr.	6/16 = 38%

The results show that JA is strikingly impaired in his ability to use verbal agreement to determine the plurality of the subject regardless of whether the presentation was written or oral. The depressed score for 'some N' is due to his general treatment of 'some N' as a singular term. If we allow the singular interpretation, JA's performance goes to 100% correct. His overall performance is better on oral presentation. However, his performance on the written version is much better than might be expected given his reading disorders. We will turn to this below.

JA's interpretation of NP number suggests that he is also marginally impaired in his ability to respect number agreement internal to the NP. His performance on the insertion test supports this.

## **5 Against the Asyntactic Account**

The asyntactic account, originally proposed by Caramazza and Zurif (1976) and later espoused in a modified form by Caplan and Futter (1980) suggests that agrammatic individuals do not generate a proper syntactic representation. The results of JA's performance on the test of grammaticality judgments and the insertion of functional items demonstrate conclusively that this is not true, at least in his case. Further support for this position comes from JA's performance on subsequent tests.

### **5.1 Grammaticality Judgments**

The preservation of grammaticality judgments in the face of comprehension disturbances has been reported previously (Linebarger et al 1983, Saffran et al 1985 and Shankweiler et al 1989). The tests reported here continue and extend the work of these authors by focusing on those types of constructions that involve dependencies between overt and empty elements. They are of repeated measure design and cover subjacency violations, specificity violations and ECP violations at both S-structure and the level of Logical Form. For all these cases JA's performance was flawless.

Grammaticality judgments do not require that a full interpretation be read from a sentence. They do require, however, that a well formed phrase marker is generated in response to a given sentential stimulus. The ability to give grammaticality judgments reflects access to the full syntactic machinery of the grammar.

The grammaticality judgment tasks were administered in stages. Initially JA was asked to distinguish between sentences 'that you could say' and sentences that 'you could not say'. The contrast being between simple active transitive sentences and 'word salad'. JA had no difficulty in comprehending the task. JA was then presented with sentences from the modified act-out paradigm which he had performed well on to judge. These were contrasted with sentences with word order violations like 'boy the kissed the girl'. These too were judged correctly. We then moved on to test JA's judgments on those sentences from the modified act-out paradigm that he had systematically miscomprehended, such as relative clause constructions and clefts. We found that he correctly judged these sentences to be grammatical. At this point a judgment paradigm was constructed that included examples of standard island violations contrasted with those constructions types he miscomprehends, i.e. clefts, relatives and passives. We found that JA accurately dis-

tinguished between the grammatical constructions and the ungrammatical island violations. Finally a judgment paradigm was developed that contained 11 examples of good multiple interrogatives and 9 examples of bad multiple interrogatives. With the exception of one item, 'what did who buy', JA correctly distinguished the good cases from the bad. This paradigm was modified and repeated on three separate occasions with different testers presenting the sentences. JA's performance was consistently accurate. The following is an example of the types of constructions presented to JA in this final judgment paradigm.

#### Grammaticality Judgments

Long Distance Dependencies:

Who<sub>i</sub> do you think Bill likes pictures of t<sub>i</sub>

Islands:

- Subject Condition:

\*Who<sub>i</sub> do you think [[[pictures of t<sub>i</sub>] are on sale]]

- Complex NP Constraint:

\*Who<sub>i</sub> do you like [stories that criticize t<sub>i</sub>]

- Adjunct Island:

\*Who<sub>i</sub> did you get jealous [because I spoke to t<sub>i</sub>]

## Multiple Interrogation:

### - Superiority:

1. SS: [CpWhere<sub>i</sub> [did]] [Ipyou [put what] t<sub>i</sub>]]  
LF: [what<sub>k</sub>[Where<sub>i</sub>]]<sub>i</sub> [did]] [you [put t<sub>k</sub>] t<sub>i</sub>]]
2. SS: \*[CpWhat<sub>i</sub> [did]] [Ipyou [put t<sub>i</sub>] where]]  
LF: [where<sub>k</sub>[What<sub>i</sub>]]<sub>i</sub> [did]] [you [put t<sub>i</sub>] t<sub>k</sub>]]
3. SS: Mary asked [Cpwho<sub>i</sub> [I<sub>p</sub> t<sub>i</sub> [bought what]]]  
LF: Mary asked [what<sub>k</sub>[who<sub>i</sub>]]<sub>i</sub> [ t<sub>i</sub> [bought t<sub>k</sub>]]]
4. SS: \*Mary asked [Cpwhat<sub>i</sub> [I<sub>p</sub>who [bought t<sub>i</sub>]]]  
LF: Mary asked [who<sub>k</sub>[what<sub>i</sub>]]<sub>i</sub> [t<sub>k</sub> [bought t<sub>i</sub>]]]

The above examples give both the Surface Structure and the Logical Form of the representative stimuli sentences. In presenting the SS and LF representations for these sentences I have attempted to remain agnostic as to an exact formulation of the ECP. The representations offered here are compatible with Lasnik and Saito's 1984 treatment. Under these assumptions, heads lexically head govern their complements, adjuncts must be antecedent governed. In the bad cases above lexical head government doesn't apply and antecedent government fails.<sup>7</sup>

---

<sup>7</sup> Under the present assumptions an LF moved WH expression adjoined to an SS moved WH expression cannot govern out of the adjunction structure due to contra indexing by the SS moved Wh expression.

Regardless of the account, it is clear that JA must have access to a highly articulated representation in order to make these distinctions. In order to make such judgments it must be the case that JA can construct a representation that includes accurate coindexing of antecedent-trace relations at both S-structure and LF.

Operator-variable binding relations established at S-structure are necessary to account for JA's sensitivity to Syntactic Islands and operator-variable binding relations established at LF are necessary to account for JA's sensitivity to Superiority effects. JA's ability to judge the grammaticality of passive and raising constructions, as demonstrated by his ability to judge the grammaticality of the sentences used in the modified act-out task, indicates that JA is also sensitive to the NP-trace relation established at S-structure.

In striking contrast to his comprehension performance, JA correctly judged all of the sentences used in the act-out test as grammatical, including those he systematically failed to comprehend. Furthermore, JA accurately judged island violations as bad and accurately distinguished cases of superiority violations from good examples of multiple interrogation. It may be worth noting that JA's judgments on multiple interrogatives are more consistent than the normal controls. It is as if

normal's judgments are affected by their ability to, in the words of one of the normal controls, " make sense of what a sentence should mean", more on this later.

As we discussed earlier, the type of grammaticality distinctions examined here are accounted for in terms of the viability of syntactic dependencies calculated over the mapping between DS and SS and the mapping between SS and the level of LF. In order to reliably make these distinctions it is necessarily the case that JA has access to a well formed syntactic representation that encodes the properties of both SS and LF. Furthermore it must be the case that he is sensitive to all of the syntactic properties of these representations.

#### 5.1.1 Grodzinsky's Approach

It is difficult to reconcile this preserved ability with Grodzinsky's trace deletion approach<sup>8</sup>.

---

<sup>8</sup> See discussion in Chapter 1. If we attempt to retain the spirit of Grodzinsky's claim we must assume that at the point at which a grammaticality judgment is made the S-Structure and LF representations are well formed. Trace deletion (at S-structure) would apply after this point. This implies that there is no loss of grammatical knowledge since well formed representations must underly the ability to distinguish between good and ill-formed multiple interrogatives. However, this would also alter the predictions made by Grodzinsky's approach. If traces are deleted after a well formed set of syntactic representations have been generated we would predict that the comprehension of sentences that involve LF movement would be impaired in addition to the comprehension of sentences that involve S-structure movement.

We will see below that JA's performance on more sophisticated comprehension tasks does not support this revision of Grodzinsky's approach. We will offer an alternative treatment of JA's receptive deficit that accounts for Grodzinsky's observations.

The fact that JA can generate well formed syntactic representations suggests that he is also sensitive to the formal syntactic properties of the closed class vocabulary. These elements play a central role in determining syntactic domains. The Insertion test was designed to examine the extent to which JA was sensitive to formal syntactic attributes of functional elements.

## 5.2 Insertion Test

The Insertion Test is sensitive to grammatical knowledge in a fashion comparable to grammaticality judgments. The insertion test requires the subject to indicate where a word or phrase may be grammatically inserted into a well formed sentence. Examples of the insertion items follow.



## Insertion Examples

fish jumped near the shore  
>insert determiners - the  
the fish jumped near the shore

Sue likes flowers  
>insert demonstratives - these  
Sue likes these flowers

Mary knows there is a dog here  
>insert complementizers - that  
Mary knows that there is a dog here

man likes sunshine  
>insert strong quantifiers - every  
every man likes sunshine

dogs won't eat these plums  
>insert weak quantifiers - most  
most dogs won't eat these plums

which men did the horse follow  
>insert numerals - six  
which six men did the horse follow

candy is bad for teeth  
>insert possessive pronouns - your  
candy is bad for your teeth

man is a mammal  
>insert adjectives - omnivorous  
man is a omnivorous mammal

dogs won't eat plums  
>insert adverbs - often  
dogs won't often eat plums

all boys like frogs  
>insert negation - not  
not all boys like frogs

the girls want to have lunch  
>insert negation with aux. - don't  
the girls don't want to have lunch

Bill knows I leave at 3  
>insert modals - should  
Bill knows I should leave at 3

In order to perform the insertion task it is necessary that the subject have generated a syntactic representation for the initial sentence so that a decision on where new material may be incorporated can be made. For example, in order to know where the word 'that' can be inserted into a sentence such as 'Mary thinks there is a party tonight' it is necessary that a syntactic representation be assigned to the sentence that distinguishes the sentential complement in the matrix VP so that an overt complementizer may be posited. The ability to perform this task indicates that a syntactic representation is available and that the syntactic properties of the element to be inserted are recognized. JA is quite good at determining most of the insertions.

Insertion Type	%Correct
Demonstrative and Determiners	9/10 = 90%
Complementizers	10/10 = 100%
Quantifiers	8/10 = 80%
Possessive Pronouns	8/10 = 80%
Adjectives	8/10 = 80%
Adverbs	9/10 = 90%
Negation and Auxiliary	2/10 = 20%

JA's pattern of performance on this task is interesting. For the cases in which he performed well, JA was clearly reciting the sentence to himself while determining the position of the insertion item. His errors in these cases was to position the insertion item one word before or after its correct position. Suggesting that JA had correctly determined the role and position of the item and had lost track of the exact position he had decided upon. In the cases of negation, modals and auxiliaries, while JA did recite the sentence to himself, he failed to even attempt to place the items. The two correct being occasions when JA indicated that he had no idea but placed the insertion item at the beginning of the stimuli sentence and this happened to be a correct placement - not all boys like frogs should I go to the store on Wednesday.

An additional factor affecting JA's performance on this task may be the memory load this task exerts on him. JA shows the impaired reading patterns of deep dyslexia. He is unable to read on confrontation most of closed class vocabulary items and non-words. He has retained the ability to read most of the open class vocabulary including the irregularly spelled items like "yacht" but fails to read non-words such as "blig" and members of the closed class vocabulary.

Prior to performing the insertion test JA was given a list of words to read aloud. The list was composed of all the words that were used as insertion items, many of which appeared in the base sentences as well. JA's performance on this reading task is given below.

#### Reading of Individual Insertion Items

Insertion Type	%Correct
Demonstrative and Determiners	0/10 = 0%
Complementizers	0/10 = 0%
Quantifiers	0/10 = 0%
Possessive Pronouns	2/10 = 20%
Adjectives	8/10 = 80%
Adverbs	5/10 = 50%
Negation and Auxiliary	0/10 = 0%

The insertion task was presented both visually and auditorily. That is the sentences and insertion items were read aloud to JA as he read along. Each sentence and insertion items was read aloud twice before JA indicated by pointing where the insertion item should go in the sentence. Given JA's reading impairment it is reasonable to assume that he had to rely on his memory of the spoken form of the word as it was read aloud to him in the presentation of each insertion item. This would account for the depression of his score in general but it does not account for the worse than chance performance on the auxiliaries and negation.

JA's performance on the insertion task is notable for two reasons. Firstly, given his inability to read the closed class vocabulary, we would expect that JA would be quite impaired on this task. In fact this retained ability to perform the insertion test using the closed class vocabulary indicates that JA has not lost access to these items. He may have lost the ability to retrieve a phonological representation for them but he has not lost his understanding of their formal properties. The second surprise is that he did so poorly with negation and auxiliaries. This disparity between his performance with negation and auxiliaries and his performance with Complementizers, determiners, demonstratives and quantifiers suggests a sensitivity on JA's part to an underlying distinction internal to the domain of the closed class vocabulary. JA makes no such distinction in his inability to read these items. This aspect of his performance supports a model of lexical representation which treats phonological information associated with a lexical item and syntactic information associated with a lexical item as independent.

Bradley, Garrett and Zurif (1980) offer an account that treats agrammatic deficits as an inability to access and respect the form and meaning of the closed class vocabulary. The insertion test specifically addresses aspects

of this claim. JA's ability to demonstrate at least a passive understanding of syntactic properties of a significant portion of the closed class (or functional) vocabulary suggests that the closed class vocabulary is accessible.

The fact that JA makes a distinction internal to the domain of the closed class vocabulary is important. This shows that the functional or closed class vocabulary is not a unified domain, even though the functional elements are treated in a uniform fashion on tests of reading and recognition. This distinction is in accord with extended Davidsonian theories of meaning that allow for a noun-verb event type distinction. If functional elements select for the 'e' type of their complements then we would expect an internal division in the functional vocabulary.

## 6 The Interpretation of Scopal Ambiguities

As we noted at the outset, the notion of 'comprehension' used in the literature on agrammatism is a restricted one. By 'comprehension' the literature means 'to thematically decode' or to understand who does what to whom. The conception of 'comprehension' adopted in the present work is more articulated. In addition to the ability to thematically decode an utterance, we take 'comprehension' to include the ability to understand the scopal properties of an utterance and the ability to understand the entailments of an utterance. The ability to accomplish any of these aspects of 'comprehension' requires that an appropriate syntactic representation be ascribed to a given utterance.

In the previous section we saw evidence that JA has access to a well formed syntactic representation. We established this by presenting JA with tasks that did not rely on his ability to thematically decode a sentence. In this section we will report the results of the investigation into an aspect of JA's comprehension that doesn't rely on thematic decoding: the recognition of scopal ambiguity in simple sentences that include both universal and existential quantification.

The issue of the interpretation of quantificational dependencies is an area that has not been previously examined in language impaired individuals. Much has been written about the interpretation of thematic dependencies and referential dependencies but scopal dependencies have not been investigated.

The model of grammar we are assuming here derives the scope of an operator type element (negation, quantification, interrogation, relative etc.) from its c-command domain. The possibility of quantificational scope ambiguity is attributed to the application of movement to quantified expressions in the mapping from S-structure to LF (see May 1977, 1985).

The ability to determine the scope of quantified expressions is independent of the ability to determine the thematic roles played by those quantified expressions. If the phrase structural representation of a sentence is autonomous then we would expect that scopal interpretation could be preserved while thematic constituency is lost.

As we discussed earlier, the essential account of comprehension deficits in agrammatism is as an inability to assign a correct interpretation to syntactic structures that involve constituents that are displaced from their



Deep Structure positions. Three versions of this account are due to the work of Saffran et al., Caplan et al., and Grodzinsky.

Caplan and Futter's account relies on a flat syntactic structure being generated and the application of a word order heuristic. Since the research in the previous section demonstrated that a full fledged syntactic representation must be available to JA we will not consider this approach further.

Grodzinsky's (1986) account holds that traces are deleted from the phrase marker representation available to agrammatics. We saw above that Grodzinsky's proposal is incompatible with the fact that JA makes reliable sophisticated grammaticality judgments. It may be possible to modify Grodzinsky's approach by claiming that the deletion of traces occurs sometime after a set of well formed representations have been generated. This approach would predict that comprehension impairments should arise with any representation involving traces of movement.

Saffran, Schwartz, Linebarger and Pate also found that their agrammatic subjects were capable of grammaticality judgments. Like the present study they took this ability as evidence of the availability of a well formed syntac-

tic representation. Their proposal is that the agrammatic cannot associate thematic roles with NP arguments that are in non-canonical order.

Note that both Grodzinsky and Saffran et al. are aiming primarily at explaining the chance performance on the comprehension of reversible passives.

Since the model of grammar we are assuming here attributes scopally distinct readings to the application of movement to quantified expressions in the mapping from S-structure to LF, the question arises as to whether, in terms of Grodzinsky's account, trace deletion applies to traces left by quantifier raising or, in terms of Saffran et al. the non-canonical order of quantifier raised NPs at LF, affects comprehension. While neither researcher makes explicit proposals regarding the application of their account to LF representations, the prediction made by a literal interpretation of these proposals is that sentences like 'Every man photographed a boy' should be misinterpreted by such brain damaged subjects. The LF representation would contain two traces of QR or two non-canonically placed NPs corresponding to the raising of both the subject and the object. In Grodzinsky's terms, the deletion of traces from the phrase marker would result in ill formed LF representations for sentences of this type. For Saffran et al. the association of the-

matic roles with the NP arguments would be disturbed. The individual would then be predicted to perform poorly on tests sensitive to their comprehension of such constructions. The prediction would be that the subject would not be able to determine what thematic roles should be assigned to the two quantified terms.

The results of a sentence-picture verification test sensitive to scopal ambiguities demonstrates that JA has no thematic confusion at all in the interpretation of sentences involving quantified terms. Furthermore, his comprehension of quantificational ambiguities is virtually perfect. JA has retained the ability to recognize scopal ambiguities. This provides further support for our contention that JA has access to a level of representation that corresponds to Logical Form and has not lost access to grammatical knowledge. It also provides further counter-evidence to Grodzinsky's theory and calls Saffran et al.'s approach into question.

### 6.1 Scope Judgment Test

In order to investigate his understanding of sentences involving scopal ambiguities, JA was presented with a sentence picture verification task. In this task, he was presented with the five sentences that represent the pos-

sible combinations of indefinite and universal expressions associated with three reversible transitive verbs: photograph, film and spray.

a child photographed every man  
every man photographed a child  
a man photographed every child  
every child photographed a man  
a child photographed a man

a child sprayed every man  
every man sprayed a child  
a man sprayed every child  
every child sprayed a man  
a child sprayed a man

a man filmed every child  
every child filmed a man  
a child filmed every man  
every man filmed a child  
a man filmed a child

a child photographed every woman  
every woman photographed a child  
a woman photographed every child  
every child photographed a woman  
a child photographed a woman

a child sprayed every woman  
every woman sprayed a child  
a woman sprayed every child  
every child sprayed a woman  
a child sprayed a woman

a woman filmed every child  
every child filmed a woman  
a child filmed every woman  
every woman filmed a child  
a woman filmed a child 91011

Associated with each of these sentences were four pictures which test the understanding of scopal interaction. Two accurately depicted the sentence, one for each scope order, the other two pictures were false to the sentence, one for each scope order. For example, for the sentence "A child photographed every man", JA was presented with one picture in which there was one child photographing a group of men and another picture in which there was a

---

9 The universal-universal combination was not tested here due to the difficulty of generating appropriate stimuli. This condition was tested in a separate paradigm using circles and squares; "every square is touching every circle" etc. JA's performance on these was consistent with his overall pattern.

10 In testing on agreement tasks not reported on in this article JA showed a predilection to treat the word 'some' as singular; therefore 'a x' instead of 'some x' was used in the stimuli sentences as the indefinite existential. Similarly, because of the predilection of the normal controls to give only wide scope to 'each x', only 'every x' was used in the stimuli sentences as the universal. In subsequent testing JA performed the same on 'some x' as he did on 'a x', that is, he recognized both scope possibilities. When 'each x' was used, he behaved like normals in that he strongly preferred pictures that gave 'each x' wide scope. See Saddy 1990 for an extensive account of JA's performance patterns.

11 The reversible verbs call and see were also developed as stimuli. They were omitted from the final test paradigm due to potential ambiguity in interpreting the pictures associated with stimuli sentences using these verbs.

different child photographing each of the men. Both of these pictures are true to the sentence. In the first picture, the existential, 'a child', is represented as having wide scope with respect to the universal, 'every man' and in the second picture the universal, 'every man', is represented as having wide scope with respect to the existential, 'a child'. The pictures that were false to the sentence also displayed scopal ambiguity. In one picture, a child photographs a group of men but an additional man is not being photographed. This picture partially maintains the wide scope interpretation of the existential but is false to the sentence. The second false picture shows a different child photographing each of the men but one. This picture partially maintains the wide scope interpretation of the universal but is false to the sentence.

In addition, for each sentence the subject was presented with the set of four pictures which depicted thematically reversed relations. Thus, for each sentence JA saw a total of eight pictures. Thus the sentence 'a child photographed every man' was presented with the four pictures that corresponded to 'a child photographed every man' as well as the four pictures that depicted 'every man photographed a child,' the reverse of the agent patient relationship given in the stimulus sentence.

JA's performance on this test was virtually the same as that of the normal controls. He recognized both a singular or distributed interpretation of the indefinite as appropriate to the sentences, making only 3 errors in 60 repetitions, that is, performing at 95% (57/60) correct. Normals made no errors. He consistently rejected all pictures that were not true to the sentence, as did normals, and he rejected all pictures in which the thematic relations depicted were reversed with respect to the sentence, as did the normals. This is strikingly good performance on a task that is computationally complex. The results of a sentence-picture verification test sensitive to scopal ambiguities demonstrates that JA has no thematic confusion at all in the interpretation of sentences involving quantified terms. Furthermore, his comprehension of quantificational ambiguities is virtually perfect. JA has retained the ability to recognize scopal ambiguities. This provides further support for our contention that JA has access to an autonomous syntactic representation.

## 6.2 Schwartz, Linebarger, Saffran and Pate

The fact that their subjects could perform grammaticality judgments but could not understand the thematic constituency in passives lead Linebarger et al. (1983) to propose that the underlying deficit in agrammatism is an

inability to map thematic constituency to syntactic representations in which argument NPs occur in non-canonical word order. JA's performance on the comprehension of scopal ambiguities calls this characterization into question.

The representation that determines relative scope orderings, LF, also contain argument NPs in non-canonical word order. Even though the argument NPs are in canonical word order at S-structure we would expect there to be some interference from the incompatible LF representation. Furthermore, in the grammar we are assuming, the level of logical form plays a crucial role in determining that theta-roles are properly discharged.

JA performs the same as Linebarger et al.'s subjects on reversible passive sentence picture verifications. Interestingly, all the cases of reversible passives presented in Schwartz et al involve only existentially quantified terms. If the account the offer is correct the prediction is that the quantificational status of the arguments expressed in a passive construction should have not bearing on a subjects performance. That is, Schwartz et al.'s approach would predict that JA when presented with a sentence of the form 'every man was photographed by a boy' would accept as appropriate a picture which



depicts every boy photographing a man. If this were true it would be interesting to see what scope relations JA took from the sentence.

In order to investigate this the scopal ambiguity test was repeated. The pictures were the same but this time the stimuli sentences were all in passive voice.

a child was photographed by every man  
every man was photographed by a child  
a man was photographed by every child  
every child was photographed by a man  
a child was photographed by a man

a child was sprayed by every man  
every man was sprayed by a child  
a man was sprayed by every child  
every child was sprayed by a man

a child was sprayed by a man

a man was filmed by every child  
every child was filmed by a man  
a child was filmed by every man  
every man was filmed by a child  
a man was filmed by a child

a child was photographed by every woman  
every woman was photographed by a child  
a woman was photographed by every child  
every child was photographed by a woman  
a child was photographed by a woman

a child was was sprayed by every woman  
every woman was was sprayed by a child  
a woman was was sprayed by every child  
every child was was sprayed by a woman  
a child was was sprayed by a woman

a woman was filmed by every child  
every child was filmed by a woman  
a child was filmed by every woman  
every woman was filmed by a child  
a woman was filmed by a child

Once again JA was presented with the set of pictures that corresponded thematically to the sentence and also those pictures in which the thematic roles of the sentence were reversed.

JA performed nearly perfectly on passive sentences involving contrasting quantification, making only four errors over the whole paradigm. It is clear that JA has no trouble recognizing the correct thematic constituency in the case of passives involving contrasting quantificational terms. In the sentences in which both the NPs were existential, JA's performance returned to chance. That is for a sentence such as 'a man was filmed by a child' he accepted pictures in which either a man was the filmer and a child was the filmee or pictures in which a child was the filmer and a man was the filmee.

This pattern of comprehension deficit cannot be reconciled with Grodzinsky's account of the interpretation of passives in agrammatism. Passive sentences that contain quantified terms would result in representations in which there are traces generated both at S-structure and LF. If anything the comprehension performance of an agrammatic on such sentences should be worse. Similarly, Schwartz et al.'s approach can not account for this

pattern of behavior. Why should the introduction of a universal quantifier into a passive sentence result in the non-canonical word order problem being overcome? JA's performance on these passive constructions provides further evidence of his intact grammatical competence and suggests that the underlying impairment is somehow linked to the quantificational properties of an utterance.

## 7 A New Comprehension Deficit

In the previous chapter we saw further evidence that a well formed set of syntactic representations is available to JA. We also saw a surprising inconsistency in his ability to demonstrate his understanding of passive constructions. Apparently his ability to understand passive constructions is improved by the presence of a universally quantified term in the construction. As we noted in the introduction, what a sentence means is a complex combination of information types. In comprehending the meaning of a sentence we are aware of its thematic properties - who did what to whom etc., its scopal properties - the potential domains of negation, interrogation and quantification, and its truth conditional entailments. All of these things are determined by the syntactic representation associated with a given utterance. We have seen considerable evidence that JA is capable of generating to a well formed syntactic representation in response to a sentence. We have seen evidence that JA appreciates scopal interactions. But we have contradictory evidence regarding his ability to understand the thematic properties of a sentence. We are left then with what we have called the truth conditional entailments of a sentences as an uninvestigated domain.

By truth conditional entailments we mean what is true of the world if the meaning expressed by a sentence is true. For example if the sentence 'John kissed Mary' is true then it is the case that John kissed Mary. The sentence does not become false if Frank kissed Mary also. With respect to a sentence picture verification task, if a normal speaker is presented with the sentence 'John kissed Mary' and a picture in which John is kissing Mary on one cheek and Frank is kissing Mary on the other, the normal speaker will accept the sentence '(in this picture) John kissed Mary' as being true with respect to the picture.

In this chapter we investigate JA's appreciation of the entailments associated with sentences involving quantified terms. This is done by expanding the scope judgment paradigm used to determine JA's understanding of scopal ambiguities to include complex foils in the pictures used for verification. The results of investigating this domain of comprehension in JA will allow us to account for his varied range of performance.

In this task the same sentences were used as in the previous task. However, instead of four pictures which are thematically appropriate, eight thematically appropriate pictures are associated with each of the sentences. The four pictures used previously contained no foils; two

accurately depicted the sentence, one for each scope order, the other two pictures were false to the sentence, one for each scope order. In the four new pictures foils are introduced; all four accurately depicted the sentence, two for each scope order with two foil types. One foil type involved an additional character corresponding to the indefinite expression that was involved in the action determined by the verb, in the other foil type an additional character corresponding to the indefinite expression is present in the picture but not involved in the action determined by the verb. In addition, for each sentence the subject was presented with pictures in which the subject-object relations was thematically reversed. For example, for a sentence such as 'A man sprayed every boy' there is one picture in which there is one man and a group of boys and the man is spraying the group of boys (every boy interpreted as narrow with respect to a man) (see Figure 1). There is another picture in which there are an equal number of men and boys and each man is spraying a boy (every boy interpreted as wide with respect to a man) (see Figure 2). The two false pictures are the same as the two true pictures just described with the exception that exhaustivity of the universal term is not met. Hence for a sentence such as 'A man sprayed every boy' there is one picture in which there is one

man, a group of boys plus an additional boy standing to the side, and the man is spraying only the group of boys. There is another picture in which there are an equal number of men and boys and each man is spraying a boy but one of the boys is not being sprayed (see Figure 3 and Figure 4). Neither of these pictures is true to the sentence since one of the boys in the picture is not being sprayed.

The four other pictures involved foils. In the pictures involving foils the relation asserted by the sentence is respected, that is, a man photographed every boy etc. in both scope orders. The foils tested the relevance of participation in the action mentioned. Thus for a sentence such as 'a man sprayed every boy' there is a picture in which one man is photographing a group of boys and another man is photographing a flower (every boy interpreted as narrow with respect to a man) (see Figure 5), another picture would have several men each photographing a different boy and an additional man photographing a flower (every boy interpreted as wide with respect to a man) (see Figure 6). The other two foils are cases where the additional participant is not involved in the action described by the verb. The scenarios just outlined are repeated with the exception that the additional man would

not be engaged in photographing. In this case the additional man is playing with a yo-yo (see Figure 7 and Figure 8).

For sentences in which the universal is in subject position the foil is drawn from the object. Thus for a sentence such as 'every man filmed a child' there is a picture in which every man is filming one child and a woman is filming another child (every man interpreted as narrow with respect to a child) (see Figure 9), the second foil has several men each filming a different child and a woman is filming another child (every man interpreted as wide with respect to a child) (see Figure 10). In addition, there are two foils, one for each scope order, in which there is a woman filming one of the children a man is also filming (see Figure 11 and Figure 12) and two foils, one for each scope order, in which there is a woman filming a plant (see Figure 13 and Figure 14). There are also two other foils, one for each scope order, in which the additional participant, the woman, is not involved in the action described by the verb, (see Figure 15 and Figure 16).

These tests revealed a surprising and consistent misinterpretation on JA's part. JA correctly accepted all of the pictures when they were associated with a sentence that involved only existential terms such as '(In this



picture,) a boy sprayed a man'. In all instances this sentence would be true of pictures in which boys sprayed men. However, for sentences that involved a universally quantified term JA accepted only those pictures in which all and only those things expressed in the universally quantified term bore the same relation to the verb as the universal term. That is, in every sentence involving a universally quantified phrase, JA interprets the universal as ranging over its nominal complement and also over the action described by the verb. For example, in response to a sentence such as (a)'(In this picture,) every man filmed a child' a picture in which every man is filming a child and a woman is also filming something, child or not, is rejected. The apparent interpretation being 'every man filmed a child and every filming is by a man'. Similarly, in response to a sentence such as (b)'(In this picture,) a man photographed every boy' a picture in which every boy is photographed by a man and a man or woman is photographing a flower is rejected. The apparent interpretation being 'a man photographed every child and every photographing is of a child'. This is in stark contrast to the performance of normals, who never rejected the pictures containing foils.

The most striking example of this is JA's consistent judgment with respect to pictures like Figure 17. In this picture there are three men and a woman each of whom is filming a child. When presented with this picture and the sentence 'a man filmed every child' JA accepts the picture as a true to the sentence. However, when presented with the same picture and a the sentence 'every man filmed a child' JA rejects the picture.

This performance contrasts with JA's judgment with respect to pictures like Figure 18. In this picture there are three men and a woman. The men are all filming a child. The woman is filming a flower. When presented with this picture and the sentence 'a man filmed every child' JA rejects the picture. When presented with the same picture and a the sentence 'every man filmed a child' JA also rejects the picture.

The examples above show us that for JA, if a universally quantified phrase occurs as the internal argument of a verb then all occurrences of the event described by the verb are understood to be applying to a token of the universally quantified nominal: 'a man filmed every child' means a man filmed every child AND every filming event is of a child, 'every man filmed a child' means every man filmed a child AND every filming event is by a man.

JA's performance demonstrates that he is not simply treating the universal quantifier as an adverb. This would predict an interpretation for 'a man sprayed every boy' and 'every man sprayed a boy' of 'always (or every time) a man sprays a boy'. First, such a characterization cannot distinguish the cases of universal in subject position from the cases of universal in object position, a distinction that JA systematically makes. Furthermore, this characterization would predict that in a sentence like 'every man sprayed a boy' JA would require all

- instances of men and boys to be related through spraying. JA does not do this. JA accepts for this sentence a picture in which every man is spraying a boy and in addition there is a boy who is not being sprayed, as in Figure 19. A simple adverbial interpretation of the universal would rule this picture out.

It is very clear from JA's performance that he is sensitive to the instantiation of the action described by the verb. For JA, instances of the verbal event are linked to the universally quantified term. The interpretation we offer of this behavior is in terms of events. JA allows a universal quantifier to bind both its own variable position and the event position associated with the verb. This has the result of this binding relation is

that the interpretation of even expressed by the sentence is tied to the state determined by the universally quantified expression.

### 7.1 JA's Comprehension Profile

Let us list the deficits we have identified in JA.

- A. His performance on the feature battery demonstrated that he is insensitive to the information conveyed in verbal agreement. That is, he was unable to distinguish 'the moose climb the hill' from 'the moose climbs the hill'. He can distinguish nominal marking. Thus he does distinguish 'these moose climbed the hill' from 'this moose climbed the hill'.
- B. He is unable to correctly insert modal auxiliary items such as could, should, don't etc. into a well formed sentence. He is capable of correctly inserting other members of the functional vocabulary such as demonstratives, determiners, quantifiers and complementizers.
- C. He accepts pictures which depict thematic role reversals in the case of passive sentences with only existential argument phrases. He rejects pictures in which depict thematic role reversals in the case of passive sentences with a universal argument phrase.
- D. He correctly accepts pictures that contain action foils when they are associated with active sentences in which both arguments are existential. He incorrectly rejects pictures that contain action foils when they are associated with active sentences in which one argument is universal unless the action foil bears the same relation to the verb as does the universally quantified argument.

This pattern of impaired behavior suggests that JA does not appreciate some verbal property. It is as if sentences were somehow nominalized for him. It is not the case that JA thinks that verbs are nouns however. His grammaticality judgments show us that he can clearly appreciate the argument structure associated with verbs.

Furthermore, if he thought sentences were NPs he would be unable to correctly analyze sentences involving movement into the projection of Comp nor would he be appreciative of the role that a complementizing element plays in a sentential structure. It must be the case that there is some verbal property that is independent of the thematic addicity of the verb that is being affected.

Recent proposals by Higginbotham extend Davidson's 1967 suggestion that there is an event argument associated with verbs of action. Within Higginbotham's theory, event positions are associated with all lexical projections. We propose that JA's impairment can be parsimoniously characterized as an impairment of his ability to distinguish between nominal and verbal event types. JA's behavior suggests that he treats all event positions as they were non-verbal.

## 8 The Davidsonian Representation

Motivation for an event position can be found in the fact that we distinguish between the truth conditions of sentences like

8. John ran across the road

and

9. John is running across the road (see Parsons L&P 1990)

8 is true just in case John made it across the road. 9 does not commit us to the completion of the act. We notice nevertheless that the verb 'run' means the same thing in both sentences. John plays the same semantic role in both sentences, as does the road. It appears then that the existence of the verbal inflection operates to change our understanding of some aspect of the verbal sense but does not affect the dictionary meaning of the verb.

One of Davidson's motivations for proposing events is to offer an explanation for "variable polyadicity" as noted in Kenny 1963 and repeated in Schein 1986. The observation is that a sentence such as 10.

10. Jones buttered the toast in the bathroom with a knife at midnight

entails that:

- i Jones buttered the toast in the bathroom with a knife
- ii Jones buttered the toast in the bathroom
- iii Jones buttered the toast

Davidson points out that if 10 is analyzed as a five place predicate with the various NPs and PPs associated each with an appropriate argument position, we have no explanation of the facts of entailment. Davidson's 1967 proposal was to supply an event argument as part of the argument structure of verbs of action. Events are ... entities about which an indefinite number of things can be said. -Davidson 1967

It is this 'event' argument that is being affected in the preceding examples. Higginbotham 1985 outlines a theory of semantics which incorporates the idea of a syntactic event position and extends this idea to all lexical elements. He also provides a formulation of operations that derive the semantics of a sentence from such a representation.

### 8.1 Higginbotham's Theta Theory

In his 1985 paper 'On Semantics' Higginbotham makes precise the notion expressed in Lectures on Government and Binding and elsewhere that there is thematic or argument structure associated with all members of the lexical categories Noun, Verb, Adjective and Preposition. Higginbotham extends Donald Davidson's (1966) notion of event

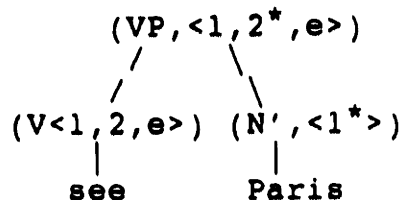
arguments associated with verbs of change or verbs of action to stative verbs as well. Thus under Higginbotham's theory all verbs include as part of their representation an event position in addition to their thematic arguments. A lexical entry for a verb will have the general form  $V\langle 1, (2), (3), e \rangle$  where 1, 2 and 3 will correspond to thematic roles, agent, patient, instrument for example, and  $e$  represents the event position.

Higginbotham also argues for the existence of an open argument position in nominals. He points out that the simple noun 'dog' denotes each of the various dogs and thus has an open place in it. He also notes that in many languages nominals can serve as predicates in main clauses. He therefore proposes that the lexical entry for a simple nominal will have the general form  $N\langle 1 \rangle$ , where 1 denotes the open argument position of the nominal. The list of argument positions associated with any given lexical item is referred to as its thematic grid. The notation  $\langle n^* \rangle$  indicates that the argument position denoted by  $n$  is discharged or saturated. In order that a syntactic representation may have an interpretation (be assigned a truth value) it must be the case that all the argument positions in the representation are discharged.

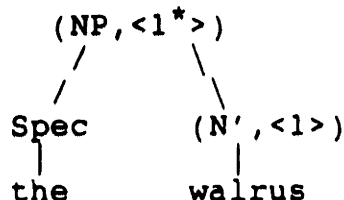


Higginbotham defines four basic modes of discharge of the thematic positions associated with lexical items. The first, theta-marking, is the theta assignment relation that holds between a predicate and an argument. The second, theta-binding, refers to the closure of the argument position of nominals through association with a specifying element. The third, theta-identification, expresses simple modification. Here the argument position of the adjective is identified with the argument position of the nominal but does not saturate the nominal's argument structure, thus showing that the properties of the modifier are to be attributed to the nominal. The fourth, autonomous theta-marking, involves both theta identification and the discharge of a thematic role in the modifier. This captures the fact that some kinds of modification impart a relational component. That is, a 'big butterfly' is big with respect to other butterflies but not necessarily big with respect to, say, an elephant. In Higginbotham's system these modes of discharge are primitive operations and must be realized, as Speas has argued, in a configuration of 'strict' sisterhood. These four types of thematic relations are exemplified below.

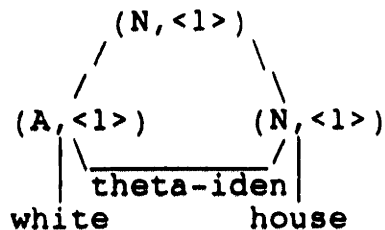
(1) Theta-marking, exemplified by pairs consisting of a predicate and one of its arguments.<sup>12</sup>



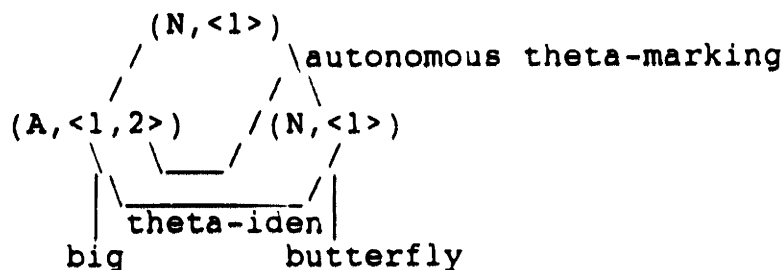
(2) Theta-binding, exemplified by determiners or measure words and their nominals.



(3) Theta-identification, exemplified in simple adjectival modification.



(4) Autonomous theta-marking, where the value assigned to the open position in the theta marker is the attribute given by its sister constituent.




---

<sup>12</sup> In these examples and throughout I adopt Higginbotham's notation for argument structure.  $X\langle 1, \dots, n \rangle$  repre-

(taken from Higginbotham 1986:14)

Recent work in linguistic theory has focused on X-bar theory and the projection of categories. Within the Barriers framework proposed by Chomsky (1986) the projection of Comp has been treated as a full phrasal category, CP, akin to IP. Recent work by Speas (1986), Fukui (1986), Abney (1986,1987) and Lumsden (1987) propose that determiners also be considered as heads of a full phrasal category, DP. The extension of this principled distinction into a Higginbotham type of representation and semantics is straightforward. The main alternation being that Higginbotham's syntactic notion of theta-binding becomes a distinguishing property of functional projections. Functional elements theta-bind maximal projections that are one place event predicates. Lexical categories, which are always one place predicates, take functional categories as arguments and assign them thematic properties through "theta-marking". Adjectives and other modifying elements correspond to "theta-identifiers". Modification is a relation between maximal projections.

---

sents the structural element X and it's associated argument(s). A superscript asterisk indicates that a particular argument has been saturated.

This way of talking about the syntactic properties of the functional elements provides us with two options as regards the way in which functional heads select (to use Abney's term) their complements. Either a functional head selects the category type of its complement (an Agreement head will select a VP) or the functional head is sensitive to the predicate type it can bind. The latter option assumes that predicate types can be distinguished. In particular we must be able to distinguish verbal <e> arguments from nominal <e> arguments.

Such a distinction is useful from at least two points of view. It allows us to say something sensible about languages such as Salish that appear to have no lexical noun-verb distinction (see Jelinek 1988). It will also allow us to provide a unified account of JA's impaired performance, one which can provide for a new approach to the nature of aphasic disorders.

#### 8.1.1 Salish

The Salishan languages exhibit properties that bear on the discussion here. It has been noted since Sapir that the Salishan languages of the Pacific Northwest make no lexical distinction between nouns and verbs (Sapir 1949, Kupers 1968, Kinkade 1976, Thompson and Thompson 1980, Jelinek 1988). However, Salish does have NPs, VPs and Ss. The category membership of a given lexical item is

determined through its association with a restricted set of functor elements in the language; DET, Transitivity and AUX (Kinkade 1976, Jelinek 1988). These languages are therefore described as having a lexical inventory consisting only of "predicates and particles".

This characterization of the coast Salish languages indicates that that these languages do not distinguish between nominal and verbal predicate or event types. In these languages all Lexical items are associated with an event argument (i.e. N,V,Adj,Adv,P are all predicates) but this event argument is not differentiated with respect to nominal and verbal properties. The Functional vocabulary can therefore bind any lexical item. The nominal or verbal status of a given projection is derivative from the functional element that theta-binds it.

David Gill (pc) points out that a similar situation obtains in the Semitic languages. The abstract (triconsonantal) roots define abstract predicates. The set of lexical projections is then determined through morphological infixation to the root. If the infixes are taken as functional heads then in Semitic too, nominal or verbal status is derivative from the functional element that theta-binds it.

This approach offers a taxonomy of languages based upon a fundamental distinction at the level of the lexicon. The lexicon either will or will not make a nominal-verbal distinction with respect to the event argument associated with a given lexical entry. We can assume that the basic properties of the functional entries will be universal across languages. Functional entries will not have an event argument and will always select their complements through theta-binding an event argument. This predicts that all languages will distinguish arguments, predicates and clauses even though there may be no noun-verb distinction discernible with respect to individual lexical items.

If a language does distinguish nominal versus verbal event arguments then theta-binding will be subject to some form of head complement compatibility. The details of such restrictions are far from obvious. The necessary investigation is postponed for future research.<sup>13</sup>

---

<sup>13</sup> The existence of such languages poses an interesting problem for acquisition. If predicate types are not universally then this aspect of language must be learned. The fact that there are two alternatives i) no distinction between predicate types and ii) a nominal-verbal distinction presents the perennial question of markedness. The form of this problem suggests that the approach of underspecification may be relevant. If concept of predicate is given in UG but underspecified as for types we could expect that there would be information available to the child that will determine the nature of predicates in the target language. If either undifferentiated predicates or differentiated predicates were taken to be the

One interesting aspect of Salish and similar languages is the mechanism and interpretation of universal quantification. Jelinek 1988 notes that the presence of the marker of universal quantification in a Salish sentence results in a range of potential interpretations that is larger than that associated with an Indo-European sentence involving universal quantification. compatible with the idea that the universal can take any constituent of the sentence as a potential restricting term.

11.   
 m&kw=1 'w na-t ts& scen&xw  
 all-1pl LINK eat -TR DET be fish  
 We all ate the fish  
 We ate all the fish  
 We ate the fish up completely  
 -Jelinek' example 25

As the above example demonstrates, any 'predicate' in the scope of the universal particle, including the verb, may be treated as the universal's restricting term. Hale has noted similar quantificational interpretations in Walpiri. The range of interpretations available in the example above is strikingly similar to the interpretations JA attests for sentences involving universal quantifiers.

---

unmarked case we would expect the course of acquisition to reflect the difficulty of determining the correct choice.

### 8.1.2 Aphasic Impairments

English is a language which distinguishes the nominal-verbal property of the event argument associated with lexical entries. We can imagine that such a distinction may well constitute an organizing principle of the mental lexicon. Suppose that some trauma could affect the ability to make this fundamental distinction. What would be the possible effects?

- A. verbal events could be mistaken for nominal events.  
This would be expected to result in:
  - i an inability to associate modal auxiliaries with verbal projections
  - ii an inability to associate Agreement properties with the verb
  - iii an inability to make well formedness judgments involving Agreement or modal auxiliaries.
- B. nominal events could be mistaken for verbal events.  
This would be expected to result in:
  - i an inability to associate determiners, quantifiers, etc. with nominal projections
  - ii an inability to recognize number agreement between determiners or demonstratives and their complement NP
  - iii an inability to make well formedness judgments involving determiners, demonstrative, quantifiers etc.
- C. nominal and verbal events could become indistinguishable. This would be expected to result in:
  - i inappropriate association of any functional element with any lexical projection
  - ii an inability to make well formedness judgments involving the functional vocabulary
- D. nominal and verbal events could become unrecognizable  
This would be expected to result in:
  - i inability to associate any functional element with any lexical projection



- ii an inability to make well formedness judgments involving the functional vocabulary

Characterization A is in accord with JA's performance. We will turn to a detailed consideration of his impairment in these terms immediately below. Characterization B partially fits the performance pattern identified for some subjects described in Caplan and Hildebrand 1987. Characterization C is compatible with some forms of Jargon aphasia (see Lecours and Nespoulous ???) and characterization E describes a pure telegrammatism. It appears that the distinctions provided by assuming a nominal-verbal event distinction makes interesting and explanatory classificatory distinctions that roughly correspond to observed aphasic performance types. The notion of a broad underlying impairment at the level of the lexicon is appealing for a number of reasons. It allows an account of impaired performance that does not predict the loss of particular lexical knowledge nor the loss of access to particular lexical entries. This is a desirable result because, as we have seen, it is often the case that impaired linguistic performance in one task is associated with preserved performance on a related task. For example, agrammatics when tested on the traditional tasks, appear to be inattentive to the closed class vocabulary yet they are capable of performing

lexical decision tasks on the same words they may have failed to attend to in an act out task. Our approach also lays the underlying impairment in the domain that we know to be most susceptible to impairment from brain damage, the lexicon. Virtually every insult to the brain regardless of location can give rise to anomia, a word finding failure. We would expect to find various disruptions to the mental lexicon subsequent to brain damage. Notice that we also predict that the range of aphasic performance in speakers of languages like Salish will differ in a restricted and interesting way from the performance just outlined. There should be no impairment that distinguishes between nominal and verbal event arguments. While the account is attractive, much more research needs to be done to establish the generality of the approach advocated here.

●

## 1 JA's Impairment

We suggest then that JA's basic impairment is an inability to distinguish the the 'types' of the event arguments. He treats them all as nominal. Such an impairment is in accord with JA's inability to correctly insert any modal elements in the insertion task. The distinction within the closed class vocabulary that JA exhibits in the insertion test is accounted for if we recognize a fundamental distinction between those functional elements that he can manipulate and those that he can't. The set of functional elements best handled by JA is that of Demonstratives, Determiners, Complementizer, Quantifiers and Numerals. These are all functional elements that select for nominal or propositional event types. Those functional elements that he failed to insert properly, modal auxiliaries and negation, are all functional elements that select for verbal event types. If JA is unable to recognize verbal event types his poor performance with modals and negation in the insertion task is explained.

Note that we distinguish here between an inability to recognise a verbal event argument and an inability to understand or recognise the properties of the those closed class elements that select for verbal event types. This is an important distinction. When asked to insert

those functional elements that select for a verbal event argument JA fails to perform. That is, he does not guess or place such elements randomly in the stimuli sentence, instead he indicates that he does not think that such an element can be inserted into the stimuli sentence. If it were the case that JA did not understand or recognise the properties of the functional element itself we would expect that he would have made attempts to insert the functional element inappropriately. JA's performance, or rather lack of performance, suggests that he recognised the formal requirements of these functional elements and could not find an appropriate insertion point. Thus, we believe that it is the type of the event argument that is not accessible to JA.

Furthermore, JA's inability to appreciate the agreement information provided by verbal inflection can be similarly explained provided we take Agreement to be a member of the set of closed class elements that select for verbal event types. Under this assumption, JA would be unable to utilize the agreement information since the relation between the agreement morpheme and the verb would be opaque to him.

This analysis finds some support in a grammaticality judgment paradigm that is sensitive to agreement mismatches. J. Nicol (pc) has noted that JA's ability to

make such grammaticality judgments is impaired. This paradigm has not been investigated systematically in the present research so this is offered as a suggestive observation. Other researchers have looked at such grammaticality paradigms in greater detail (see Schwartz et al. 1987) and found poor performance on grammaticality judgments sensitive to agreement phenomena.

The fact that there could be a systematic distinction in a subject's ability to make complex judgments regarding movement and ECF violations and his ability to recognize agreement mismatch is supportive of the notion that the verbal event argument is present but somehow defective. The performance reported in Schwartz et al. also brings out an interesting distinction. Their subjects were quite good at recognizing mismatches between the modal auxiliaries and the main verb. They report that their subjects could make the following distinctions:

Did/\*was the girl enjoy the show 87.5% correct

John has/\*was finally kissed Sue 89.1% correct

It has been argued by Perlmutter, and Burzio among others that the selection of BE versus HAVE as auxiliary depends upon the argument structure of the matrix verb. Essentially if the matrix verb is 'unaccusative' in Burzio's sense then the HAVE is selected as auxiliary. The fact that Swartz et al.'s subjects were sensitive to

properties shows that they were were sensitive to the internal argument structure of the matrix verbs. This is in accord with the characterization offered here and demonstrates the distinction between sensitivity to lexically determined properties and the ability to recognise specific formal properties in the representation.

### **1.1 Sensitivity to Predicate Types**

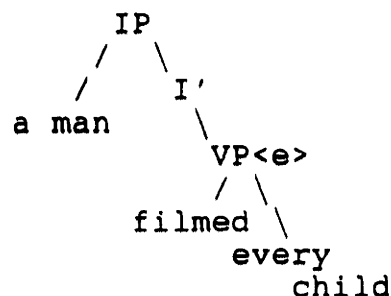
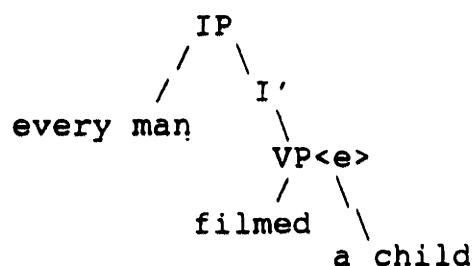
This characterization of JA's impairment also allows an explanatory account of his peculiar performance on sentences involving universal quantification. Recall that JA interprets the universal term as linked to the event. Furthermore, if a passive sentence contains no universal terms, JA accepts both pictures in which the thematic roles are respected and pictures in which the thematic roles are reversed. The presence of a universally quantified expression in a passive sentence results in a dramatic improvement in his performance.

We assume that all 'event' positions must be bound in order that a sentence may have an interpretation. Since JA treats the verbal event position in the representations as nominal or propositional, the event position cannot be bound in the normal fashion, that is, by Tense. However, if the sentence is to have an interpretation the event argument associated with the verb must be bound.

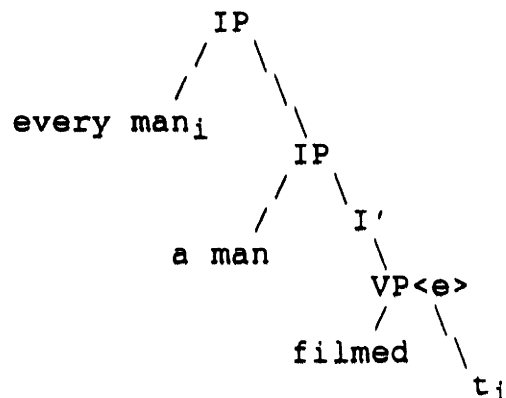
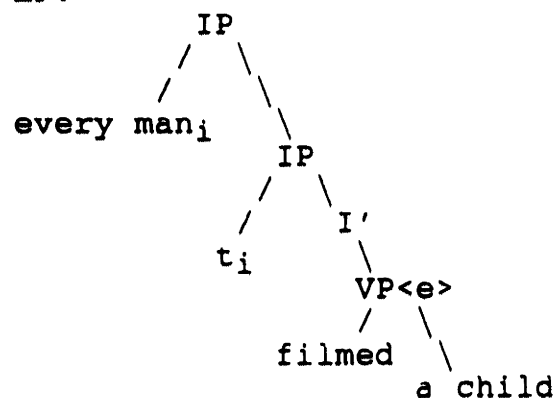
JA's performance tells us that the universally quantified term must somehow be playing the role of binder to the verb's event argument.

Note that at LF after the application of Quantifier Raising, the universal expression will always c-command both its variable and the event. That is, regardless of whether the universal term is subject or object, QR will adjoin the universal expression to a position that has the VP in its scope.

SS:



LF:



Recall that under the extended Davidsonian characterization adopted here both nouns and verbs have an <e> argument position. The requirement that this variable

position be bound is met through the application of theta-binding, in Higginbotham's sense. This binding relation is very local one that holds between a determiner and a noun's <e> position. It has been argued recently, (see Heim 1982, Higginbotham 1987) that the <e> argument of indefinite expressions is not bound by the indefinite article, that is, the indefinite article does not qualify as a 'theta-binder'. Indefinite expressions therefore may be viewed as contain a free variable.

Heim 1982 gives examples like the following.

1. In most cases, if a table has lasted for 50 years, it will last for another 50.
2. If a person falls from the fifth floor, s/he will very rarely survive.

Heim points to the fact that in the above examples the quantificational force of the indefinite expressions varies with the adverbial expressions. 12 can be paraphrased as "Most tables that have lasted for 50 years last for another 50." 13 can be paraphrased as "Very few people that fall from the fifth floor survive." Thus 'a table' is interpreted as 'most tables' and 'a person' is interpreted as 'few people' (see Heim 1982 pg. 123, 127 and Lewis 1975). In Heim's terms, "indefinite expressions resemble variables more than quantifiers". They .. "have no quantificational force of their own at all, but are rather like variables, which may get bound by whatever



quantifier is there to bind them." (Heim 1982, pg. 127)

This characterization of the quantificational interpretation of indefinites in the normal grammar serves also to characterize JA's peculiar interpretation of sentences containing universally quantified terms. We have provided evidence that JA no longer differentiates between nominal and verbal predicates. He treats them both as nominal predicate types. This means that for JA a VP and an indefinite NP will have the same status. Both represent variables that can be bound by an available quantifier. Since JA treats the VP<e> predicate as nominal, the verbal predicate binders in a syntactic representation do not serve to bind the VP predicate. This means that no truth value can be ascribed to the proposition determined by the verbal predicate and its arguments. However, if at the level of Logical Form a quantifier acts as a proxy binder for the verbs predicate argument, a truth value may be assigned to the representation. In the sentences investigated here there is an unusual property associated with the universal expression binding the verbal event predicate; the binder of the <e> argument is also an argument of the verb. Thus in a sentence such as 'a man filmed every child' the operator construed as binding the verbs <e> argument is also the operator binding 'child'. The result of this connection is that the proposition

described by the verb and its arguments can be assigned a truth value just in case the events of filming are instances of filming children.

Notice that the mechanisms of thematic role assignment are not disengaged. 'Every child' is still the internal argument of 'film' and 'a man' is still the external argument of 'film'. Notice also that the scopal ambiguities will still follow. Nothing prevents the existential term from being interpreted as wide with respect to the universal expression.

The interpretation of 'every man films a child' follows in the same fashion. Here a truth value can be assigned to the proposition described by the verb and its arguments just in case all filming events are also filming by men events.

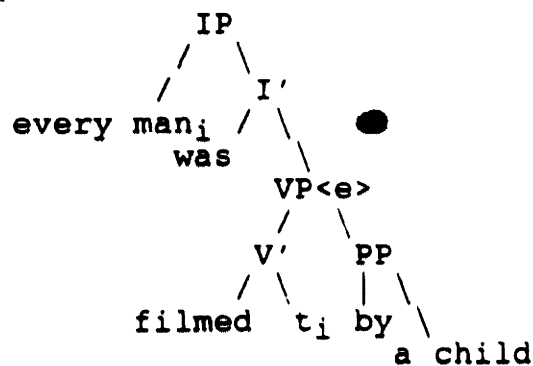
We have accounted for the readings JA assigns to sentences of the form 'every x verbs a y' and 'a x verbs every y'. The account carries over in a straightforward way to JA's performance on passives. Recall that JA performs at chance on passives that involve only existential terms but does much better on passives that involve a universal term.

#### 1.1.1 Passives

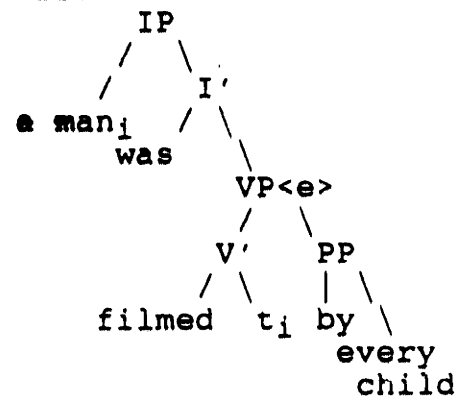
We can account for JA's performance on the passive constructions involving universally quantified terms in the

same manner as we dealt with the other universally quantified constructions. After quantifier raising applies to the universally quantified expression unselective binding of the misconstrued <e> argument is possible. Once the event position in the passive construction becomes bound the interpretation of the expression follows.

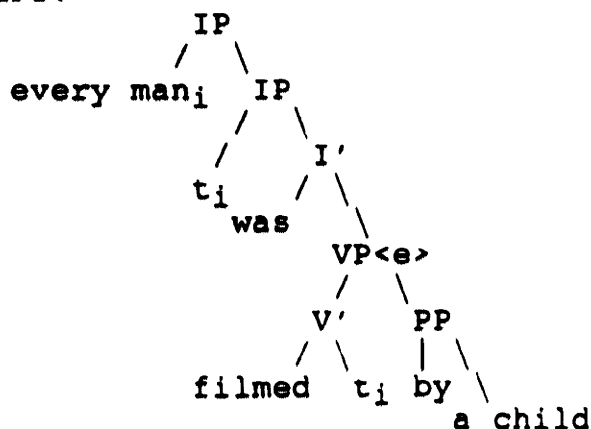
SS1:



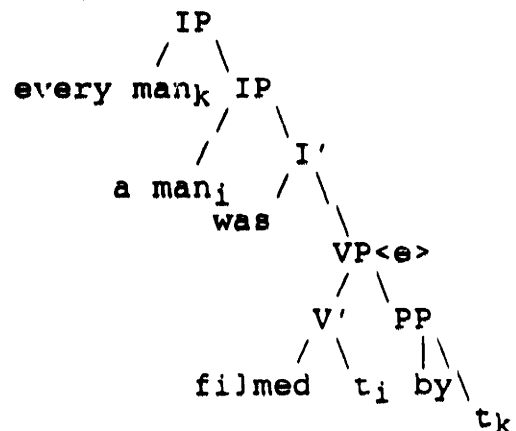
SS2:



LF1:



LF2:



As in the case of active sentences the <e> position associated with the verb is unselectively bound by the universal expression it falls in the scope of. The

advantageous result being that a truth condition can be assigned to the expression. In addition, the events of filming are identified with the domain picked out by the universal expression. However, other events of filming are undefined.

Notice that we are assuming that the assignment of thematic roles proceeds normally in these cases. The chain formed by passive movement is interpreted as bearing the patient role. The event is saturated through its association with the universal operator and hence has a truth value. The adjunct PP determines the optional realization of agent and is incorporated into the meaning of the sentence<sup>1</sup>.

We are lacking, however, an account of why JA's performance on passives without universals should be as it is. Why should he accept pictures in which the thematic roles are reversed in just these cases? Apparently the operator binding relation that discharges the event position is not available in these cases. We are led to suppose that existentials do not behave like operators, that is, they do not obligatorily undergo quantifier raising. In

---

<sup>1</sup> Whether or not the external theta role is assigned to the passive morphology as suggested by Jaeggli and Baker, Johnson and Roberts does not materially affect the analysis here.

terms of JA's impairment this means that the event position cannot be construed as a variable bound by a quantifier.

We find some support for this position if we reconsider JA's judgments on active sentences involving universal quantification. Recall that it is always the universally quantified term that is linked to the event, never the existentially quantified term. If the existential term could be bound to the event we would predict a different pattern of judgments from JA. In particular, a sentence such as 'a man sprayed every boy' would be predicted to have as a possible interpretation 'a man sprayed every boy and some spraying was by a man'. This interpretation predicts that JA would accept those pictures involving foils which he in fact rejects. For example, when the universal term is the external argument, as in 'a man sprayed every boy' JA rejects pictures in which it is true that a man is spraying every boy but in addition a woman is spraying something as well (boy or not). If the existential was generating a binary quantifier that bound the event and a variable generated through LF movement the resulting interpretation, 'a man sprayed every boy and some spraying was by a man', would allow for such pictures. Since JA's performance demonstrates that he

consistently associates only the universal term with the event, we have support for the idea that JA does not treat existential terms as operator-like.

We also have evidence that it is not only indefinite NPs that behave in this fashion but also definite descriptions. The first sentence picture verification task examining JA's performance on passive constructions involved passive constructions using proper names and definite descriptions.

Ken was washed by Bill  
The man was sprayed by the boy

JA's performance on these constructions was the same as his performance on passive constructions with indefinite NPs

A man was sprayed by a boy

We see then that JA's ability to understand passive constructions involving universally quantified expressions can not be accounted for by appealing to the specificity or strength of the universal expression. Definite descriptions and proper names are specific and 'the' is a strong quantifier. It appears that expressions, either definite or indefinite, with existential force do not suffice to do the work that universal expressions do for JA.

If we accept the notion that existentials are not behaving like operators for JA then his performance on passives involving only existential expressions is less puzzling. However, the explanation of the behavior is not entirely transparent. We cannot simply say that since there are no universally quantified terms in the expression the event position is not bound, therefore there is no interpretation for the sentence, hence JA guesses at the interpretation. This won't work for several reasons. One is that JA performs well on active sentences that contain no universally quantified terms. If it were simply the case that without a universal operator in the expression JA guessed at the interpretation, we would expect chance performance on such actives too. Another reason is that JA (and all other reported agrammatics) does not guess. He will only accept pictures associated with passives containing no universal terms that are thematic reversals of each other but otherwise correspond to the sentence. If no interpretation was taken from such strings and performance is determined through guessing there is no reason why JA's guesses should be restricted to the proper thematic roles expressed in the sentence. Why not treat the optional 'by' phrase in the passive as locative and reject the pictures that show the NP in the 'by' phrase as agent?

Furthermore, Janet Nicol reports (pc) that in grammaticality judgments on implausible passive constructions like 'the boy was eaten by the apple' JA accepts them as grammatical but recognizes that sentence is peculiar. His performance on sentence picture matching for such constructions is to primarily accept just those pictures that depict a plausible state of affairs. We have good reason then to think that JA is getting the thematic relations determined by the structure of the sentence. His impairment must be leading him to an ambiguous interpretation.

As we noted above, in order to assign a truth value to representation all the event positions in that representation must be bound (discharged in Higginbotham's terms). Furthermore, those event positions must be bound internal to the representation at hand. In the case of passives that do not contain any universal terms it will never be the case that all the event positions are bound. This is true for two reasons. First, by hypothesis, the event position is not bound internal to the representation. Second, we have the problem of interpreting the optional adjunct 'by' phrase. We can plausibly assume that the adjunct 'by' phrase supplies information about the event portrayed in the passive sentence. However, in JA's representation, the event position is not bound so



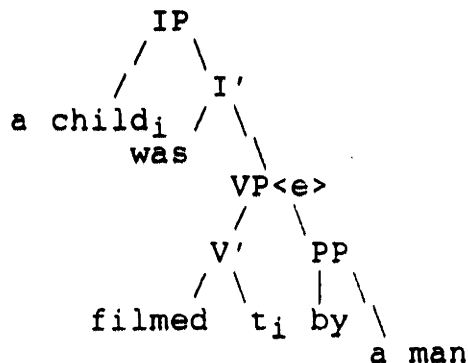
the adjunct's interpretation is dubious. This means that for JA a passive such as 12 will encode the following information: a child is 'patient' of the verb 'film', man is 'agent' but not necessarily connected to the verb 'film' and no truth value can be ascribed to the representation.

3. a child was filmed by a man

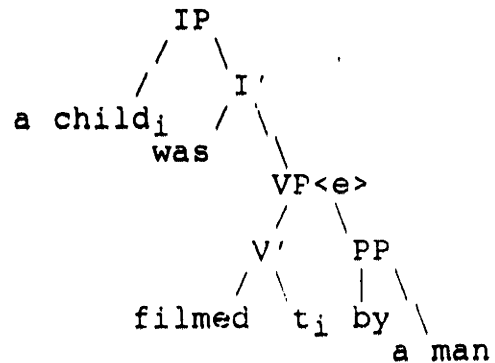
If we adopt the mechanism of 'existential closure' discussed in Heim 1982 and elsewhere to account for the interpretation of indefinite expressions, we could allow for the possibility of existential closure applying to the unbound event position. Existential closure on the event position in @Ref{pss} above would add the information that 'some filming occurs'. Existential closure of the event position is similar to the mechanism of operator binding proposed to account for JA's interpretation of sentences involving universal quantification. However, in the cases of operator binding of the event position that we have discussed the binder was related to the argument structure of the verb. A consequence of the binding was to link the event to the interpretation of the verbal expression. In the case of existential closure the operator binding the event is not related to the argument structure of the verb. Thus the thematic information associated with the arguments of the verb need not

be related to the event. The result of applying existential closure to the syntactic representation for @Ref{pss} would be to give two interpretations. The one we determined above; a child is 'patient' of the verb 'film', man is 'agent' but not necessarily connected to the verb 'film'. Plus; there was a filming. The information that filming involves a filmer and a filmee will be available to JA and the fact that 'a man' and 'a child' are present in the representation will also be available. The outcome of this is that JA will know a lot about the thematic relations relevant to the sentence but will be at doubt as to whether a child being a patient and a man being the agent of 'film' is necessarily related to the event of filming portrayed. His performance in the sentence picture matching paradigm is therefore true to his interpretation. It is either the case that a child was filmed by a man or it is the case that there was a filming that involved a man and a child.

SS:



LF:



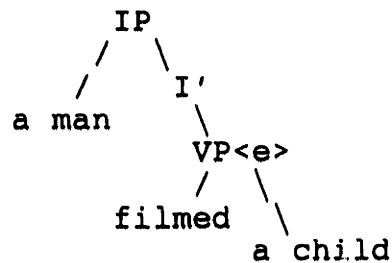
JA's interpretation of simple active sentences that do not involve universal quantification follows a similar track. A sentence such as 13.

4. a man filmed a child

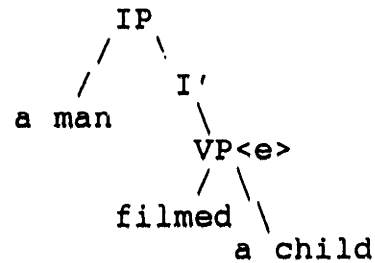
will be interpreted as 'a man' is agent of 'film', 'a child' is patient of film and there is a filming event. As in the case of passives, the binding of the event position is independent of the argument structure of the verb. JA's good performance on such sentences is presumably due to the lack of an adjunct agent phrase.

Schwartz et al. 1983 report that their subjects did not perform well on both reversible active and reversible passive sentences. This performance is compatible with the analysis offered here. A great deal of variable performance must be due to factors such as memory load and attention, elements that are external to the linguistic domain. Note that our analysis provides for the fact that knowledge of the thematic roles in the sentences is retained. The variability in performance is explained in terms of the ambiguity of the interpretation derived from the structure.

SS:



LF:



### 1.1.2 Relative Clauses

Relative clauses present an interesting problem. The restricting clause in a relative expression of English contains an instance of operator movement to Spec of Comp. Thus, for JA, the representation of a relative construction contains an operator in Spec of Comp and a unbound event position associated with the VP projection at SS and LF. The representation therefore contains an operator that c-commands the event position. Under the account developed above we would expect the WH operator to bind the free <e> in the VP. If the operator were to bind the event position we would expect that the interpretation of the restricting clause would be preserved. However, JA's performance on sentence picture matching tasks shows that he performs roughly at chance on both subject and object relatives that do not contain universally quantified phrases. That is, he is likely to accept pictures in which the thematic roles associated with the actors mentioned in the restricting clause are

reversed with respect to those presented in the stimuli sentence. It cannot be the case, then, that the relation between the operator and the event position is the same as that found in the case of constructions involving universal quantifiers. We are led to propose that WH expressions are on a par with indefinite expression. That is, they do not have the force of a quantificational operator. This position finds support in recent work by Berman (Berman 1989a&b).

Given that WH expressions may have the quantificational properties of indefinite expressions, it follows then that the event position in relative constructions will generally be subject to existential closure. The resulting representation will be parallel to the case of the passives. The construal of the head of the relative with the event identified through existential closure will compete with the construal of the head of the relative with the operator in the restricting clause. Note that this predicts, contrary to Grodzinsky, that both subject and object relative constructions should be impaired. This is indeed the case with JA his performance on subject relative constructions is 66% correct.

## 2 Two Problems

### 2.1 Relative Clauses

Two problems associated with the account of JA's pattern of comprehension need to be addressed. The first concerns his failure to understand relative clause constructions involving only indefinite expressions such as

the boy who a girl pushed is smiling  
the boy who pushed a girl is smiling

JA was quite impaired in his ability to associate sentences such as these with appropriate pictures. Our account of his differential ability to understand sentences containing universally quantified expressions relied on the idea that JA could make use of an available quantifying expression to bind the verbs <e> argument. In the case of relative clause constructions one might expect that there would always be a c-commanding quantifying expression supplied by the WH operator. Relative constructions involve WH movement in the restricting clause. If WH expressions are quantificational they should be able to perform the same role that the universal expressions provide in other constructions we considered. In fact, WH expressions are generally treated as

having universal force. It is therefore all the more puzzling that JA should have difficulties with these constructions.

Berman 1989 presents a variety of arguments that demonstrate that WH expressions may have properties much the same as those identified with indefinite expressions in Lewis 1975 and Heim 1982. Berman demonstrates that embedded WH expressions that have exhaustive or universal force associated them can also have non-exhaustive readings depending upon their quantificational environment. For example,

Sue remembers who was at the party  
has an exhaustive interpretation. As demonstrated by the contradiction inherent in 'Sue remembers who was at the party but she doesn't remember that Bill was there'. Berman contrasts sentences such as these with their counterparts containing quantificational adverbs.

Sue mostly remembers who was at the party  
Sentences such as the above do not exhibit the contradiction observed above. 'Sue mostly remembers who was at the party but she doesn't remember that Bill was there' is not a contradiction. These examples demonstrate embedded WH expressions are not inherently exhaustive. Further-

more, the quantificational force associated with the indirect question is determined by the quantificational adverb. Berman offers various examples of this:

- 1 Sue mostly remembers what she got for her birthday
  - 2 For the most part, Bill knows what they server for breakfast at Curtis and Schwartz
  - 3 Mary largely realizes who cheated on the exam
  - 4 With few exceptions, John knows who likes Mary
  - 5 To a considerable extent, the operating manual lists what bugs might occur
  - 6 The school paper recorded in part who made the dean's list
  - 7 The conductor seldom finds out who rides the train without paying
- from Berman 1989

In the above examples, the quantificational force of the embedded WH expression varies with the particular adverbial expression associated with it. Berman concludes from this that embedded WH expressions, like indefinites contain free variable positions that may be bound by a c-commanding quantificational expression.

We can see from this argument that JA's performance with respect to relative clauses is to be expected. The Wh operator in the relative clause has no inherent quantificational force. The quantificational force it exerts is derived from some quantificational property in the matrix clause. What this for JA is that there is no potential binder internal to the restricting clause that can bind the verbs <e> argument. The result is that JA's interpre-



tation of relatives is disjunctive. He will be able to determine that the action encoded in the verb is taking place and that the arguments bear various relations to the verb but he will be unable to integrate these two informational subcomponents.

An obvious question to ask is whether the introduction of a quantificational adverb into the matrix clause would improve JA's performance. This question awaits future investigation.

## 2.2 Wide Scope Indefinites

The second problem is perhaps more difficult. JA's interpretation of sentences involving universally quantified sentences led us to propose that he was using a quantified expression, when available, as a binder for the <e> argument associated with the verb. However, we also saw that JA was able to assign both narrow and wide scope interpretations to the indefinite expressions in those sentences. We adopted Heims's 1982 (and Kamp 1981) proposal that indefinites do not have a quantificational force of their own. Rather, indefinites contain free variables. The quantificational force of an indefinite is supplied by a c-commanding quantifying expression. In the case where an indefinite is not construed as within the scope of a quantifying expression the problem of interpretation arises. In a sentences such as

Every man filmed a child

A child filmed every man

JA recognizes the reading in which the indefinite is construed as having scope wider than the universal.

The commonly assumed mechanism for accounting for these wide scope readings is to apply Quantifier Raising to the indefinite expression. In the case of the above sentences, this can raise the indefinite to an A-bar position outside of the scope of the universal quantifier.

The indefinite expression will have the property of an operator. It will A-bar bind a variable in its

D-Structure position (see May 1977, 1985). However, if it is the case that the wide scope reading of indefinites is consequent to the creation of an operator-variable relation at LF we cannot distinguish between the cases of universal quantification and wide scope existential quantification of the indefinite. Our account of JAs skewed comprehension of sentences involving universal quantification would predict that wide scope indefinites should also be able to bind the <e> argument associated with the verb. The wide scope indefinite will have quantificational force. Furthermore, unlike the case of the embedded WH expression discussed above, the quantificational interpretation of the indefinite is determined within the clause containing the verb. This

would predict that JA would allow an interpretation in which only one occurrence of the event described by the verb needs to be attested in a stimuli picture order to accept it. For instance,

every man filmed a child

would be true if every man filmed a child and at least one filming is of a child. This would mean that a picture in which all the men are filming one child and a woman is filming another child (or anything else) should be accepted. Sentences such as

A man filmed every child

would be true if a man filmed every child and at least one filming is by a man. This would predict that JA would accept a picture in which one man films a group of children and another films a tree. JA never accepted such pictures.

One potential explanation exploits the fact that the universally quantified expression will always be closer to the VP after QR has applied giving rise to wide scope interpretation of the indefinite. Such an approach is would rely on some version of locality preventing the wide scope indefinite from binding into the verbs <e> argument over the universal. The type of evidence Heim

used to adduce the non-quantificational aspect of indefinite expressions appears to show such a locality requirement.

Heim presents examples such as

'In most cases, if a table has lasted 50 years it will last for another 50'

The fact that the non-adverbial paraphrase associated with this sentence is

'Most tables that have lasted for 50 years will last for another 50'

Heim takes as evidence that the quantificational force of the indefinite expression is determined by the adverbial phrase. (see Heim 1982, pg.123) We can apply a similar test to see if the force of the adverbial expression can apply over a universal expression. consider

In most cases, every cup on a shelf will be chipped.

every cup on a shelf will usually be chipped.

These sentences can be paraphrased as

'every cup on most shelves will be chipped'.

providing the indefinite is construed as wide with respect to the universal. That is, 'in most cases, if you have a shelf with cups on it, every cup will be chipped' as opposed to 'in most cases, if you have every chipped cup, it will be on a shelf'. The above sentences contrast with the following.

In most cases, every president of a company is rich.  
 every president of a company is usually rich.  
 These sentences cannot be paraphrased as  
 'every president of most companies is rich'  
 unless the indefinite is construed as wide with respect  
 to the universal. That is, the paraphrase can only be  
 associated with 'in most cases, if you have a company,  
 every president of that company is rich'. Such examples  
 would appear to support Heim's contention that "...indefi-  
 nites get bound by the nearest c-commanding quantifier"  
 (Heim 1982,pg. 307). However, a problem arises in  
 determining the nature of 'nearest'. It is clear from  
 the above examples that 'nearest' can't be an S-structure  
 phenomena. The universal is a closer c-commander than  
 the quantificational adverbial in both cases. LF must be  
 the relevant domain for 'nearness'. However, at LF the  
 quantifier raised quantificational adverbial and the  
 quantifier raised universal are equally close to the  
 quantifier raised indefinite.

[<sub>IP</sub>a shelf<sub>3</sub>[<sub>IP</sub>[every cup on t<sub>3</sub>]<sub>2</sub>]<sub>2</sub>[<sub>IP</sub>in most  
 cases<sub>1</sub>[<sub>IP</sub>t<sub>1</sub>[<sub>IP</sub>t<sub>2</sub>.....  
 [<sub>IP</sub>usually<sub>1</sub>[<sub>IP</sub>a shelf<sub>3</sub>[<sub>IP</sub>[every cup on  
 t<sub>3</sub>]<sub>2</sub>]<sub>2</sub>[<sub>IP</sub>t<sub>1</sub>[<sub>IP</sub>t<sub>2</sub>.....

I have omitted the representation in which the QRed indefinite attaches to the universally QP it is raised from. In this configuration the universal is always 'nearer' than the quantificational adverb.

If we adopt the segmented maximal projection approach to adjunction then both the universal and the quantificational adverb m-command the indefinite (see May 1985 and Chomsky 1986). If we count nodes we find that in the case of the VP adjoined QAdv, the QAdv and the universal are both one node distant from the indefinite. In the case of the IP adjoined QAdv the universal is one node closer.

If we hold to strict c-command we expect there to be a difference between the interpretational possibilities associated with quantificational adverbs adjoined to IP and quantificational adverbs adjoined to VP owing to their potential QR landing sites. In order to avoid nested dependencies (see May 1985), the IP adjoined QAdv must take the innermost IP adjunction. For the same reason, the VP adjoined QAdv must take the outermost IP adjunction. Thus we would expect that only the VP adjoined QAdv could bind the wide scope indefinite. As we can see, there is no straight forward way to apply the notion of 'nearness' even though it is an intuitively appealing approach. It may well be that the objections

we raised here are technical problems however, given the pattern of JA's performance we will entertain another possibility.

Is it possible that scope is assigned to these expression without movement? If that we so then no operator variable chain would be generated and the wide scope indefinite would never be a potential binder for the verbs <e> argument.

In what follows we will examine evidence that there must be a mechanism additional to movement that can provide scopal interpretation. The evidence comes from the properties of WH expressions in Bahasa Indonesia.

## 1 Bahasa Indonesia WH Constructions

The following is a sketch of the grammatical properties of WH construal in Bahasa Indonesia. The aim here is to demonstrate a 'scoped' interpretation can be accounted for in terms of movement. It is of relevance to our discussion in that it represents a special property of WH expressions that, we will argue, is tied to the fact that they behave quantificationally like indefinites. For a detailed examination of the properties of Bahasa Indonesia fronting operations see Saddy forthcoming.

Bahasa Indonesia (henceforth BI) is a SVO language. It is somewhat similar to Chinese in that its word order is fairly strict and it shows no agreement for person, number or gender on the verb or noun. The verbs are prefixed with a transitivity marker. /men/ indicates transitive, /ber/ indicates intransitive and /di/ indicates passive. The property that interests us here is the constraints on WH question constructions.



WH constructions in BI are of two sorts, those in which the WH expression remains in its D-Structure position and those in which an argument WH phrase has undergone focus movement. This movement may be into matrix or intermediate clauses in multi-clausal constructions. In the former case, BI argument WH expressions are immune to island and/or ECP effects. An argument WH expression that remains in-situ can always be interpreted as a matrix question. This is much the same as the phenomena reported for Chinese by Huang 1982. In the case of moved WH expressions, their movement possibilities are constrained. They are subject to island and ECP type effects. The sensitivity to island phenomena exhibited by S-structure moved WH expressions can be shown to apply in their mapping to LF as well. That is, moved Wh expressions show correspondence effects. Thus BI WH expressions appear to provide evidence for two mechanisms of WH scope construal applying at LF. One, which applies only to unmoved argument WH expressions and which is not sensitive to any syntactic constraints on movement. Another, which applies to WH expressions that have been moved at S-structure, and which is sensitive to syntactic constraints on movement.

The properties of these two mechanisms of WH scope construal are also distinguished with respect to their interaction with quantification. WH in-situ argument expressions are not quantificationally interactive. They always have widest scope interpretation. Thus a family of questions reading is never available with WH in-situ argument expressions whereas family of questions readings are available with moved WH expressions.

This phenomena is compatible with Pesetsky's 1987 proposal of D-linking. If focussed WH expressions in BI are necessarily non-D-linked then Pesetsky's system predicts their LF sensitivity to movement constraints. However, Pesetsky's characterization of the D-linked readings as Q-binding does not, on the face of it, predict the lack of quantificational interaction exhibited by the unmoved BI WH expressions.

This phenomena also bears upon recent proposals by Rizzi (1990). Rizzi makes use of the notion of 'Referential Indices' as an important mechanism for accounting for extraction asymmetries. Essentially, Rizzi proposes that traces of extracted expressions bearing referential indices need not be antecedent governed, only bound,

where binding includes the requirement that the binder and the bindee share referential index. This allows Rizzi to simplify his definition of the ECP.

According to Rizzi, "A referential index must be licensed by a referential theta role." (Rizzi 1990, #(28)). The BI phenomena calls this characterization into question. The sensitivity of a WH argument expression to movement constraints depends upon whether or not it has undergone syntactic movement. The theta role, and hence whether or a referential index is licensed, does not change.

Rizzi does suggest that "a long-distance binding connection gives optimal results when the variable is in the referential thematic position" (Rizzi 1990, pg. 102). However, the effects he is discussing are much subtler than the phenomena attested in BI. The asymmetries attested in BI appear to be of a different than those traditionally discussed. The evidence seems to be that a mechanism exists for wide scope WH construal that is independent of movement. Given the arguments from Berman cited earlier, we may treat the cases of BI WH-in-situ wide scope construal and the case of indefinite wide scope construal as varieties of the same phenomena.

## 1.1 Constraints on BI WH Movement

WH argument expressions in BI may remain in their D-structure positions or, like other arguments in BI, they may be focussed. Adjunct expressions may not undergo focus movement.

Focus movement of WH arguments involve two salient features.

1) The appearance of the element /yang/ immediately following the moved element, see 2 and 4. In cases of WH in situ no /yang/ occurs.

2) If the object remains in-situ the verbal prefix optionally appears. However, if movement takes place out of a VP then the verbal prefix must delete. Thus in 4 movement of an WH object results in the appearance of /yang/ and the disappearance of the verbal prefix /men/.

Subject WH in situ:

(1)

Siapa men-cintai Sally  
Who trans-loves Sally

Subject WH focus:

(2)

Siapa yang men-cintai Sally  
Who trans-loves Sally

Object WH in situ:

(3)

Sally men-cintai siapa  
Sally trans-loves who

Object WH focus:

(4)

Siapa yang Sally cintai  
Who Sally love

.

The phenomena described above hold for movement across clauses as well. The deletion of the verbal prefix occurs regardless of whether the moved element is an argument of the verb or an

argument coming from an embedded complement.

(5)

Bill men-gira Tom meng-harap Fred men-cintai Mary  
Bill thinks Tom expects Fred loves Mary

(6)

Bill men-gira Tom men-harap Fred men-cintai siapa  
Bill thinks Tom expects Fred loves who

(7)

siapa<sub>i</sub> yang Bill Ø-kira Tom Ø-harap Fred Ø-cintai t<sub>i</sub>  
who Bill think Tom expects Fred loves  
Who did Bill think Tom expects Fred loves

(8)

\*siapa<sub>i</sub> yang Bill men-gira Tom men-harap Fred men-cintai t<sub>i</sub>  
who Bill think Tom expects Fred loves  
Who did Bill think Tom expects Fred loves

In 5 we see that the transitive marker /men/ appears on all three verbs. In 6 the most embedded object is questioned but the WH term /siapa/ 'who' stays in situ and the prefixes remain on the verb. In 7 the most embedded object is questioned and WH movement has applied. In this case the prefixes on the verbs must delete. If the second most embedded

object were to be questioned the verb governing it and the matrix verb would lose their prefixes but the prefix would remain on the most embedded verb. If the prefixes do not delete, as in 8, the sentence is ill formed.

As we saw in 2 above, WH movement from subject position does not result in deletion of the verbal prefix.

However, if

extraction takes place from an embedded subject the verbal prefix

deletes from the superior verbs.

(9)

Bill men-beri Tom men-harap siapa men-cintai Fred

Bill thinks Tom expects who loves Fred

Who does Bill think Tom expects loves Fred

(10)

siapa<sub>i</sub> yang Bill Ø-beri Tom Ø-harap t<sub>i</sub> men-cintai Fred

who Bill think Tom expects loves Fred

Who does Bill think Tom expects loves Fred

(11)

\*siapa<sub>i</sub> yang Bill men-beri Tom men-harap t<sub>i</sub> men-cintai Fred

who Bill think Tom expects loves Fred

Who does Bill think Tom expects loves Fred

### 1.1.1 Complementizer and Focus Marker

The particle /yang/, which we will treat as a focus marker, occurs in all cases WH argument movement. It is tempting to identify /yang/ as an interrogative counter part to the complementizer /bahwa/. It occurs in the appropriate constructions and in the appropriate positions. However, a moved WH argument and /yang/ can co-occur with the overt complementizer. This cooccurrence forces an embedded question interpretation in the complements of verbs that optionally take +WH complements like know -/tahu/.

(12)

Bill tahu bahwa Tom men-cintai Fred  
Bill knows that Tom loves Fred



(13)

Bill tahu bahwa Tom men-cintai siapa

Bill knows that Tom loves who

(14)

Bill tahu bahwa siapa yang Tom cintai

Bill knows that who Tom loves

(15)

\*Siapa yang Bill tahu bahwa Tom cintai

Who Bill knows that Tom loves

(16)

\*Siapa yang Bill tahu bahwa men-cintai Fred

Who Bill knows that loves Fred

(17)

\*Siapa Bill tahu bahwa yang Tom cintai

Who Bill knows that Tom loves

(18)

\*Siapa yang Bill tahu bahwa yang Tom cintai

Who Bill knows that Tom loves

13 and 14 both have only the embedded question interpretation - 'Bill knows who Tom loves'.

Neither objects nor subjects may be moved over an overt complementizer. Thus 15 and 16 are both bad. In fact any S-structure movement over an overt complementizer is ungrammatical.

The /yang/ must appear left string adjacent to the question word

as shown in 17, and a downstairs /yang/ does not license an upstairs/yang/ as in 18. In general only one /yang/ can occur.

The removal of the overt complementizer /bahwa/ from 13, 14, 15 and 16 changes their properties. 15 and 16 become well formed matrix questions. 13 and 14 become ambiguous between the embedded interpretation and a matrix question interpretation. Note that the WH expression may move part way, as in 20.

(19)

Bill tahu Tom men-cintai siapa  
Bill knows Tom loves who

(20)

Bill tahu siapa yang Tom cintai  
Bill knows who Tom loves

(21)

Siapa yang Bill tahu Tom cintai  
Who Bill knows Tom loves

(22)

Siapa yang Bill tahu men-cintai Fred

Who Bill knows loves Fred

We see then that the presence or absence of the complementizing element has a important effect on the potential interpretations of sentences involving focus movement. These interpretations follow if we assume that the LF movement of the WH expressions is constrained in a similar fashion as their S-structure movements.

#### 1.1.2 Extraction From Islands

The above examples show that movement can be blocked by certain types of Barriers; S-structure movement is constrained by the existence of complementizers and verbal prefixes. We find too that the traditional island constructions are islands to overt movement in Bahasa. However, unmoved WH argument expressions freely take interrogative scope outside of the syntactic island. In the following examples the grammatical cases are all well formed matrix questions.

WH Island:

(23)

\*Apa<sub>i</sub> yang kamu katakan [dimana kita beli t<sub>i</sub>]

What                    you mention where                    we    bought

(24)

\*Apa<sub>i</sub> yang kamu katakan [kita beli t<sub>i</sub> dimana]

What                    you mention    we    bought    where

(25)

kamu ingat kita mem-beli apa dimana

you remember we bought    what    where

What do you remeber where we bought

Extraction from Relative Clause:

(26)

\*Siapa<sub>i</sub> yang kamu sukai [dpcerita yang mengeritik t<sub>i</sub> itu]

Who do                    you like                    stories that criticize    the

(27)

kamu sukai [dpcerita yang mengeritik siapa itu]

you like    stories that criticize    who    the

Who do youlike stories that criticize

Extraction from Subject:

(28)

\*Siapa<sub>i</sub> yang kamu kira [dpgambar t<sub>i</sub>] dijual

Who do                    you think that pictures of be sold

(29)

kamu meng-gira [dpgambar siapa] dijual

you    think    pictures of who    be sold

Who do you think that pictures of were sold

Extraction from Adjunct:

(30)

\*Siapa<sub>i</sub> yang kamu cemburui Bill [karena saya berbicara dengan t<sub>i</sub>]

Who did you be jealous of Bill because I spoke with

(31)

kamu men-cemburui Bill [karena saya berbicara dengan siapa]  
you be jealous of Bill because I spoke with who  
Who did you get jealous of Bill because I spoke with

(32)

\*kamu men-cemburui Bill [karena dengan siapa yang saya berbicara]

you be jealous of Bill because with who I spoke

(33)

\*kamu men-cemburui Bill [karena dengan siapa saya berbicara]  
you be jealous of Bill because with who I spoke

Following a long tradition, we assume that matrix  
question

interpretation results from the association of a WH  
expression

with the matrix Comp position. The fact that the unmoved  
versions

of these sentences are grammatical suggests that, in the  
mapping

from S-structure to LF, movement takes place that is

unconstrained. This is the familiar phenomena noted in Lasnik and Saito 1984 and Huang 1983.

### 1.1.3 LF Movement Constraints

The preceeding examples have presented the basic phenomena associated with WH argument expressions in BI. By and large, moved WH expressions in this language behave in a familiar, if somewhat more restricted, fashion.

The extra restrictions on moved WH expressions in BI offers some interesting evidence that LF WH movement is syntactically constrained. The examples involve cases of moved WH arguments in complement clauses to verbs that do not take interrogative complements.

We saw above that neither WH subjects nor WH objects could be moved over the overt complementizer /bahwa/. There is another class of environments that shows a similar restriction. Factive verbs exemplified here by /ingat/ - 'remember' and verbs with negative force exemplified here by /tolak/ - 'deny' do not tolerate well movement of WH expressions out for their complements.

Subjects:

(34)

\*siapa<sub>i</sub> yang Tom ingat t<sub>i</sub> mem-beli buku

Who Tom remember bought a book

\*Tom rembered who bought a book

\*Who did Tom remember bought a book

(35)

Tom ingat siapa<sub>i</sub> yang t<sub>i</sub> mem-beli buku

Tom remembered who bought a book

Tom rembered who bought a book

\*Who did Tom remember bought a book

(36)

Tom ingat siapa mem-beli buku

Tom remembered who bought a book

Tom rembered who bought a book

Who did Tom remember bought a book

(37)

\*Siapa yang Tom tolak mem-beli buku  
who did Tom deny bought a book

\*Who did Tom deny bought a book

(38)

?Tom men-(t)olak siapa yang mem-beli buku  
Tom denied who bought a book

Who did Tom deny bought a book

(39)

Tom men-(t)olak siapa mem-beli buku  
Tom denied who bought a book

Who did Tom deny bought a book

Objects:

(40)

\*?Apa<sub>i</sub> yang Tom ingat Mary Ø-beli t<sub>i</sub>  
What Tom remembered Mary bought

\*Tom remembered what Mary bought

\*What did Tom remember Mary bought

(41)

Tom ingat apa<sub>i</sub> yang Mary Ø-beli t<sub>i</sub>  
Tom remembered what Mary bought

Tom remembered what Mary bought

\*What did Tom remember Mary bought

(42)

Tom ingat Mary mem-beli apa  
Tom remembered Mary bought what

Tom remembered what Mary bought

What did Tom remember Mary bought



(43)

\*Apa<sub>i</sub> yang Tom Ø-tolak Mary Ø-beli t<sub>i</sub>

What Tom deny Mary bought

\*What did Tom deny Mary bought

(44)

?Tom men-olak apa<sub>i</sub> yang Mary Ø-beli t<sub>i</sub>

Tom deny what Mary bought

What did Tom deny Mary bought

(45)

Tom men-olak Mary mem-beli apa

Tom deny Mary bought what

What did Tom deny Mary bought

The interpretation of WH expressions under factives is somewhat

restricted. If the WH expression occurs in situ in the complement to a factive verb or verb of negative force, the

sentence may be freely given a matrix question interpretation. If

the WH expression has moved within the complement to the factive

verb or verb of negative force then an embedded question interpretation is highly preferred if the verb takes an interrogative complement. If the verb does not take an

interogative complement then a matrix question interpretation is possible.

This contrasts with the viability and interpretation of extraction over non-factive verbs.

Subjects:

(46)

Siapa<sub>i</sub> yang Tom harap t<sub>i</sub> mem-beli buku  
Who Tom expect bought a book  
Who did Tom expect bought a book

(47)

Tom men-ceritakan siapa<sub>i</sub> yang t<sub>i</sub> mem-beli buku  
Tom said who bought a book  
Tom said who bought a book  
Who did Tom say bought a book

(48)

Tom men-ceritakan siapa mem-beli buku  
Tom say who bought a book  
Tom said who bought a book  
Who did Tom say bought a book

Objects:

(49)

Apa<sub>i</sub> yang Tom  $\emptyset$ -harap Mary  $\emptyset$ -beli t<sub>i</sub>

What Tom expect/hope Mary bought

What did Tom expect/hope Mary bought

(50)

Tom men-ceritakan apa<sub>i</sub> yang Mary  $\emptyset$ -beli t<sub>i</sub>

Tom say what Mary bought

Tom said what Mary bought

What did Tom said Mary bought

If the matrix verb cannot take an interrogative complement then the sentence is interpreted as a matrix question, regardless of whether or not the WH expression has moved within the complement. If the non-factive verb can take an interrogative complement, then the sentence is ambiguous between an embedded or matrix question interpretation regardless of whether or not the WH expression has moved within the complement.

#### 1.1.4 Evidence of Syntactic Constraints on LF Movement \*

We can exploit the possibility of partial WH fronting presented in the above constructions. In the syntax the WH expression moves to an intermediate position in an embedded clause. Due to selectional constraints however,

the WH expression must be interpreted as a matrix interrogation. Thus LF WH movement is forced in these constructions. If LF WH movement is sensitive to syntactic constraints on movement we would expect that the introduction of an additional barrier into the matrix clause would affect the possibility of LF WH movement. This is indeed the case in BI.

If we add negation to the matrix verb we find that while the in situ constructions are still fine, the intermediate movement constructions become ungrammatical.

(51)

Tom tidak meng-harap Mary mem-beli apa  
 Tom not expect Mary bought what  
What doesn't Tom expect Mary bought  
\*Tom doesn't expect what Mary bought

(52)

\*Tom tidak meng-harap apa yang Mary beli  
 Tom not expect what Mary bought  
\*What doesn't Tom expect Mary bought  
\*Tom doesn't expect what Mary bought

(53)

Tom tidak men-olak Mary mem-beli apa  
 Tom not deny Mary bought what  
What doesn't Tom deny Mary bought  
\*Tom denies what Mary bought

(54)

\*Tom tidak men-olak apa yang Mary beli  
Tom not deny what Mary bought  
\*What doesn't Tom deny Mary bought  
\*Tom doesn't deny what Mary bought

Here we see rather striking evidence syntactic constraints applying to abstract movement. Movement of the WH expressions are not constrained at all internal to the complement clause. However, the introduction of a negative element to matrix clause renders the moved WH constructions ungrammatical. The WH does not and need not move out of the island induced by negation at S-structure. However, since the matrix verb does not take an interrogative complement, the WH expression must have a matrix construal. Thus we see that the introduction of the negative to the matrix clause introduces a barrier to LF movement of the partially moved Wh expression. Both subjects and objects show this effect. Thus we have subject examples like 55, 56 and 57 as well.

(55)

Tom meng-harap siapa mem-beli buku  
Tom expects who bought a book  
Who does Tom expect bought a book  
\*Tom expects who bought a book

(56)

?Tom meng-harap siapa yang mem-beli buku

Tom expects who bought a book

Who does Tom expect bought a book

\*Tom expects who Mary bought a book

(57)

\*Tom tidak harap siapa yang mem-beli buku

Tom not expects who bought a book

\*Who does Tom expect bought a book

\*Tom expects who bought a book

The above paradigm approximates an LF parallel to the range extraction phenomena recently considered in Rizzi 1990, Lasnik and Saito 1990 and Kroch 1990. Certain Wh expressions are unrestriced in thier extraction possibilities while others are subject to local constraints on movement. One distinguishing feature is the fact that the movement takes place at LF in both instaces. Furthermmore, the form of the WH expressions themselves are identical, they are both arguements and they bear the same theta roles. What we observe is that once any syntactic WH movement has taken place, WH movement for that item must continue via some locally constraining mechanism. If no movement has taken place some alternative and unconstrained method of construal is

available. This description is in accord with the constraints on interpretation introduced by the presence of an over complementizer we saw earlier.

## 1.2 WH-Quantifier Interactions

These two mechanisms of WH movement are also distinguished with respect to their interactions with quantifying expressions.

Non-interrogative expressions in Bahasa Indonesia generally show a surface order pattern of interpretation.

(58)

setiap orang men-cintai seorang perempuan  
every person loves some woman

58 is ambiguous between an interpretation in which there is one woman such that every person loves her and a

reading in which for every person there is some woman  
that he or  
she loves.

In the case of wide scope reading of a universal over an  
existential subject. If the existential quantifier  
/seorang/ -'some' is used, as in 59, then an  
interpretation in which the existential is wide with  
respect to the universal is enforced. If a bare noun is  
used, as in 60, then the wide scope construal of the  
universal is possible. The reading in these cases,  
however, appears to be generic.

(59)

Seorang perempuan men-cintai setiap orang  
some woman loves every person

(60)

Perempuan men-cintai setiap orang  
woman loves every person

When the existential expression is replaced with an  
interrogative a different pattern of interpretation  
emerges. The salient contrast is in the interpretations  
afforded the two sentences given below in 61 and 62.  
These two sentences constitute a minimal pair



distinguished only by the application of A movement of the WH expression.

(61)

Setiap orang men-cintai siapa  
every person loves who  
Who did every person love

(62)

Siapa<sub>i</sub> yang setiap orang 0-cintai t<sub>i</sub>  
who every person loved  
Who did every person love

These two sentences are distinguished also in their interpretations. In the case of WH in situ constructions, the WH term may not be interpreted as distributed with respect to a dominating quantified expression. 61 is unambiguous. The only interpretation available for 61 is 'who is the one individual such that every person loves that person'.

In the case of WH moved constructions however, ambiguity obtains. 62 is ambiguous, admitting either the reading in which the 'who' takes wide scope with respect to 'every person' and also the reading in which 'who' is interpreted as narrow with respect to 'every person' resulting in a family of questions interpretation.

This this pattern is also evidenced in multi-clausal constructions. 63 has only widest scope interpretation. Both 64 and 65 allow either a wide or narrow scope interpretation of the WH expression with respect to the universal quantifier in subject position when interpreted as matrix questions.

(63)

Bill tahu Tom men-beli apa  
Bill knows Tom bought what

(64)

Bill tahu apa yang Tom beli  
Bill knows what Tom bought

(65)

Apa yang Bill tahu Tom beli  
What Bill knows Tom bought

A similar pattern can be seen with embedded subjects. 66 has only a widest scope interpretation. 67 and 68 permit quantificational ambiguity.

(66)

Bill tahu siapa men-beli buku  
Bill knows who bought a book

(67)

Bill tahu siapa yang mem-beli buku  
Bill knows who bought a book

(68)

Siapa yang Bill tahu mem-beli buku  
Who            Bill knows    bought a book

In addition we see a parallel in the interpretation of multiple WH constructions in BI. 69 only allows widest scope interpretation on /apa/-'what'. It does not allow a list of pairs or 'absorbed' response. 70, on the other hand does allow such a response.

(69)

Siapa yang tahu Tom men-beli apa  
Who            knows Tom    bought what

(70)

Siapa yang tahu apa yang Tom beli  
Who            knows what    Tom    bought

The nature of these contrast calls into question some of our assumptions regarding the determination of relative scope. The relative scope of quantified expressions generally corresponds to their c-command relation (see Reinhart 1983 and 1976). If A c-commands B then, all things being equal, A has scope over B. For example, negative polarity items must be in the scope of negation. This requirement is met if some element with negative force c-commands the polarity item. Following May 1977

we can assume that the relative scope of universal and existential quantifiers is similarly determined.

If we assume that WH expressions in Indonesian move to Spec of Comp at LF we would predict that the 61 and 62 should have the same interpretations. They do not. 62 is ambiguous in its scopal interpretation, 61 is not. If we suppose that WH in situ expressions do not move at LF, we would expect that the interpretation of 61 would correspond to the surface order of its constituents. That is, we would expect that the interrogative existential apa would be interpreted as having narrow scope with respect to the universally quantified term setiap orang. Under this relative scope ordering the existential should distribute with respect to the universal, giving us a family of questions interpretation. Once again, this is not the case. The interpretation in which 'what' is distributed with respect to 'every person', is not available. That is, 61 cannot be answered ' Bill loves Mary, Tom loves Sue, Alice loves Harold etc..'. In fact, the actual scope interpretation is the opposite of we would typically expect.

This interpretational pattern is generally true. If the WH expression is unmoved no quantificational interaction is possible. If movement has taken place the possibility of construing WH expression as narrow with respect to a c-commanding quantifier reappears modulo the syntactic environment.

### 1.3 Scope without Movement?

We saw in 1.1.4 evidence that fronted WH expressions do move at LF. The evidence for this comes from constraints on potential interpretations as well as island effects applying in the mapping to LF. This type of phenomena is compatible the long standing assumption that WH interrogative readings (either embedded or matrix) come about via the association of the WH expression with a maximal clause node, in current parlance, with CP. Baker 1970 made use of this assumption to account for ambiguities of inherent in multiple WH constructions in English. In the BI examples we evidence of the fronted WH expressions attempting to move to a superior CP projection at LF.

The WH-quantifier interaction facts cited above are partially supportive of this notion as well. Fronted WH expressions are capable of interacting with quantified expressions that c-command them at S-structure. The quantificational interpretation associated with unmoved WH expressions, however, is not amenable to the standard assumption. If fronted and unmoved WH expressions ultimately end up in the same position they should have the same possibility of quantificational interaction.

Pesetsky's D-linking approach supplies a mechanism for accounting for cases like the fronted WH expressions in BI. Under his analysis, WH expressions are distinguished between two types. Those that are associated with a discourse referent, D-linked expressions and those that are not associated with a discourse referent, non-d-linked expressions. Pesetsky adopts Baker's (1970) proposal that scope of interrogation is determined via a binding relation holding of an abstract Q morpheme base generated in Comp and combines it with Heim's (1982) notion of unselective binding (discussed earlier). Pesetsky's proposal is that Wh interpretation proceeds via two mechanisms depending upon whether or not the WH

expression is D-linked. If D-linked, the Wh expression may be unselectively bound by a Q-operator. If a WH expression is not D-linked cannot be Q bound and must move cyclically. Pesetsky presents evidence from various languages that non-D-linked WH expression show evidence of syntactically constrained movement at LF while D-linked expressions are not so constrained.

Pesetsky's account of the properties of non-D-linked WH expressions can be applied directly to the BI cases. If the fronting operation movement to a focused position we can expect that the WH expression will not be treated as "familiar" in the discourse context. Hence it will qualify as non-D-linked in Pesetsky's sense. However, the behavior of the unmoved WH expressions is still problematic. It is a necessary property of Pesetsky's Q-bound D-linked Wh expressions that they do interact quantificationally with other elements in the matrix clause. A case in point is the absorbed readings in multiple WH expressions.

(71)

Which man said that a student knew the clerk who cheated which chil

Examples like 71 demonstrate the fact that D-linked WH expressions are not sensitive to syntactic islands. Furthermore, they demonstrate that the unmoved WH D-linked WH expression is interpreted with the matrix WH expression. 71 can be interpreted as a request for a list of name pairs; each instance of the pairing between 'the man that said..' and 'the cheated child'. This exactly the type of reading that is impossible in BI if the deepest WH expression hasn't fronted (see 69 and 70 above).

This phenomena of multiple interrogation without absorption or matrix scope interpretation without quantificational interaction is unique to BI. Such cases exist in English as well.

If a WH-in-situ expression under goes passivization, there is a shift in the acceptability of the constructions and the possibility of an absorbed reading is lost. Contrast 71, repeated here as 72, with 73, 74 with 75 and 76 with 77.

(72)

Which man said that a student knew the clerk who cheated which chil



(73)

?Which man said that a student knew the clerk who which child was cheated by

(74)

Which man wonders where you met which woman

(75)

?Which man wonders where which woman was met

(76)

Who said that who kissed Sue

(77)

Who said that who was kissed

All of the above examples are reasonably well formed multiple questions. However, in the passive case the answer assumes that answer to the passivized WH expression is the same regardless of the answer to the matrix WH expression. Thus in all the cases in which passive has applied we find that a list of pairs or absorbed reading is not available or is markedly more difficult than in the non-passivized cases. Examples 76 and 77 show that the problem is not simply due to being in subject position. An attempt at explaining this surprising asymmetry would take us far afield (but see Saddy forthcoming for a attempt). Rather we note this paradigm as another example of apparent matrix scope being determined in an unconventional manner.

#### 1.4 Specific Variables

We find then that BI WH expressions and to a lesser extent English WH expressions present us with the same problem we were led to in the case of JA's ability to construe scope ambiguities. How is it possible to have an apparent wide scope reading without having quantificational force? In JA's case this was a property of indefinite expressions. In BI and The english cases cited above, it is a property of WH expressions.

We were led to examine the properties of WH expressions because of their similarities to indefinite expressions as demonstrated by Berman's arguments. The salient aspect that united indefinites and WH expressions was the demonstration that these elements appear to have no quantificational force of their own. The mechanism by which these elements are construed as taking scope must be the same then as the construal mechanism by which other non-quantificational expressions appear scoped. Proper names, for example, appear to take widest scope (see Russell 1905). The sentence 'everyone saw John'

means only that everyone saw the same individual. It cannot mean that each person saw a different individual named John. This of course is because 'John' denotes a specific individual in its normal use. Fodor and Sag (1982) discuss the specific and non-specific use of indefinite expressions. If, as Heim has argued, the range of properties characteristic of indefinites follows from their non-quantificational status then the full range of interpretations associated with indefinites would be expected to be attested with WH expressions as well. The cases of non-quantificationally active wide scope readings of WH expressions can be interpreted as instances of a specific reading of a free variable WH expression. Obviously this possibility is constrained in various fashions. Our examination of BI has brought to light examples where this interpretation becomes salient. Furthermore, the task JA was performing, sentence picture matching, is very conducive to a specific indefinite interpretation. Indeed, the pictures provide a specific individual that can be understood as the object denoted by the specific indefinite use. We hope these demonstrations prove helpful to the task of understanding the quantificational properties of natural language.

### 1.5 Concluding Remarks

We have presented what we consider to be a parsimonious account of a complex pattern of impaired behavior. The account assumes the essentially intact operation of grammatical machinery and relies on the notion that an event argument is associated with a verb. The specific properties of this deficit provide evidence in favor of the notion that such an element exists. We propose that under normal conditions this event argument has a distinctive verbal feature. It is then demonstrated that the pattern of retained and impaired performance follows from the assumption that the distinctive verbal property of the event argument is lost. The properties of the otherwise intact grammar provide an explanatory account of the range of behavior observed.

Our account crucially assumed that JA was capable of generating a well formed syntactic representation in response to a given sentence. JA's peculiar comprehension sensitivity to universally quantified expressions is accounted for by assuming that a level of

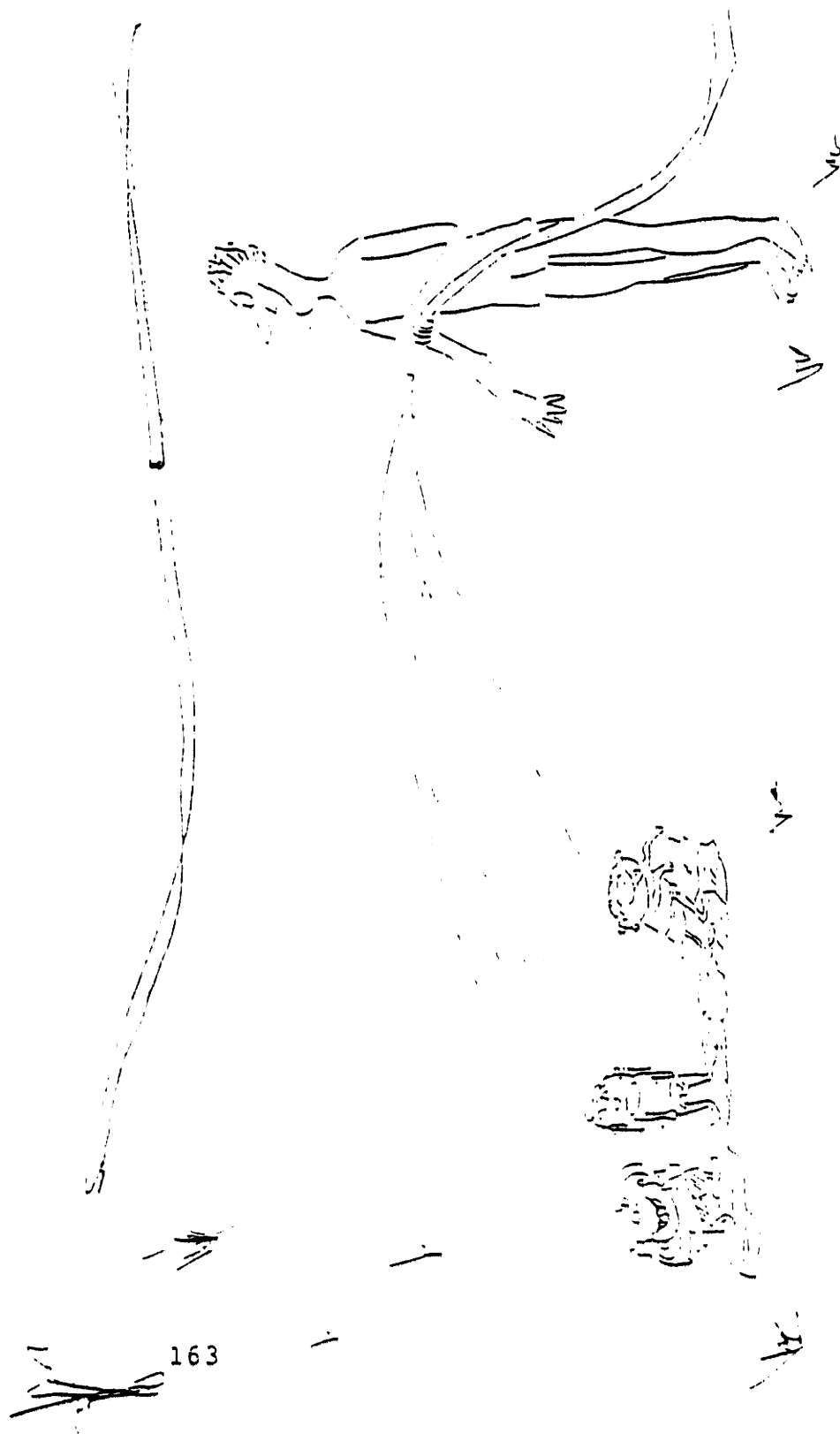
logical form is generated that accommodates the special property of the event argument. Our study provides a demonstration of the generation of a well formed phrase marker from two sources: (1) the retained ability to make grammaticality judgments, perform the insertion task and recognize scope ambiguities and (2) the existence of a deficit that requires that a level of logical form be generated in order to account for subsequent misinterpretation.

We also addressed JA's apparent paradoxical behavior in that he could assign wide scope readings to indefinites but did not use the scope indefinite as a substitute binder for the verbs <e> argument. In doing this we provided new evidence of the availability of a non-quantificational mechanism for attaining apparent wide scope readings of indefinite and WH expressions.

## 12 FIGURES

Figure 1

A man sprayed every child  
True : existential wide to universal  
JA judges true



A man sprayed every child  
True : universal wide to existential  
JA judges true

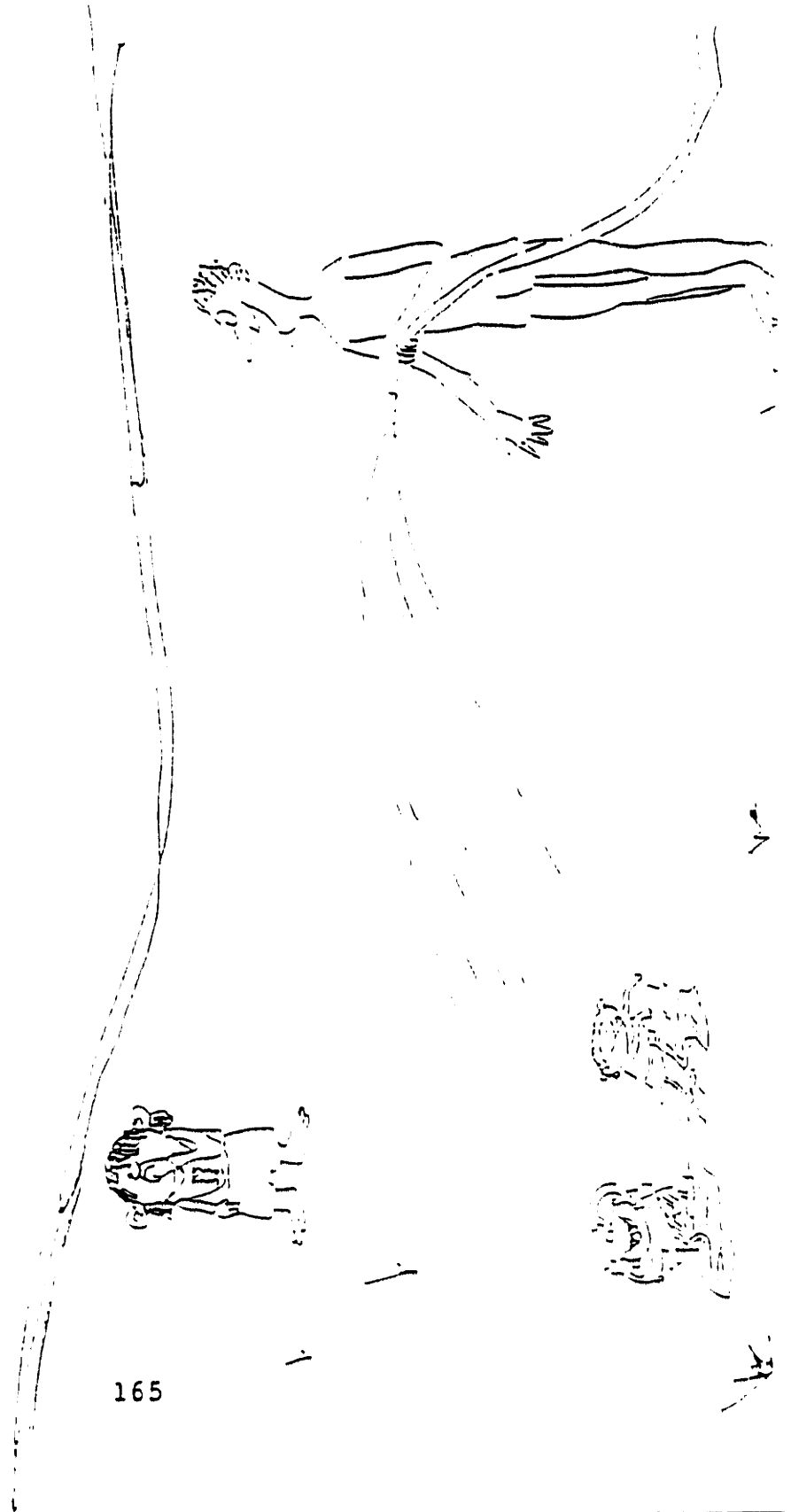
Figure 2





Figure 3

A man sprayed every child  
False : existential wide to universal  
JA judges false



A man sprayed every child  
False : universal wide to existential  
JA judges false

Figure 4



Figure 5

A man sprayed every child  
True : existential white to universal  
Foil : every child is sprayed plus man sprays flower  
JA judges false

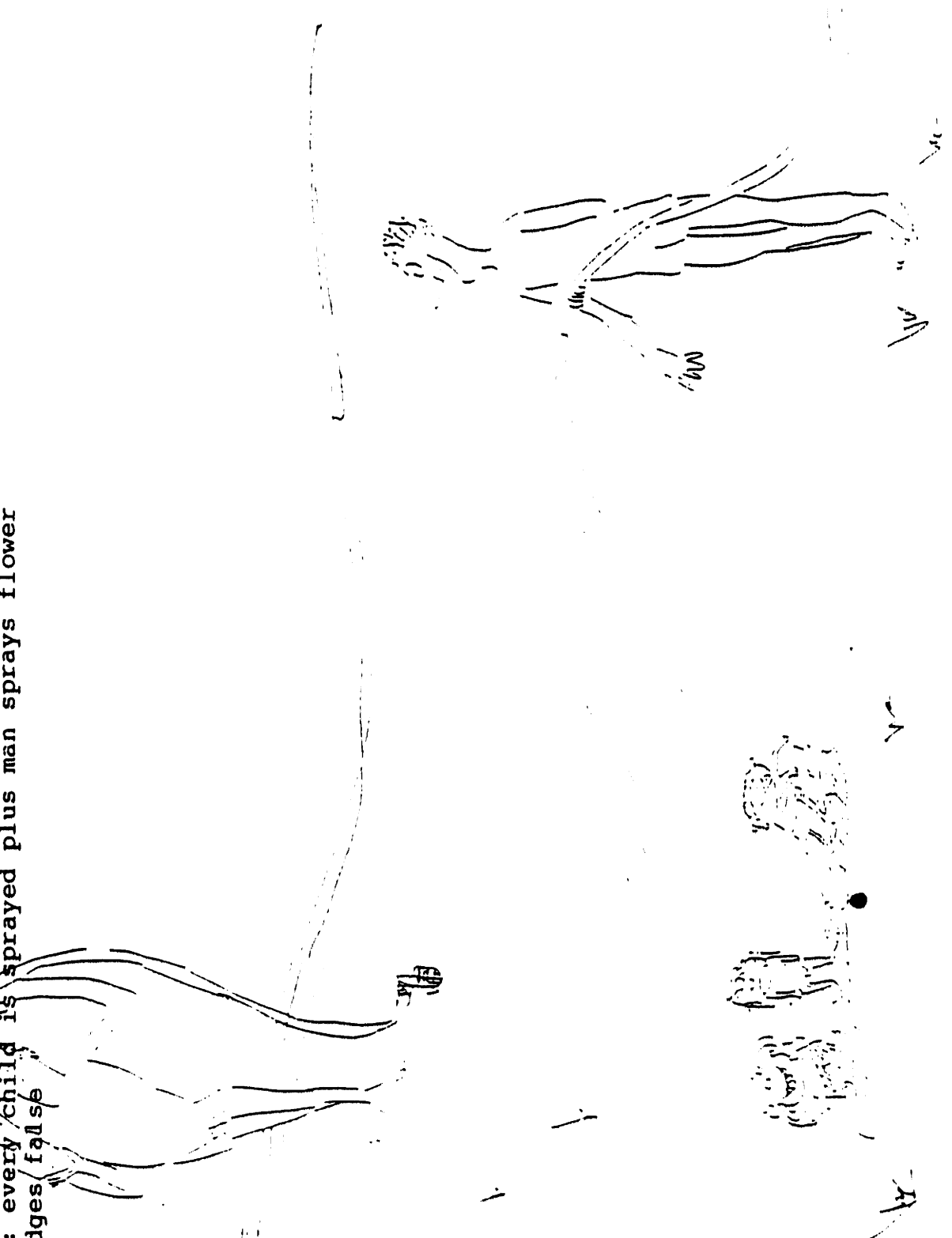


Figure 6

A man sprayed every child  
True : universal wide to existential  
Foil : every child is sprayed plus man sprays flower  
JA judges false

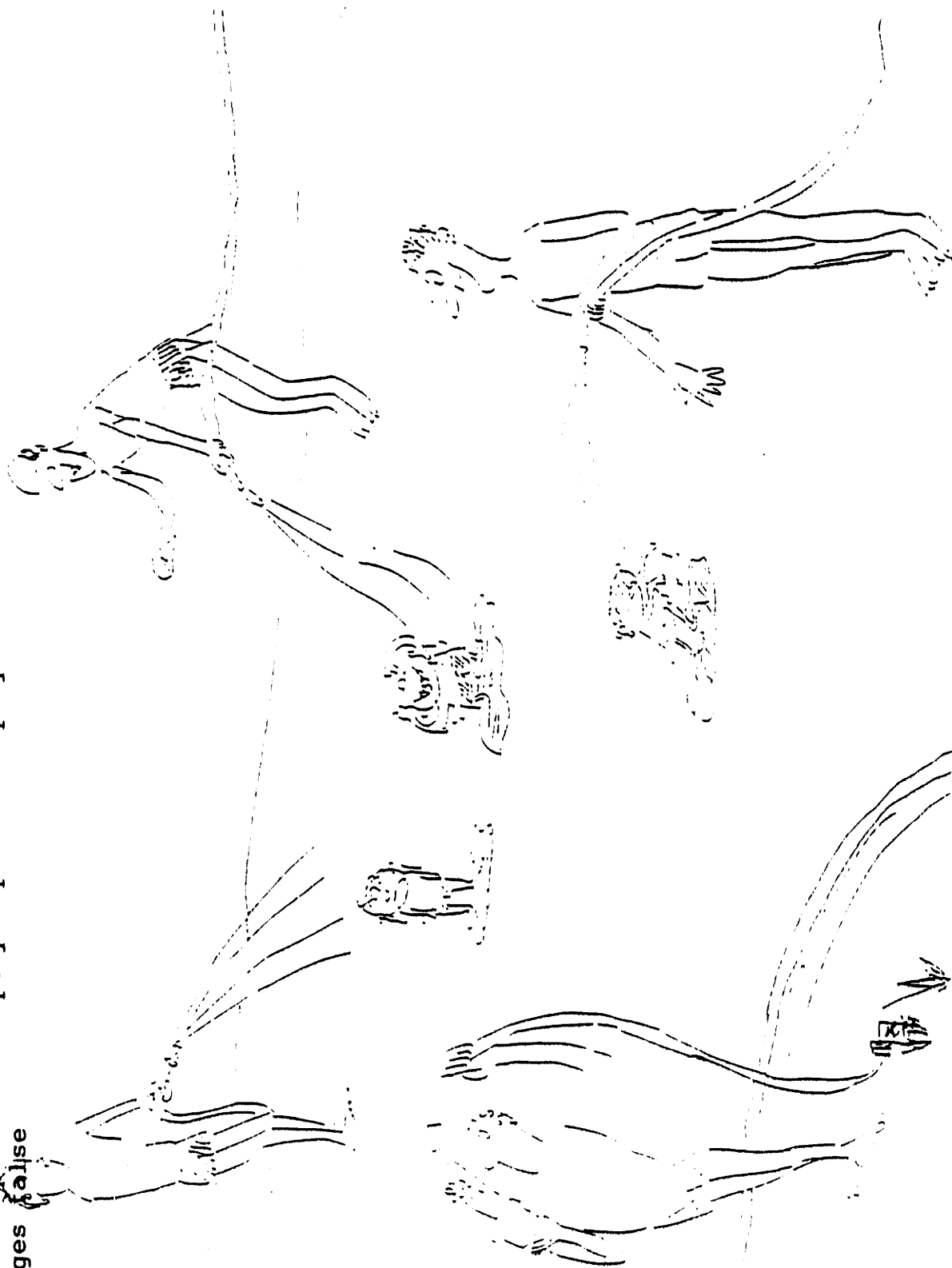


Figure 7

A man sprayed every child  
True ; existential wide to universal  
Foil if every child is sprayed plus man plays does nothing  
JA judges true

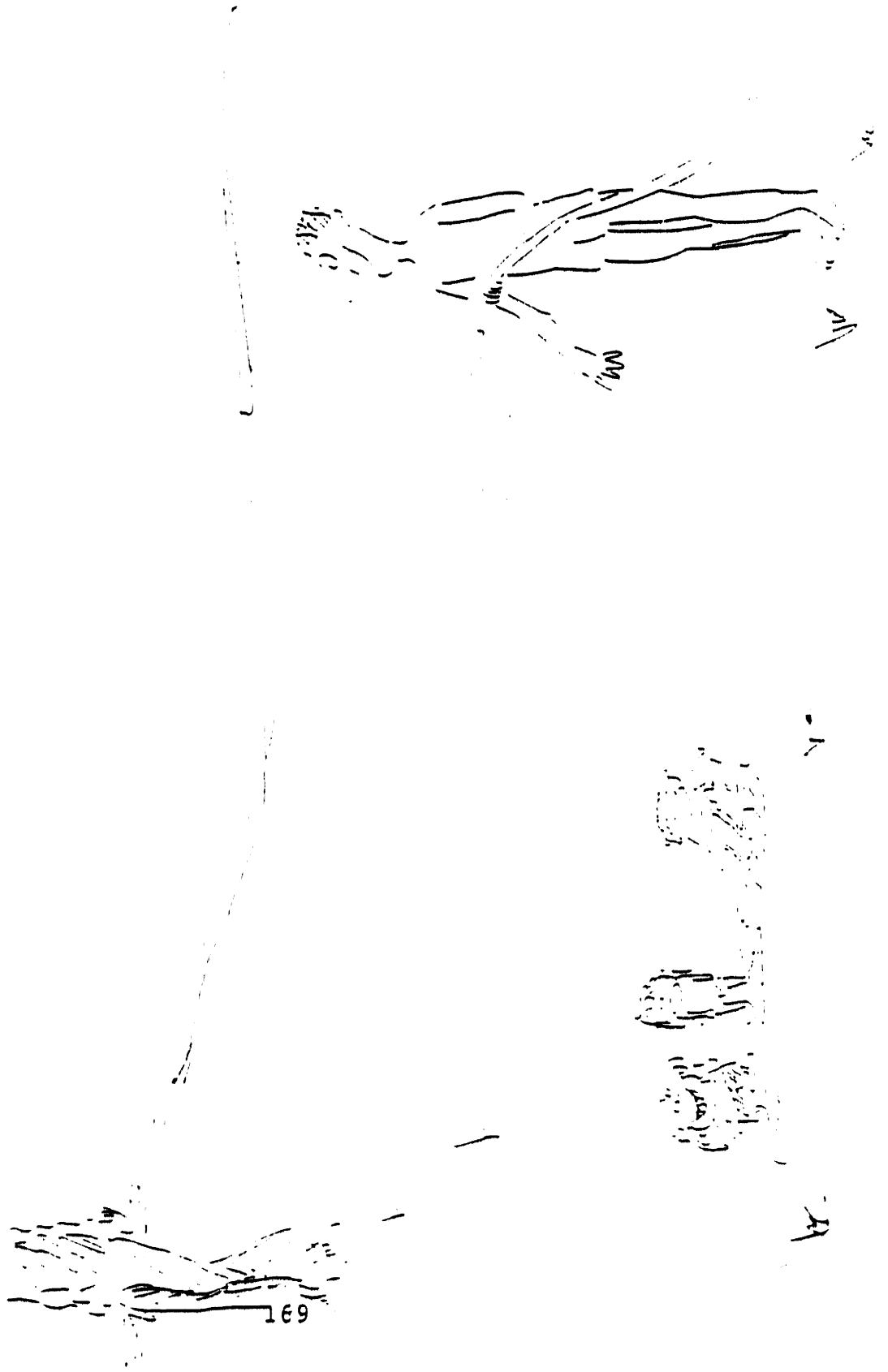


Figure 8

A man sprayed every child

True : universal wide to existential

Foil : every child is sprayed plus man eats a sandwich

JA judges true

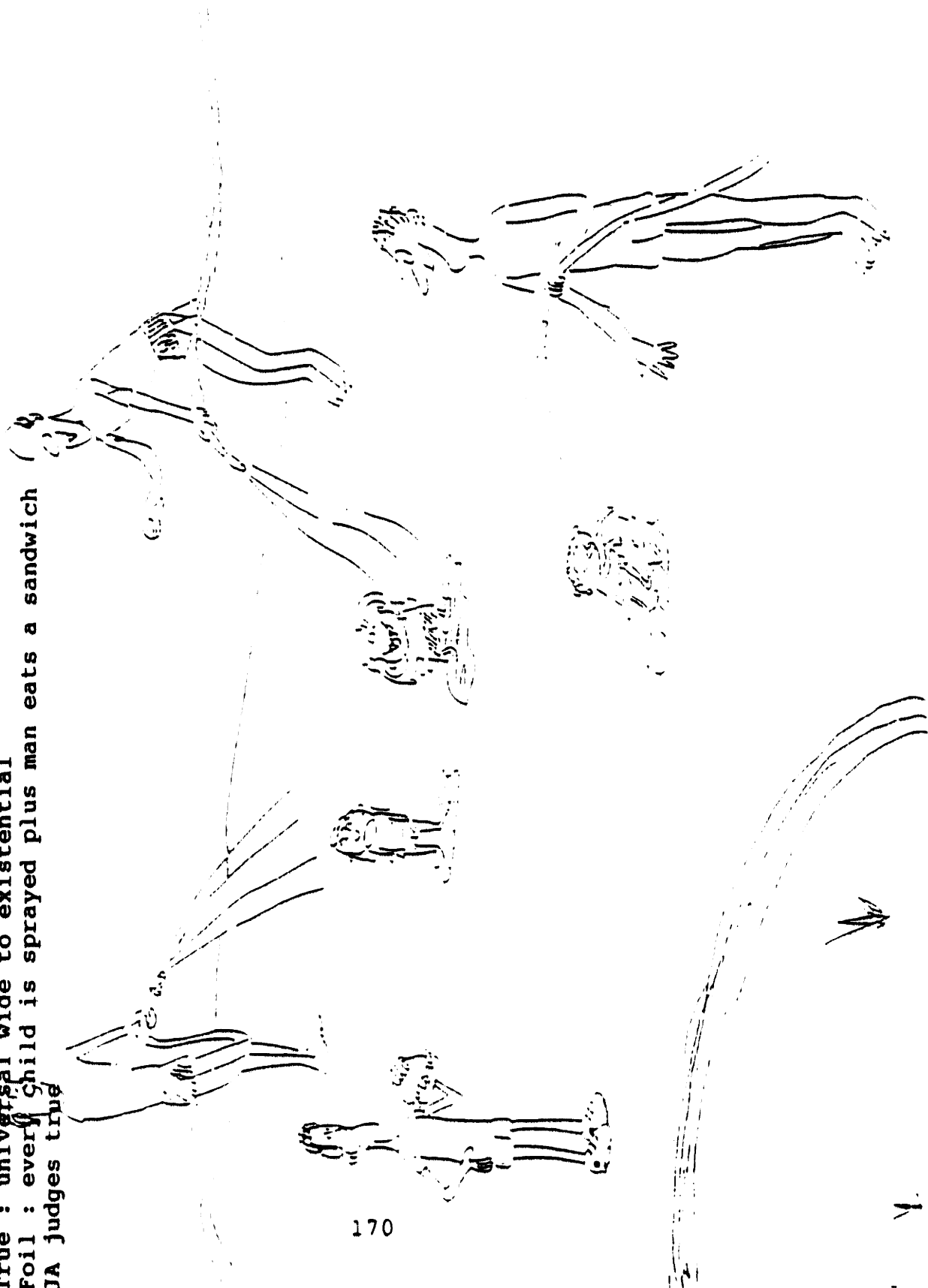


Figure 9

Every man filmed a child  
 true; universal wide to existential  
 Foil; every man films a child plus a woman films another child  
 JA judges false

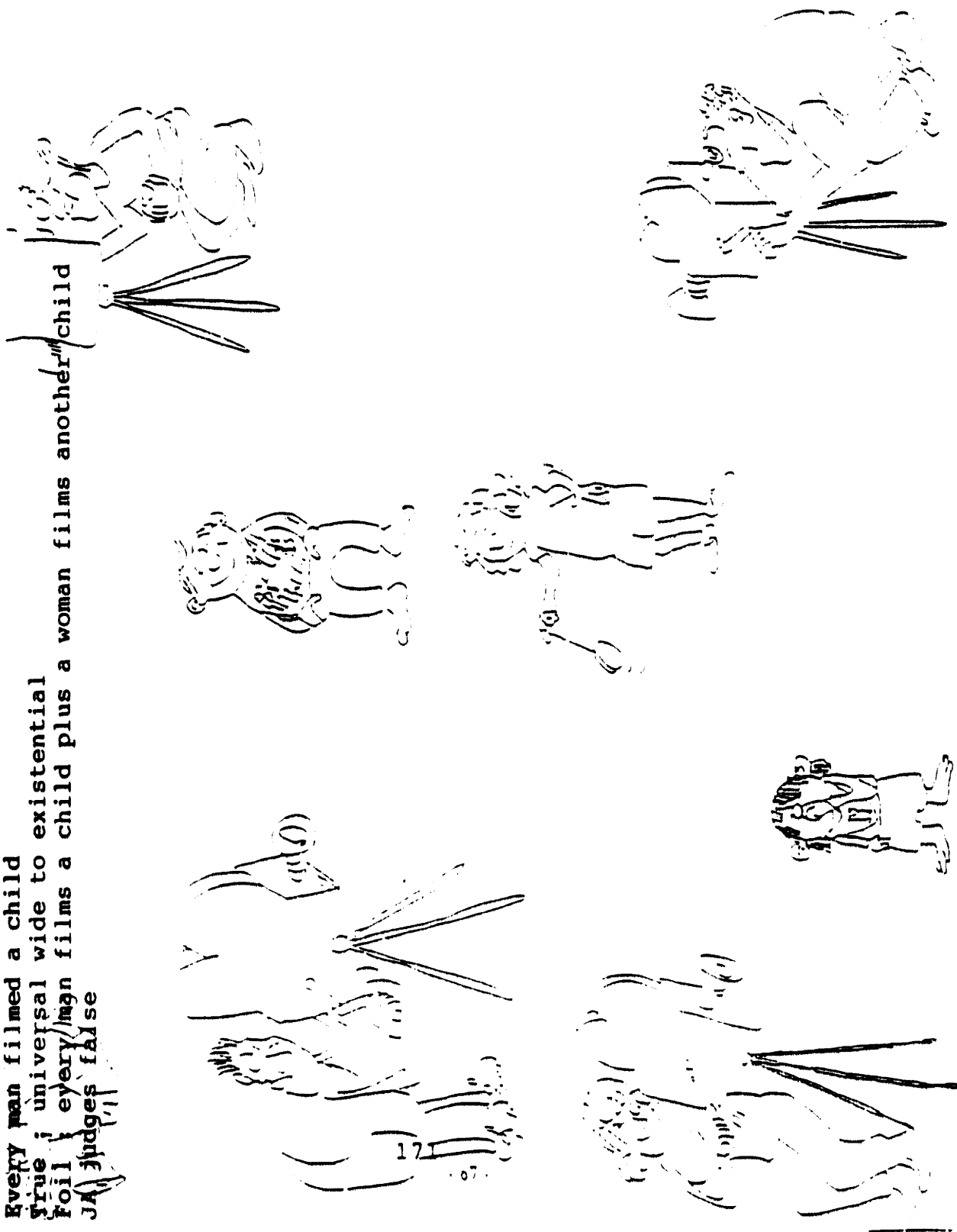


Figure 10

Every man filmed a child  
True : existential wide to universal  
Foil : every man films a child plus a woman films another child  
JA judges false

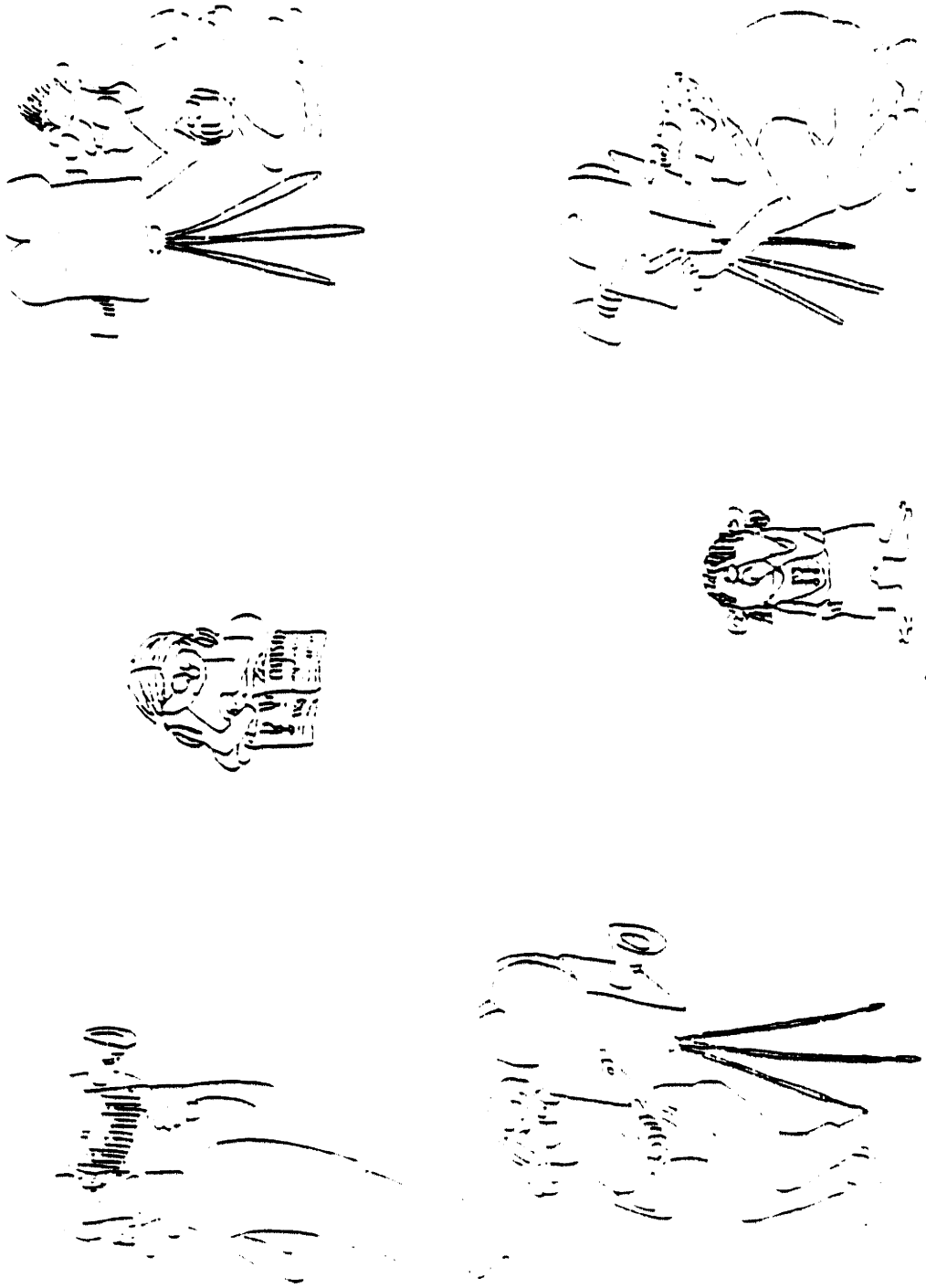




Figure 11

Every man filmed a child  
 True : universal wide to existential  
 Foil : every man films a child plus a woman films one too  
 JA judges false

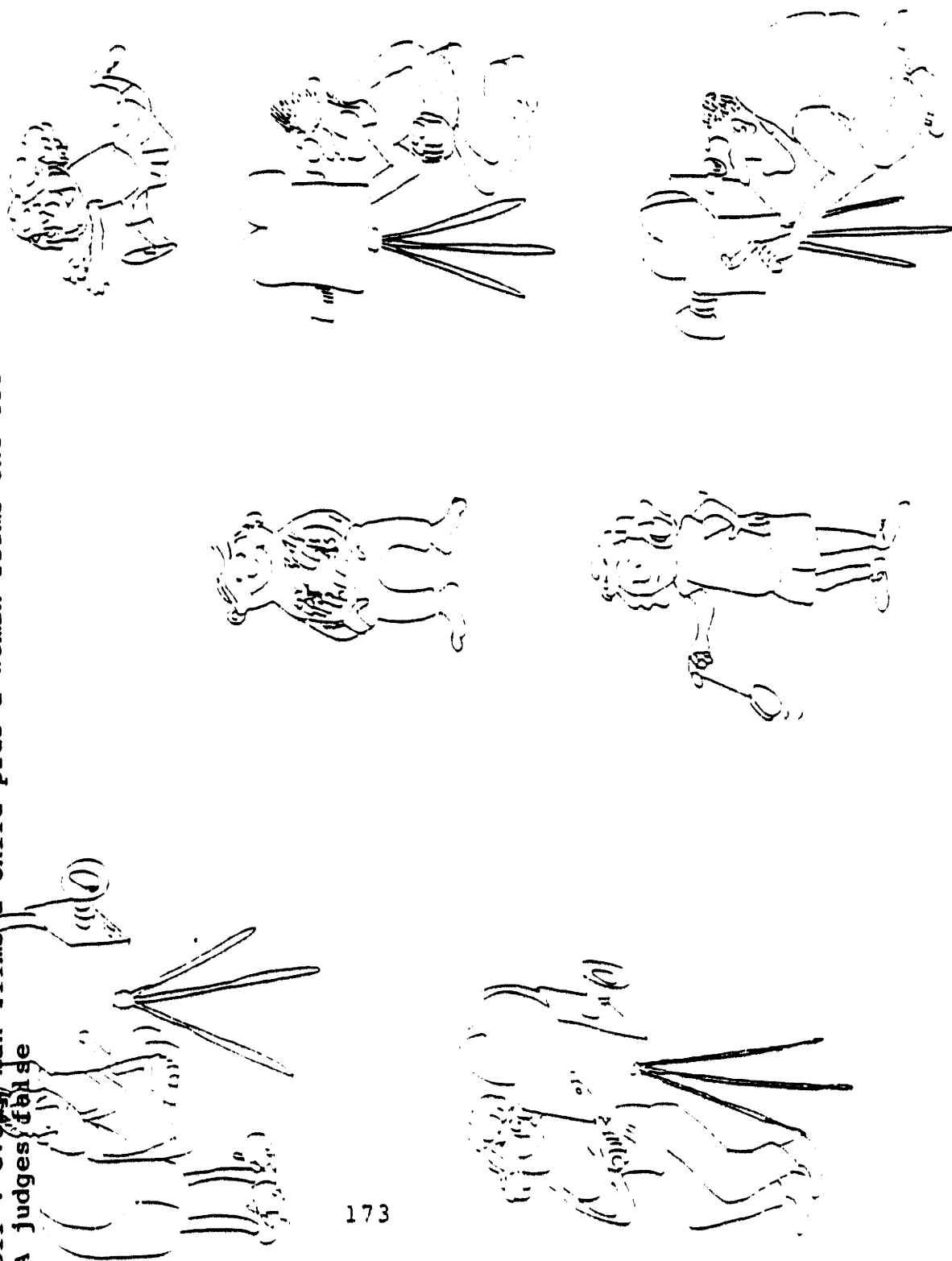


Figure 12

Every man filmed a child  
True : existential wide to universal  
Foil : every man films a child plus a woman films the child too  
JA judges false

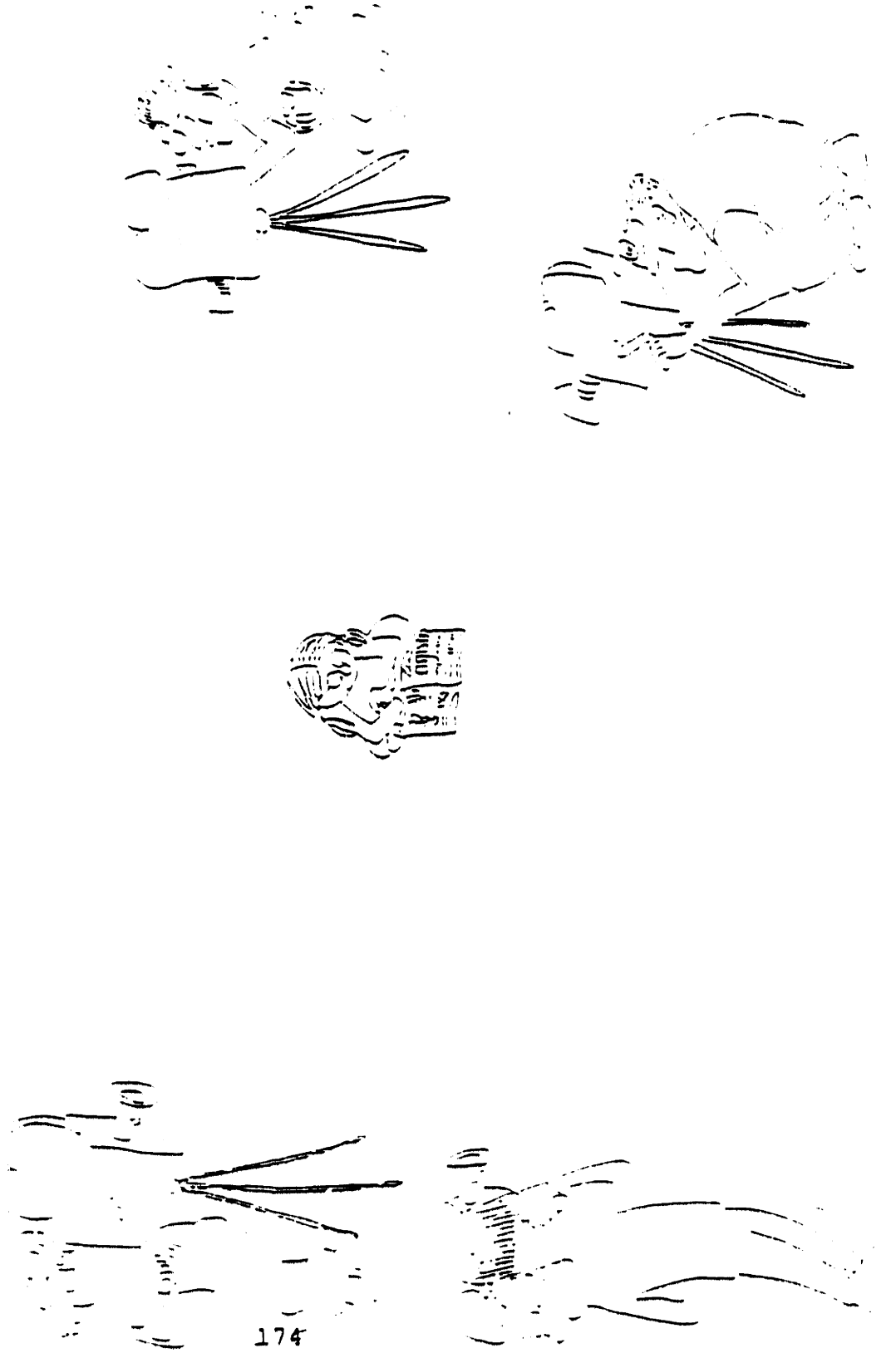


Figure 13

Every man filmed a child  
 True universal wide to existential  
 Poik Every man films a child plus a woman films a plant  
 A judges false

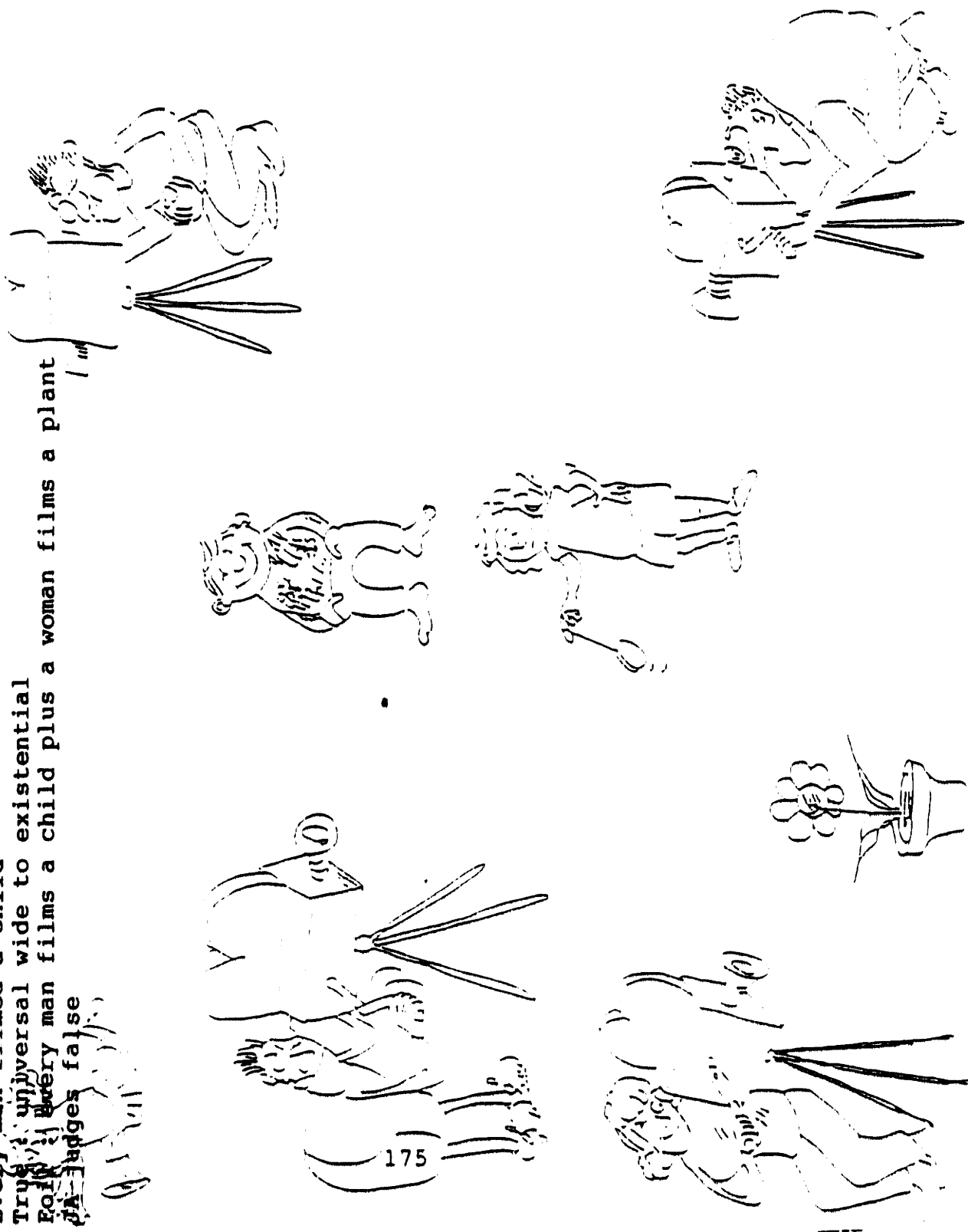


Figure 14

Every man filmed a child  
True : existential wide to universal  
Foil : every man films a child plus a woman films a plant  
JA judges false

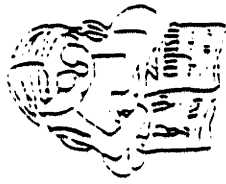


Figure 15

Every man filmed a child  
 True, universal wide to existential  
 fill : every man films a child plus a woman waves  
 (JA judges tries)

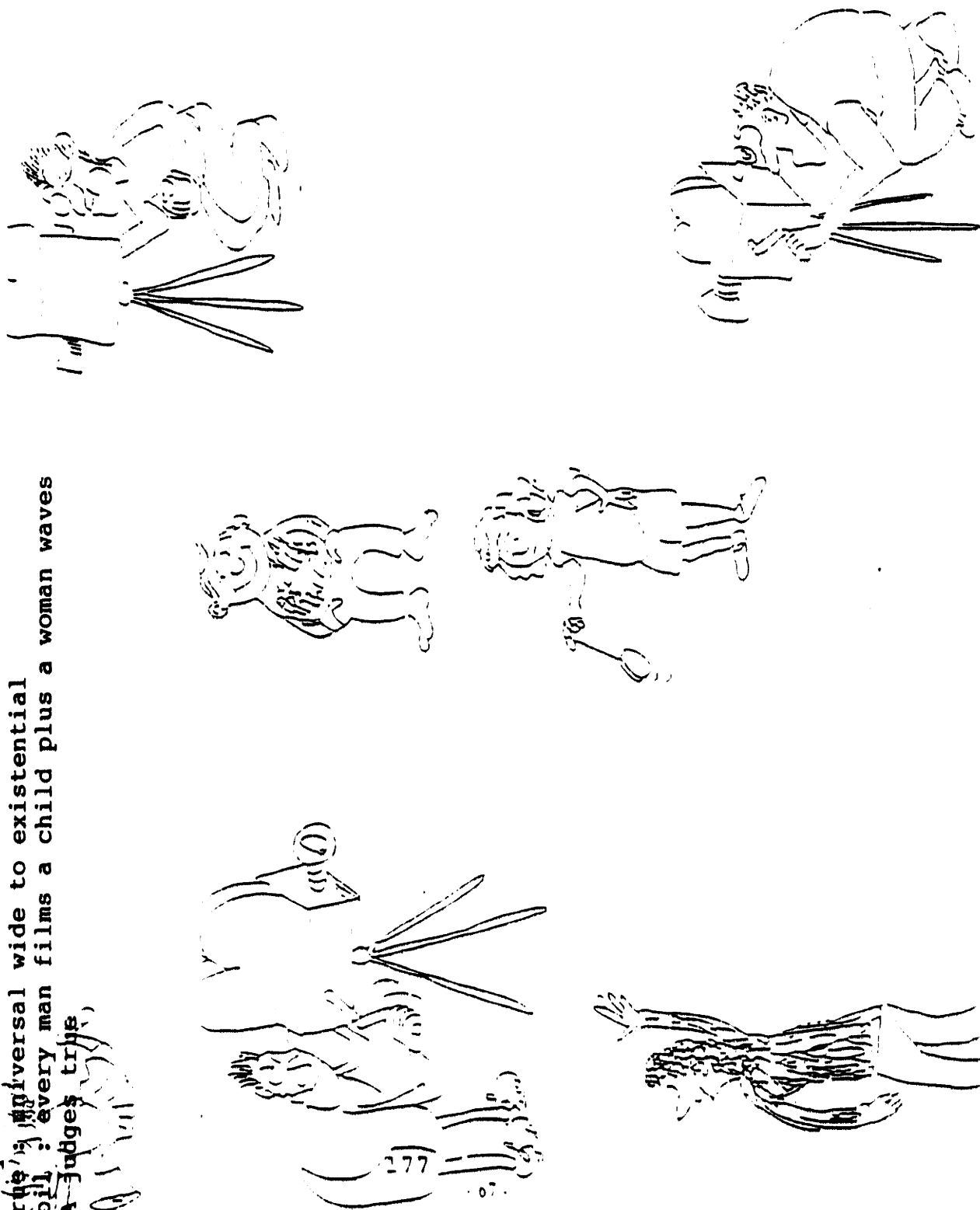


Figure 16

Every man filmed a child  
True : existential wide to universal  
Foil : every man films a child plus a woman dances  
JA judges true

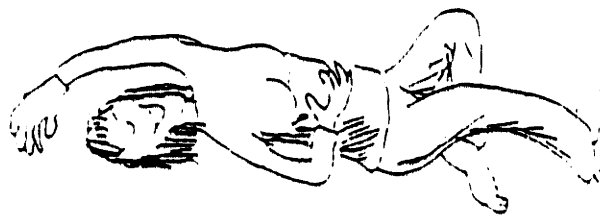
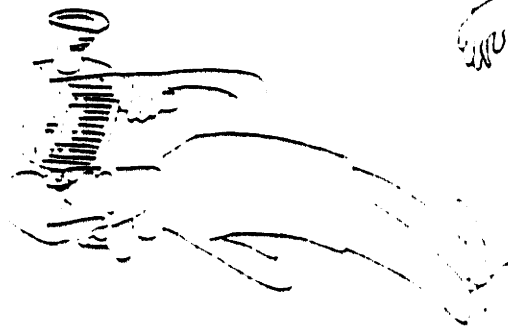


Figure 17

A man filmed every child: JA judges true  
 Every man filmed a child: JA judges false

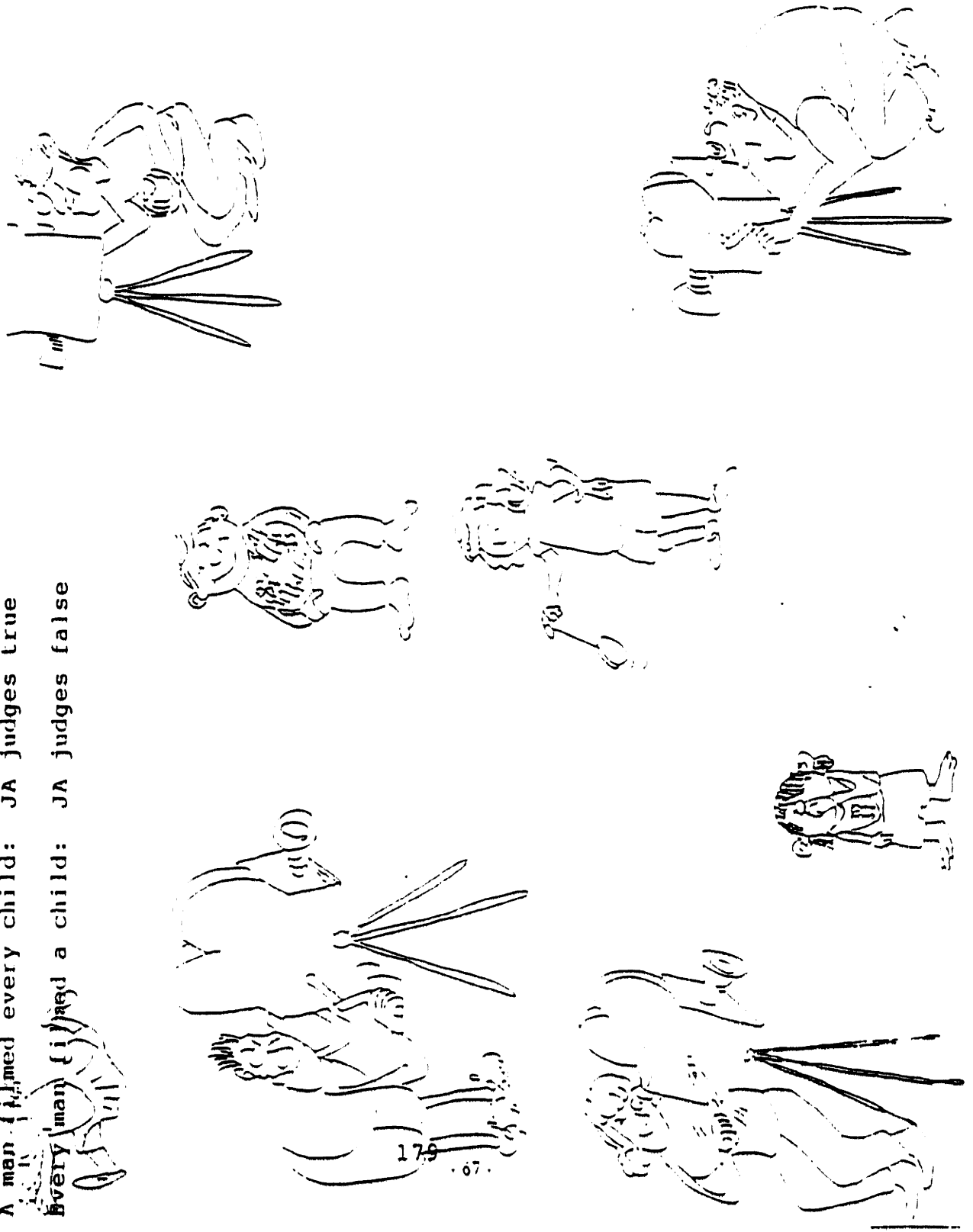
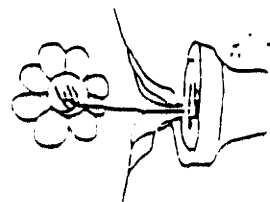
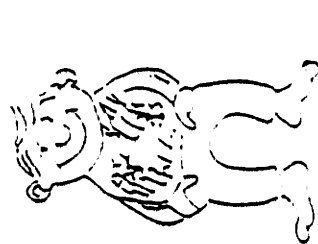
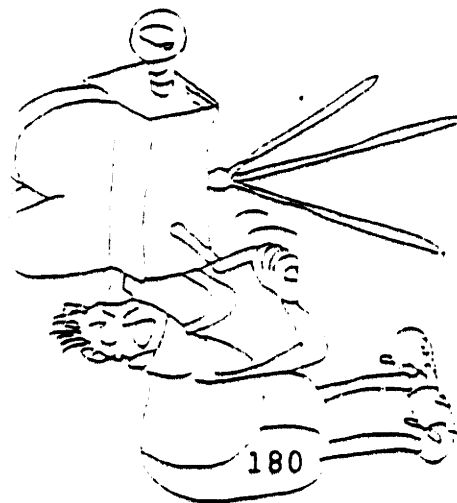


Figure 18

A man filmed every child: JA judges false

Every man filmed a child: JA judges false





### 13 REFERENCES

- Allen, C. (1980) "Movement and Deletion in Old English", Linguistic Inquiry 11:2
- Avery, D.A. (1975) Studies in the Syntax of Relative and Comparative Clauses. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Baker, C.L. (1970) "Notes on the description of English: The Role of an Abstract Q morpheme", Foundations of Language 6.
- Berman, S. (1989a) "On Certain Differences between WH-Phrases and Indefinites", NELS 20 presentation, in Papers on Quantification, NSF Grant BNS 8719999 Report, University of Massachusetts at Amherst.
- Berman, S. (1989b) "An Analysis of Quantificational Variability in Indirect Questions", in Papers on Quantification, NSF Grant BNS 8719999 Report, University of Massachusetts at Amherst. Also published in MIT Working Papers in Linguistics, Vol. 11, 1989.
- Bradely, D.C., Garrett, M.F. and Zurif, E.B. (1980) "Syntactic Deficits in Broca's Aphasia". In D. Caplan (Ed) Biological Studies of Mental Processes, MIT Press, Cambridge, MA.
- Brame, M.K. (1968) "A New Analysis of the Relative Clause: Evidence for an Interpretive Theory", unpublished MIT manuscript.
- (1981) "The General Theory of Binding and Fusion", Linguistic Analysis 7:3
- Broca, P. (1861) "Remarques sur le siege de la faculte del al parole articulee, suivies d'une observation d'aphemie (perte de parole). Bulletin de la Societe d'Anatomie (Paris) 36.
- Browning, M. (1987) Null Operator Constructions, Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Caplan, D. (1983) "A Note on the 'Word Order Problem' in Agrammatism", Brain and Language 10, 155-165.
- Caplan, D. (1987) Neurolinguistics and Linguistic Aphasiology: An Introduction, Cambridge University Press.
- Caplan, D., Baker, C. and Dehaut F. (1985) "Syntactic Determinants of Sentence Comprehension in Aphasia", In Kean, M.L. (Ed.) Agrammatism, Academic Press, New York.
- Caplan, D. and Futter, C. (1986) "Assignment of Thematic Roles to Nouns in Sentence Comprehension by an Agrammatic Patient", Brain and Language 27, 117-134.

Caplan, D. and Hildebrandt, N. (1988) Disorders of Syntactic Comprehension, Bradford Books, MIT Press, Cambridge MA.

Caramazza, A. and Zurif, E.B. (1976) Dissociation of Algorithmic and Heuristic Processes in Language Comprehension: Evidence from Aphasia", Brian and Language 3, 572-582.

Carlson, G.N. (1977) "Amount Relatives", Language Vol.53, No.3

Chomsky, N. (1986) Knowledge of Language. Convergence, Praeger.

----- (1986) Barriers. Linguistic inquiry Monograph 13, The MIT Press.

----- (1981) Lectures on Government and Binding. Dordrecht: Foris

----- (1965) Aspects of the Theory of Syntax. The MIT Press.

----- (1973) "Conditions on Transformations" in Anderson, S.R. and Kiparsky, P., eds., A Festschrift for Morris Halle. New York: Holt Rhinehart and Winston. Reprinted in Chomsky, N. 1977 in Essays on Form and Interpretation. New York: Elsevier North-Holland.

Dardjowidjojo, S. (1971) "The MEN-, MEN-KAN and MEN-I Verbs in Indonesian", The Philippine Journal of Linguistics.

----- (1971?) "The Role of Overt Markers in some Indonesian and Javanese Passive Sentences", Oceanic Linguistics, vol. XIII

----- (1978) Sentence Patterns of Indonesian. PALI Language Texts, The University Press of Hawaii.

Djiang, S.I. (1988) The Syntactic Passive in Bahasa Indonesia: A Study in Government and Binding Theory, Ph.D Dissertation, The University of Amsterdam, ISBN 90-9002537-5.

Davidson, D. (1966) "The Logical Form of Action Sentences," in D. Davidson (1980), 105-122.

Donnellan, K.S. (1972) 'Proper Names and Identifying Descriptions', in Semantics of Natural Language, Davidson and Harman (eds.), D. Reidel Publishing Co.

Engdahl, E. (1986) Constituent Questions, D. Reidel Publishing Co.

Epstein, S.D. (1987) Empty Categories and Their Antecedents. Ph.D Dissertation, The University of Connecticut.

- Epstein, S.D. (1989) "Adjunction and Pronominal Variable Binding", Linguistic Inquiry 20:2
- Fabb, N. (1984) Syntactic Affixation. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Fiengo, R. and Higginbotham, H. (1981) "Opacity in NP", Linguistic Analysis 7:4
- Fodor, J.D. and Sag, I. (1982) "Referential and Quantificational Indefinites", Linguistics and Philosophy 5.
- Fukui, N. (1986) A theory of Projections and its Applications. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Giorgi, A. (198?) "Toward a Theory of Long Distance Binding", Linguistic Review ??
- Grodzinsky, Y. (1984) Language Deficits and Linguistic Theory. Ph.D. Dissertation, Brandeis University, Waltham, MA.
- Grodzinsky, Y. (1984) "The Syntactic Characterization of Agrammatism", Cognition 16:99-120
- Grodzinsky, Y. (1986) "Language Deficits and the Theory of Syntax", Brain and Language 27:135-159
- Gueron, J. (1981) "Logical Operators, Complete Constituents, Extraction Transformations", in Levels of Syntactic Representation, J. Koster and R. May (eds.), Foris, Dordrecht.
- Guerssel, M. (1986) "Subject Clitic Doubling in Berber", unpublished manuscript, Massachusetts Institute of Technology, Cambridge, MA.
- Haik, I. (198?) "Indirect binding" Linguistic Inquiry 15:2
- Harbert, W. (1983) "A Note on Old English Free Relatives" Linguistic Inquiry 14:3
- Heim, I.R. (1982) The Semantics of Definite and Indefinite Noun Phrases. Ph.D Dissertation, University of Massachusetts, Amherst, MA.
- Higginbotham, J. (1980) "Pronouns and Bound Variables", Linguistic Inquiry 11:4
- Higginbotham, J. and May, R. (1981) "Questions, quantifiers and crossing", The Linguistic Review 1:1
- Higginbotham, J. (1983) "Logical Form, Binding, and Nominals", Linguistic Inquiry 14:3
- (1985) "On Semantics", Linguistic Inquiry 16:4.

----- (1986) "Elucidations of Meaning", manuscript, Massachusetts Institute of Technology, Cambridge, MA.

----- (1987) "Indefiniteness and Predication", in The Representation of Indefiniteness, Reuland, E.J. and ter Meulen, A.G.B. eds., MIT Press.

Hirschbuhler, P. (1985) The Syntax and Semantics of Wh-Constructions, Garland Publishing

Hirschbuhler, P. and Rivero, M.-L. (1983) "Remarks on Free Relatives and Matching Phenomena", Linguistic Inquiry 14:3

Iwakura, K. (1981) "The Case Assignment Theory and Filters", Linguistic Analysis 7:4

Jenkins, L. (1972) The English Existential, Tübingen: Max Niemeyer Verlag.

Kana, M. (1983) "The Syntax and Semantics of Verbal Prefixes in Bahasa Indonesia", in Papers from the Third International Conference on Austronesian Linguistics, Halim, Carrington and Wurm, eds.

Kayne, R.S. (1975) French Syntax. Current Studies in Linguistics, The MIT Press, Cambridge, MA.

Kean, M.L. (ed) (1985) Agrammatism. Academic Press.

Keenan, E.L. and Comrie, B. (1977) "Noun Phrase Accessibility and Universal Grammar.", Linguistic Inquiry 8.

----- (1979) "Data on the Noun Phrase Accessibility Hierarchy", Language 55:2

Keenan, E.L. and Stavi, J. (1986) "A Semantic Characterization of Natural Language Determiners", Linguistics and Philosophy 9:3

Kripke, S.A. (1972) "Naming and Necessity", in Semantics of Natural Language, Davidson and Harman (eds.), D. Reidel Publishing Co.

Kinkade, M.D. (1983) "Salish Evidence against the universality of 'noun' and 'verb'", Lingua 60, 25-40.

Larson, R. (1985) "Base-NP Adverbs", Linguistic Inquiry 16:4

----- (1987) "Missing Prepositions" and the Analysis of English Free Relative Clauses", Linguistic Inquiry 18:2

Lasnik, H. and Saito, M. (1984) "On the Nature of Proper Government", Linguistic Inquiry 15:2

Lewis, D. (1975) "Adverbs of Quantification", in E. Keenan (ed.), Formal Semantics of Natural Language. Cambridge University Press.

Lightfoot, D.W. (1979) Principles of Diachronic Syntax. Cambridge Studies in Linguistics 23, Cambridge University Press.

Linebarger, M.C. (1989) "Neuropsychological Evidence for Linguistic Modularity", in G.N. Carlson and M.K. Tanenhaus (eds.), Linguistic Structure in Language Processing, 197-238, Kluwer.

Linebarger, M.C., Schwartz, M.F. and Saffran, E.M. (1983) "Sensitivity to Grammatical Structure in So-Called Agrammatic Aphasics", Cognition 13, 361-392.

Linebarger, M.C., Schwartz, M.F. and Saffran, E.M. (1983) "Syntactic Processing in agrammatism: A reply to Zurif and Grodzinsky", Cognition 15, 215-225.

Longobardi, G. (1988) "In Defense of the "Correspondence Hypothesis" Island Effects and Parasitic Constructions in Logical Form" to appear in: Huang and May (eds.) Logical Structure and Linguistic Structure, Reidel.

Lukatela, K., Crain, S. and Shankweiler, D. (1988) "Sensitivity to Inflectional Morphology in Agrammatism; Investigation of a Highly Inflected Language", Brain and Language 33, 1-15.

Lumsden, J. and Saddy D. (1985) "1066 and all That", unpublished manuscript, Massachusetts Institute of Technology, Cambridge, MA.

Macdonald, R.R. (1976) Indonesian Reference Grammar. Georgetown University Press.

Macdonald, R.R. and Darjowidjojo, S. (1967) Indonesian Reference Grammar. Georgetown University Press.

Maxwell, D.N. (1979) "Strategies of Relativization and NP Accessibility" Language 55:2

May, R.C. (1977) The Grammar of Quantification. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.

May, R. (1985) Logical Form: Its Structure and Derivation. MIT Press, Cambridge, MA.

McCune, K. and Simin, A. M. (1983) "Anaphoric Markers in Indonesian Texts", in Papers from the Third International Conference on Austronesian Linguistics, Halim, Carrington and Wurm, eds.

Milsark, G. (1974) Existential Sentences in English. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.

----- (1974) "Toward an Explanation of Certain Peculiarities in the Existential Construction in English." Linguistic Analysis 3.

Moore, Knot and Hulbert (1977) The Elements of Old English. George Wahr Publ., Ann Arbor, MI.

Montalbetti, M.M. (1984) After Binding: On the Interpretation of Pronouns. Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge, MA.

Mosse, F. (1952) Handbook of Middle English. Johns Hopkins Press, Baltimore, MA.

Pesetsky, D. (1987) "Wh-in-Situ: Movement and Unselective Binding", in The Representation of Indefiniteness, Reuland, E.J. and ter Meulen, A.G.B. eds., MIT Press.

Pitres, A. (1898) L'Aphasie amnesique et ses varietes cliniques, Paris: Alcan.

Pollock, J-Y. (1982) Accord, Chaines Impersonnelles et Variables. unpublished manuscript, Paris 12.

Purwo, B. M. (1983) "The verbal 'Aspect': A Case of the Indonesian Passives", in Papers from the Third International Conference on Austronesian Linguistics, Halim, Carrington and Wurm, eds.

Reinhart, T. (1983) Anaphora and Semantic Interpretation, University of Chicago Press

----- (1986) "On the Interpretation of 'Donkey'-Sentences", in On Conditionals, Traugott, E.C., ter Meulen, A., Snijzer Reilly, J. and Ferguson, C.A. eds, Cambridge University Press

Rivero, M-L., Sainz, K. (1986) Barriers and NP-Movement. unpublished manuscript, University of Ottawa.

Rizzi, L. (1986) "On Chain Formation", in syntax and Semantics 19, H. Boer (ed.), Academic Press.

Ross, J.R. (1967) Constraints on Variables in Syntax, Ph.D. Dissertation, Massachusetts Institute of Technology, Cambridge, MA. Published in 1986 as Infinite Syntax! (Hillsdale, NJ: Erlbaum)

Safir, K. (1986) "Relative Clauses in a Theory of Binding and Levels", Linguistic Inquiry 17:4

Saffran, E.M., Schwartz, M.F. and Marin, O.S.M. (1980) "The Word Order Problem in Agrammatism: II Production" Brain and Language 7, 307.

Saloman, E. (1914) "Motorische Aphasie mit Agrammatismus und Sensorischagrammatischen Storungen", Monatschrift fur Psychiatrie und Neurologie 35.

- Sapir, E. (1949) Selected Writings of Edward Sapir. Berkely: University of California Press.
- Schmidgall-Tellings, A.Ed. and Stevens, A.M. (1981) Contemporary Indonesian-English Dictionary. Ohio University Press.
- Schwartz, M.F., Saffran, E.M., and Marin, O.S.M. (1980) "The Word Order Problem in Agrammatism: I Comprehension" Brain and Language 7, 277-306.
- Schwartz, M.F., Linebarger, M.C., Saffran, E.M. and Pate, D.S. (1987) "Syntactic Transparency and Sentence Interpretation in Aphasia", Language and Cognitive Processes 2 (2), 85-113.
- Shankweiler, D., Crain, S., Gorrell, P., and Tuller, B. (1989) "Reception of Language in Broca's Aphasia", Language and Cognitive Processes 4 (1), 1-33.
- Speas, M.J. (1986) Adjunctions and Projections in Syntax. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Stowell, T. (1981) Origins of Phrase Structure. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Taraldsen, K.T. (1986) in Topics in Scandinavian Syntax, L.Hellan and K.Koch Christensen (eds.), D. Reidel Publishing Co.
- Thompson, L.C.M. and Thompson, M.T. (1980) "Thompson Salish //-xi//". IJAL 46, 27-32.
- Travis, L. (1984) Parameters and Effects of Word Order Variation. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.
- Williams, E. (1983) "Semantic vs Syntactic Categories", Linguistics and Philosophy, vol. 6, no. 3.
- van der Auwera, J (1985) "Relative that - a centennial dispute", J. Linguistics 21, 149-179.
- Verhaar, J.W.M. (1983), "On the Syntax of yang in Indonesian", in Papers from the Third International Conference on Austronesian Linguistics, Halim, Carrington and Wurm, eds.
- Vickner, S. (1987) "The Expletive Der in Danish", unpublished ms. University of Geneva
- Visser, F. Th. (1970) An Historical Syntax of the English Language. E.J. Brill, Leiden, Netherlands.

Zubizarreta. M. L. (1982) On the Relationship of the Lexicon to Syntax. Ph.D Dissertation, Massachusetts Institute of Technology, Cambridge, MA.

Zurif, E. and Grodzinsky, Y. (1983) "Sensitivity to grammatical structure in agrammatic aphasics: A reply to Linebarger, Schwartz and Saffran", Cognition 15, 207-213.