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BOUND VARIABLES IN SYNTAX
(ARE THERE ANY?)

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Current theories of grammar handle both extraction and anaphorization by introducing variables into syntactic representations. Combinatory categorial grammar eliminates variables corresponding to gaps. Using the combinator **W**, the paper extends this approach to anaphors, which appear to act as overt bound variables.

0. OUTLINE

Most current theories of grammar handle "extraction" as well as "anaphoric binding" by introducing variables into syntactic representations. A radical alternative is offered by the theory of combinatory categorial grammar, one salient property of which is that it eliminates syntactic variables corresponding to gaps. The question arises whether such an approach can be extended to anaphors, which act as overt bound variables. The paper proposes a natural syntactico--semantic treatment for the core cases of binding, and examines its interaction with extraction and coordination processes.

The paper is organized as follows. Section 1 reviews some of the fundamental assumptions concerning the motivation and format of combinatory categorial grammar. Section 2 introduces the problem posed by anaphors and presents the essence of its solution. Section 3 takes up the problem of two-complement verbs, and Section 4 pied piping. Section 5 concludes with a brief discussion of the status of locality and pronouns.

1. BACKGROUND

The Government--Binding (GB) theory works on the assumption that all grammatical relations, including those relevant for the assignment of theta-roles, are to be defined in strictly local terms. There is a precise analogue of this assumption in various versions of categorial and phrase structure grammar (CG/PSG): the restriction of the interpretation of concatenation to functional application (FA). The common assumption leads to essentially the same problems and associated solutions in GB and in CG/PSG. To express their equivalence in the pertinent respect, I will refer to all these theories as FA-grammars.

FA-grammars make the prediction that natural language functors are to be adjacent to their arguments. One set of data that may constitute a glaring counterexample to this includes sentences informally describable as containing a gap left by a leftward or rightward extracted constituent:

(1)a. **You think that Mary likes Bill.**
WHO do you think that Mary likes —?

b. **I put the cup on the table.**
I put — on the table THE BIGGEST CUP YOU HAVE EVER SEEN.

The standard solution to this problem goes as follows. In accordance with the FA-strategy, the gap is filled by a placeholder interpreted as a variable and, in necessary deviation from the FA-strategy, the extracted constituent is affixed to the sentence in a syncategorematic fashion resembling the introduction of binding operators in logic. In view of what such sentences mean, the procedure seems semantically correct.

Notice, however, that this solution makes one expect that the possibilities for gaps and extracted constituents to occur in natural language are the same as those for variables and operators in logical syntax. This expectation is not borne out. Consider the following paradigmatic cases of divergence noted in the literature:

(2)a. Free variables: **fx**
* — saw Bill.

b. Vacuous operators: $\lambda x[a]$
* What did Mary see Bill?

c. Crossed binding: $\lambda x \lambda y[fx(gy)]$
* What$_1$ do you wonder who$_2$ to talk about —$_1$ to —$_2$?

d. Binding over arbitrary domains: $\lambda x[...x...]$
* Who$_1$ did you meet John, who likes —$_1$?
? Who$_1$ did you go home without meeting —$_1$?

The only way-out is to supplement the grammar with filters, i.e., well-formedness conditions imposed on the input or the output of rules. These may be formulated in terms of government projections (Kayne 1983), feature percolation conventions (Gazdar et al. 1985), or storage mechanisms (Cooper 1983) etc. Common to all is the property that, having the status of axioms, these filters can at best state the facts correctly but cannot explain why the facts are as they are.

Ades--Steedman (1982) observe that there is an alternative way to approach structures like (1). They abandon the FA-restriction and propose to add functional composition to the apparatus of categorial grammar. This extension allows the grammar to assign the same interpretation to extraction structures without invoking placeholder variables, syncategorematic operators, and filters:

(3) Composition: If £ e $CAT_{a|b}$ and \$ e $CAT_{b|c}$ then £\$, \$£ e $CAT_{a|c}$ with the interpretation $\lambda x[£'(\$'x)]$.

E.g.: **who do you think that Mary likes**

who	do	you	think	that	Mary	likes	
NP					S|VP	VP|NP	
							S|NP
							.
							.
							.
							S|NP

The introduction of an argument can now be delayed if, and only if, the items intervening between it and its functor can combine with it or its functor. "Combination" means application or composition. Note that this extension does not merely allow us to derive the well-formed extraction structures of (1), it also offers an explanation of the ill-formedness of the structures in (2). (2a) is fine but not an S, and the ungrammaticality of (2b,c,d) must follow from the lack of proper matching in the participating categories.

(Steedman 1987 actually imposes directionality constraints on composition, some of which follow from the "semantics" of composition and some of which amount to empirical claims about English. They will be reviewed at the end of this section.)

Promising as this line of research seems to be, it is immediately clear that FAC-grammar can only handle sentences with a one-to-one correspondence between "extracted" constituents and "gaps". It is therefore challenged by the existence of so-called parasitic gap sentences like (4):

(4) Multiple binding: $\lambda x[\ldots x \ldots x \ldots]$
What$_1$ did you file —$_1$ without reading —$_1$?
He is a man who$_1$ everyone who knows —$_1$ ends up liking —$_1$.
* What$_1$ do you think —$_1$ got filed without John reading —$_1$?

The possibility of multiple binding is predicted by the variable introduction strategy in FA-grammars. Note, though, that the restrictions on the relative positions of the two gaps, discussed by Engdahl (1983) and others, call for further filters in those theories.

Szabolcsi (1983) observes that (4) need not constitute an argument against the variable-free approach. The conditions under which multiple gaps are possible are suggestive of a further specific operation on functors being at work here. The operation introduced in that paper under the name connection (after Kayne) will make the correct predictions: 1

(5) Connection: If $\pounds \in CAT_{(a|b)|c}$ and $\$ \in CAT_{b|c}$ then $\pounds\$$, $\$\pounds \in CAT_{a|c}$ with the interpretation $\lambda x[\pounds'x(\$'x)]$.

E.g.: what you filed without reading
NP S|VP VP|NP (VP|VP)|NP
———————— VP|NP by connection
———————— S|NP by composition

It can be demonstrated that there is a fairly close parallelism between the working of composition and connection on one hand, and of the rules and filtering mechanisms employed in FA-grammars on the other. We are not dealing with notational variants, however. As was pointed out above, the relevant apparatus of FA-grammars is stipulative in nature. The apparatus of FACC-grammar is not. The availability of composition and connection follows from the fact that we modelled lexical items with function-argument structures -- it is just as natural for functions to compose and to connect as it is to apply. To put it that way, FACC-grammar explains why the construction of empirically adequate FA-grammars is possible; but not vice versa.

Steedman (1985b) raises the question of what inventory of operations composition and connection are drawn from. He observes that they are identical to the combinators B and S of Curry--Feys (1958), respectively, and suggests that categorial grammar should in general be based on combinators. Given that one of the fundamental results of combinatory logic, as Curry puts it, is that "variables are a logically unnecessary but practically very useful device", the exclusion of placeholder variables from derivations will no longer be a mere expedient but receives coherent mathematical support. More precisely, Steedman argues on both grammatical and computational plus parsing grounds that adequate grammars for natural language are to be based on (some extension of) the following system: 2

(6) $\mathbf{B} \equiv \lambda fgx.f(gx)$ [composition]
$\mathbf{S} \equiv \lambda fgx.fx(gx)$ [connection]
$\mathbf{C} \equiv \lambda fxy.fyx$ [permutation]
$\mathbf{I} \equiv \lambda x.x$ [identity] $\mathbf{CI} \equiv \lambda xf.fx$ [raising]

While it may be a matter of debate whether C is to be used in syntax, he argues that **I** (as well as the constant function creating combinator **K**, $\lambda x[a]$) is to be excluded because it would allow unrecoverable deletion, so to speak. On the other hand, the composite combinator **CI** has for long been known to be operative in grammar.

CI, i.e., type raising is the operation Montague (1974) used to ensure that all noun phrases denote generalized quantifiers. But, apart from the treatment of scope, raising seems necessary to provide the appropriate categories for subjects that undergo composition (cf. the example in (5)), and for "non-constituents" that undergo extraction or coordination. The following is due to Dowty (1985), who develops a proposal in Steedman (1985a):

(7) **John gave** **Mary** **a book**

$$\dfrac{(VP/NP_{acc})/NP_{dat} \quad \dfrac{(VP/NP)\backslash((VP/NP)/NP \quad VP\backslash(VP/NP)}{VP\backslash((VP/NP)/NP)}}{VP}$$

The raised categories allow **Mary** and **a book** to compose into the "non-constituent" **Mary a book**, of category VP\((VP/NP)/NP). This may apply to the two-complement verb **gave** directly, or it may first conjoin with **Susan a record** of the same category.

Finally, let me summarize the actual operations to be used below on the basis of Steedman (1987). A word about notation: given that I do not have a backwards slash, ! will be used instead.

(8)

Application:	A/B B = A	
	B A!B = A	
Composition:	A/B B/C = A/C	(indexed as **B**)
	B!C A!B = A!C	(indexed as **B**)
	B/C A!B = A/C	(indexed as **B!**)
Raising_{syn}:	A ⇒ B/(B!A)	(indexed as **CI**)
	A ⇒ B!(B/A)	(indexed as **CI**)
Raising_{lex}:	A ⇒ S/(S/A)	

2. ANAPHORIC BINDING -- THE BASIC IDEA

We are now in a position to appreciate the problems posed by reflexives and reciprocals (anaphors). Standard theories follow Chomsky (1981) in assigning the following primitive properties to anaphors:

(9)a. An anaphor is a variable that must not remain free.
b. The binder must be an argument that is hierarchically more prominent than the anaphor.
c. The binder must be local.

The first property is reminiscent of property (2a) noted for gaps. In fact, Pollard's (1984) FA-grammar, for instance, assigns the same free variable interpretation to **himself** that he assigns to the placeholder **t** for gaps. The difference is that **himself** and **t** are accompanied by somewhat different algorithms for finding their antecedents and for actually getting bound by them. Now, there are obvious reasons why we cannot follow him and likeminded theorists in straightforwardly assimilating anaphors to gaps left by extraction.

First, we did not use placeholder variables for gaps. In our theory, the fact that "gaps" must not remain free simply followed from the fact that the pertinent argument must be supplied sooner or later if we are to get a full sentence. Given that "gaps" are not visible, it was easy to argue that the only item whose placement and interpretation we need to account for is the "gap filler". But anaphors are surely visible arguments, and their binders are also independently necessary arguments. So there is every reason to expect that we need bound variables for the treatment of anaphors. The problem is, though, that we did not merely opt for a framework which allows us to handle specifically extraction structures without using bound variables in syntax. We committed ourselves to combinatory logic, which does not have bound variable items at all.

It appears, therefore, that the treatment of anaphor binding is kind of a test case for the tenability of the general claim that natural language grammar is to be based on (the proposed kind of) combinatory logic. In what follows I will examine anaphors in this light. Rather than trying to provide a sophisticated empirical analysis of binding facts, I will focus on the essential properties of anaphors within the context of the theory reviewed in Section 1.

Pending the discussion of locality, reflexives appear to have two uncontroversial properties. One, they are a kind of noun phrase. Two, they differ from other members of the species in their meaning. Both **John** and **himself** can serve as the object of **hit**, for instance. But by combining **John** with **hit** we get the VP-meaning $\lambda x[\mathbf{hit'(j)(x)}]$, and by combining **himself** with **hit** we get the meaning $\lambda \mathbf{x}[\mathbf{hit'(x)(x)}]$.

While combinatory logic has no bound variables and therefore we cannot identify **himself** with the first bound instance of **x** in $\lambda \mathbf{x}[\mathbf{hit'(x)(x)}]$, it does have operations (combinators) that identify the arguments of the function they apply to. One such combinator is **W**, the duplicator:

(10) $\mathbf{W} \equiv \lambda fx.fxx$

(11) If $\mathbf{g}$ is $\lambda y \lambda z[hyz]$, then $\mathbf{Wg}$ is $\lambda f \lambda x[fxx](\lambda y \lambda z[hyz]) = \lambda x[hxx]$.

Let **g** be multiplication, for instance -- a two-argument function whose arguments can of course be distinct. Then **Wg** will be squaring - a one-argument function which need not be looked upon as a primitive but can be defined as multiplying its argument by itself. Now, it is clear that the contribution of **himself** to **hit himself** is the same as the contribution of **W** to the meaning of **Wg**. This entails (12):

(12) The meaning of **himself** is the same as the meaning of **W**.

With this we have a straightforward account of the semantics of reflexives. Note, however, that the fact that they are a kind of NP appears to be unaccounted for. The multiplication/squaring analogy may not seem revealing in this respect. After all, **W** is a function over multiplication in squaring, while **himself** is the first argument of **hit**. But notice that what **W** does to its input is to turn it from a two-place function into a one-place function, which is essentially the same as to provide the first argument. The conceptual gap will be bridged by function-argument structure reversal, i.e., raising:

(13) **CI** $\equiv$ $\lambda xf.fx$

(14) $\lambda f[fa](\lambda y\lambda z[hyz]) = \lambda y\lambda z[hyz](a) = \lambda z[haz]$

This tells us what kind of a noun phrase a reflexive is: nothing but a raised kind. Given that raising is amply motivated in the grammar, reflexives are by no means exceptional in this regard.

The above reasoning, leading to the recognition that reflexives must be raised noun phrases can also be put in the following way. **W** may be taken to be a primitive combinator. If it is not, however, one of its definitions is (15):

(15) **W** $\equiv$ **S(CI)** $\lambda g\lambda h\lambda x[gx(hx)](\lambda y\lambda f[fy]) = \lambda h\lambda x[hxx]$

That is, **W** is obtained by applying the connector to the raiser.

In yet other words, every expression that is interpretable as **W** has a raised kind of category, although not every expression with a raised kind of category is interpretable as **W**. Compare:

(16)a.	**everyone**	**Mary**	**heself**
	S/(S!NP)	S/(S!NP)	S/(S!NP)
	$\lambda f\forall x[fx]$	$\lambda f[fm]$	
b.	**everyone**	**Mary**	**himself**
	(S!NP)!((S!NP)/NP)	(S!NP)!((S!NP)/NP)	(S!NP)!((S!NP)/NP)
	$\lambda g\lambda y\forall x[gxy]$	$\lambda g\lambda y[gmy]$	$\lambda h\lambda x[hxx]$

Himself has the standard raised NP category of ("narrow scope") objects. But just as the interpretation of **everyone** differs from that of **Mary**, **himself** has its own interpretation, too. The gap with **heself** of category S/(S!NP) is due to the fact that **W** is by definition a two-place function, whence it cannot be the interpretation of a one-place functor.

Consider now the derivation of a simple example:

(17)

everyone	**hit**	**himself**
S/(S!NP)	(S!NP)/NP	(S!NP)!((S!NP)/NP)
$\lambda f\forall x[fx]$	$\lambda y\lambda z[hit'yz]$	$\lambda h\lambda u[huu]$

S!NP $\lambda u[hit'uu]$

S $\forall x[hit'xx]$

Summarizing the basic idea: **himself** is assigned a lexical interpretation which (i) is consonant with it being a standard kind of NP, and (ii) allows us to derive the requisite interpretation for **Everyone hit himself** without further tricks. 3

Prior to proceeding to more complex cases, let me briefly comment on the significance of the fact that **W** is a lexical and not a syntactic combinator. Consider the sentence **John turned**. If we could argue convincingly that this is synonymous with **John turned himself** and, moreover, if this "transformation" of transitive verbs were fully productive, we could use **W** in syntax:

(18) **John turned**

$$\frac{(S!NP)/NP}{S!NP}\ \mathbf{W}$$

English is certainly not a language with such properties; whether there is a language like that I will leave open. But what can we make of all this?

Szabolcsi (1986) noted that if we just identified the set of possible syntactic operations with the set of possible combinators, we would be faced with an undesirable embarras de richesse. Composite combinators can perform indefinitely complex operations in one swoop. It is obvious that at most a very small set of combinators are plausible as operations on natural linguistic functors. Now, it may not at all be accidental that the combinators **B**, **S**, **CI** that have been found useful in English syntax constitute a primitive set -- a set whose members are not interdefinable. We may take this to indicate that natural languages restrict the operations freely available in syntax to members of such primitive sets -- or, at least, to very modest extensions of such primitive sets. Composite combinators definable in terms of those primitives will only be allowed if they are embodied by some lexical item; the categories and/or interpretations of those lexical items can then be regarded as mere abbreviations for composite combinators of the given system. 4

Now, this restriction (which clearly has promising implications for acquisition as well) may turn out too good to be true. Note however that the use of **W** outlined above conforms to it. **W** is a composite combinator in the system we envisage for English, and it can be argued to be lexical. Now, suppose there is in fact a language in which all transitive verbs can be used intransitively with a reflexive meaning (without morphological indication). In the ideal case we expect this language to be based on a combinator system in which **W** is a primitive -- for instance, **B**, **W** and **CI**. We predict, then, that this language has no free parasitic gaps because **S** is not available in its syntax. (It may have across the board extractions since connectives, whose semantics is closely related to **S**, are lexical items.) We have thus opened a line of research for mathematically coherent parametric variation.

3. TWO-COMPLEMENT VERBS

So far we have only dealt explicitly with reflexives as objects of simple transitives. In this section the term "two-complement verb" will be applied indiscriminately to **give**, **introduce**, and **talk** etc., that is, to any verb that takes two non-subject arguments, whether those be prepositional or not. **About himself** and its brothers will also be treated as syntactically primitive until Section 4.

What does the **W**-proposal imply for these cases? Let us again begin by sketching the general picture. An expression interpreted as **W** says, 'I am the first argument of a function, and its second argument will inescapably bind me'. But this only singles out what **W** cares about. It is by no means necessary that the function at issue be an atomic two-place function, and hence **W** is not specific for direct objects. In principle, we have all the following possibilities, with g an atomic three-place verb:

(19) $\lambda f \lambda x[fxx](\lambda y \lambda z \lambda u[gyzu]) = \lambda x \lambda u[gxxu]$
(20) $\lambda f \lambda x[fxx](\lambda z \lambda u[gazu]) = \lambda x[gaxx]$
(21) $\lambda f \lambda x[fxx](\lambda y \lambda u[gyau]) = \lambda x[gxax]$

In (19) **W** applies to **g** directly, so **g**'s 1st and 2nd arguments will be identified and its 3rd (subject) argument is left intact. We might have said that **W** applied to a two-place function whose value is VP, not S. In (20) and (21) **g** had managed to combine with its 1st and 2nd argument, respectively, before **W** aplied to it. Again, **W** actually applied to two-place functions that contain, but are not identical to **g**. This shows that **W** captures the prominence condition (9b) on the binder quite generally.

Let us now spell out what all this means and presupposes in grammatical terms. First of all, the general discussion relied on the type-freeness of combinatory logic. In such terms **CI** is just $\lambda x \lambda f[fx]$ and **W** is just $\lambda f \lambda x[fxx]$, with **f** any function. Our grammar is typed, however, so the degree of raising needs to be specified. Assuming that both complements are NPs, and ignoring the directionality of categories (as is indicated by the use of strokes instead of slashes), (19)-(20)-(21) can be redone as follows. **Arg** is the irrelevant item:

```
(19')  verb             reflexive                          binder   arg
       ((S|NP)|NP)|NP   ((S|NP)|NP)|(((S|NP)|NP)|NP)       NP       NP
       ------------------------------------------------
                        (S|NP)|NP
       ---------------------------------------------------------
                        S|NP

(20')  verb             arg     reflexive                  binder
       ((S|NP)|NP)|NP   NP      (S|NP)|((S|NP)|NP)         NP
       ----------------------
        (S|NP)|NP
       ----------------------------------------------
         S|NP
       ------------------------------------------------------
         S

(21')  verb             arg                         reflexive                bnd
       ((S|NP)|NP)|NP   (S|NP)|((S|NP)|NP)          (S|NP)|((S|NP)|NP)       NP
       ------------------------------------------
        (S|NP)|NP
       ------------------------------------------------------------------
         S|NP
       ----------------------------------------------------------------------------
         S
```

The first thing these show is that the orientation of the reflexive is dependent on the degree of raising used to obtain its syntactic category. In (20') and (21') the reflexives are subject-oriented (recall also (17)), while in (19') the reflexive is object-oriented, due to its higher-order raised category. Assuming that the 1st argument of a three-place verb may raise either as in (19') or as in (21'), this is just fine.

This analysis reveals two problematic presuppositions, however:

(22) a. The surface order of arguments must normally be the same as their "semantic order" (the "semantically first" argument should be closest to the verb etc.), and

b. It must be possible to compose the (raised) second argument with the verb.

The problem posed by (22a) is only too familiar from every theory of binding. Its most recent formulation is, perhaps, Barss--Lasnik's (1986) discussion of two-object verbs of the show-type. They point out that there are several phenomena demonstrating an asymmetrical relation between two NPs, all of which indicate that the linearly first (dative) NP is more prominent than the second (accusative) NP. (They discuss the binding principles, QNP-pronoun relations, WH-movement and weak cross-over, superiority, **each ... other**, and polarity any.) Nevertheless, phrase structures that do not allow for discontinuous constituents will either make the opposite prediction or make no distinction at all. Now, while the realization of this may be a novelty in GB literature, Montagovian literature has for long used a wrap operation to obtain the surface order in two-complement verbs of various sorts (cf. Bach (1979) and his followers Pollard (1984) and Chierchia (1985), to name only a few.)

Now, while it may be a matter of debate whether the theory I presuppose allows wrap operations, the particular version developed in Ades--Steedman (1982) and used in Steedman's subsequent work does not. In fact, even the conflict between "surface order" and "semantic order" is not acknowledged. Steedman establishes verbal categories on the basis of neutral surface order and sees no reason to believe that the "semantic order" may be any different (p.c.). His procedure is adopted in Dowty (1985), who adds, "the correct translation of **John showed Mary Bill** will therefore be **showed'(m)(b)(j)**, not **showed'(b)(m)(j)**".

If we adopt Steedman's proposal, we have to exclude complement oriented anaphors from this treatment. Of (23a,b) only the ungrammatical version could be derived:

(23) a.* **John showed herself Mary.**
b. **John showed Mary herself.**

(24)	**John**	**showed**	**herself**		**Mary**
	NP	((S!NP)/NP)/NP	((S!NP)/NP)!(((S!NP)/NP)/NP)		NP
			(S!NP)/NP	λxλy[show'xxy]	
			S!NP	λy[show'mmy]	

Steedman (p.c.) suggests that this conclusion is actually correct. Only the existence of subject-oriented object reflexives is universal. A number of languages have no complement-oriented reflexives at all; in a number of others, prepositional reflexives, whether subject or complement oriented, are in fact stressed pronous. These latter should be treated in some principally different way, and the superficially misleading case of English (and Hungarian, for that matter) is to be assimilated to theirs.

In what follows I will experiment with an analysis that includes, rather than excludes, complement-oriented anaphors. My reason is as follows: (i) The cross-linguistic argument is not watertight. Not every language exhibits unbounded dependencies in its surface syntax, for instance. This however does not seem to prevent one from believing that unbounded dependencies are a natural phenomenon that needs to be accounted for in, say, English. (ii) Subject orientation is not an unmarked concept in our theory. The subject is nothing but the last argument of an atomic functor. While it is always possible to seek out the last argument of functors of a given arity, there is no general way to refer to last arguments in combinatory logic. (iii) On the basis of arguments related either to binding in the broad sense or to other phenomena, I do believe that English verbs have a "semantic" argument order that is different from the surface order. That is, I believe in the reality of something like a wrap operation. (iv) The treatment of extraction in two-complement cases makes some slightly questionable predictions in Steedman (1987), a point to be returned to in Section 4. So his assumptions do not make life so easy in purely syntactic terms that it would make no sense to try to modify them.

In view of these considerations I have to choose between adopting or simulating the wrap operation. To retain the coherence of the framework, I will opt for simulation. In addition to the standard raised category VP!(VP/NP), cf. (25a,b), objects will also be assigned the non-standard raised category VP/(VP/NP), cf. (26).

```
(25)a.  introduce    Mary            to Bill [PP or]
        (VP/NP)/PP   VP!(VP/NP)      VP!(VP/PP)
        -----------------------B!
                     VP/PP
        ----------------------------------------
                     VP

    b.  introduce    to Bill [PP or]         every celebrity who...
        (VP/NP)/PP   (VP/NP)!((VP/NP)/PP)    VP!(VP/NP)
        -----------------------------------
         VP/NP
        ---------------------------------------------------------
         VP
```

The VP!(VP/NP) category used above is standard in the sense that it preserves the directionality of combination, wherefore it is freely obtainable in syntax and may be input to any of the operations that we picked for English (cf. (8) and Steedman (1987)). I will assume that objects may have this category iff they are "heavy", i.e., iff they are heavier than any complement that comes between them and the verb. (Heaviness in this sense is a filter applicable to strings that are already assembled: it will throw out *John introduced to Bill me, for instance.)

The category VP/(VP/NP) is not standard in the same sense. It is like the lexically assigned preposing categories of WH-words, S/(S/NP) and its brothers. Furthermore, to avoid disastrous effects it must be restricted to being input to **B/**, the forward mixing version of composition otherwise not operative in English syntax: 5, 6

```
(26)  introduce    Mary          to Bill
      (VP/NP)/PP   VP/(VP/NP)    (VP/NP)!((VP/NP)/PP)
                   ----------------------------------B/
                                   VP!((VP/NP)/PP)
      -----------------------------------------------
                                   VP
```

Although this would suffice for the coming discussion, a few comments are in order here to clarify the status of this way of simulating wrap. The fact that VP/(VP/NP) is restricted to **B/** contradicts the spirit of our theory, according to which legitimate combinators are to apply quite unconstrained in syntax. The only decent way to accomodate the requisite restriction is to encode it in the lexicon. And there is an easy way to do it. Instead of VP/(VP/NP) we will assign the category (VP!((VP/NP)/PP))/((VP/NP)!((VP/NP)/PP)) to such objects in the lexicon. It is easy to see that the latter category is obtained from the former by applying Lambek's (1958) division to it, in our terms, by applying composition to one argument. Thus **B** is put into the lexicon (with a special main slash direction) and the relevant part of (26) can be rewritten by using application in syntax:

```
(27)  Mary                                          to Bill
      (VP!((VP/NP)/PP))/((VP/NP)!((VP/NP)/PP))      (VP/NP)!((VP/NP)/PP)
      ------------------------------------------------------------------
       VP!((VP/NP)/PP
```

This is, of course, a generally applicable method of simulating wrap in our grammar. Nevertheless, given that the monstrous category in (27) would make it impossible to arrange examples in one line, I will retain (26) -- marking B/ as **Blex** in the rest of the paper.

Ideally, the introduction of the "wrapping category" for objects should allow us to simplify Steedman's apparatus: it should allow us to get rid of **B!**, the backwards mixing composition operation as well. Unfortunately, it does not. Apart from the treatment of adjuncts, the exclusion of **B!** would only allow the following derivation of **to whom you introduced NP**, for instance: 7

(28) **to whom** — (S/NP)/((S/NP)/PP) | **you** — S/VP | **introduced** — (VP/NP)/PP | **NP**

you introduced ⟹ (S/NP)/PP (BBB)

to whom you introduced ⟹ S/NP

This may be tolerable if NP is something like **Bill** -- it is not tolerable if **NP** is a reflexive (**yourself**), however. My proposal for reflexivization implies that the binder must be directly accessible to the reflexive. In a derivation like (28) the subject **you** inescapably combines with the verb prior to the object reflexive being able to come to the picture. Coordination data indicate that this really excludes reflexivization: (29) is grammatical but (30) is not. (I wonder if this is predicted by other theories.)

(29) **Mary** S/VP **hates** VP/NP **while** **Judy** S/VP **admires** VP/NP **Bill** NP

Mary hates ... Judy admires ⟹ S/NP

... Bill ⟹ S

(30)* **Mary hates, while Judy admires herself.**

The sentence **To whom did you introduce yourself?** is grammatical, however, so it must be derived in analogy to (25a):

(31) **to whom** — S/(S/PP) | **you** — S/(S!NP) | **introduced** — ((S!NP)/NP)/PP | **yourself = W** — (S!NP)!((S!NP)/NP)

introduced yourself ⟹ (S!NP)/PP (B!)

you introduced yourself ⟹ S/PP (B)

to whom you introduced yourself ⟹ S

With these observations in mind, let us return to the phenomenon that serves as the main topic of this section: anaphors that are first arguments of three-place verbs.

The discussion of (19') through (21') presupposed that we are dealing with the ideal situation in which surface order and semantic order coincide. This coincidence may actually obtain in English but, as we have seen, it does not always obtain. Consider complement-oriented anaphors first. In cases of argument order coincidence we may follow (19') -- see (32)-(33), while otherwise we may rely on the new possibility opened up in (26)-(27) -- see (34):

(32) **Mary** | **introduced** — (VP/NP)/PP | **to himself = W** — (VP/NP)!((VP/NP)/PP) | **everybody who...** — VP!(VP/NP)

introduced to himself ⟹ VP/NP

introduced to himself everybody who... ⟹ VP

(33) **who** — S/(S/NP) | **Mary** — S/VP | **introduced** — (VP/NP)/PP | **to himself = W** — (VP/NP)!((VP/NP)/PP)

introduced to himself ⟹ VP/NP

Mary introduced to himself ⟹ S/NP (B)

who Mary introduced to himself ⟹ S

(34) **Mary** **introduced** **everyone** **to himself = W**

(VP/NP)/PP   VP/(VP/NP)   (VP/NP)!((VP/NP)/PP)

VP!((VP/NP)/PP) —Blex

VP

(Caveat: The examples in (32) through (38) do not sound very good. I am informed, however, that this is due to the fact that they are not idiomatic/pragmatically plausible. Similar examples involving reciprocals are much better, e.g., **Mary introduced the boys to each other** or **The boys introduced Mary to each other**. The only reason why I use reflexives is that I do not wish to propose an explicit interpretation for reciprocals here.)

Consider subject-oriented cases next. As (21') showed, a simple treatment is possible iff the irrelevant argument (in our case, the direct object) can compose with the verb before the reflexive enters the picture. This is possible on the neutral order, (35), but not if the direct object is preposed or heavy NP shifted, (36) and (37):

(35) **Mary introduced John to herself.**
(36) **Who did Mary introduce to herself?**
(37) **Mary introduced to herself everybody who came into the room.**

Notice, though, that not only (36) and (37) are a problem. A derivation in which the direct object forms a constituent with the verb does not allow the possibility of non-constituent conjunction that involves reflexives:

(38) **Mary introduced John to herself and Bill to himself.**

The grammaticality of (38) indicates that both **John to herself** and **Bill to himself** are possible representatives of the category (S!NP)!(((S!NP)/NP)/PP). Moreover, the coordination in (38) is not only categorially but also semantically coherent, i.e., it has the interpretation $\lambda f \lambda x[\mathbf{f(to\ x)(j)(x)\ \&\ f(to\ b)(b)(x)}]$. These facts indicate that the derivation that could be used for (35) is really not generally useful.

It appears that the only way to account for the possibility of 3rd argument oriented 1st argument reflexives is to build the skip of the irrelevant argument into the interpretation of the reflexive. This can be done by using the composite combinator **B(BW)C** instead of **W** as its interpretation: [8]

(39) **B(BW)C** = $\lambda g \lambda x \lambda z[gzxz]$

(40) **John** **to herself = B(BW)C**

(S!NP)/((S!NP)/NP)   ((S!NP)/NP)!(((S!NP)/NP)/PP)

(S!NP)! (((S!NP)/NP)/PP) —Blex

and

Bill **to himself = W**

(S!NP)/((S!NP)/NP)   ((S!NP)/NP)!(((S!NP)/NP)/PP)

(S!NP)! (((S!NP)/NP)/PP) —Blex

The derivations of the conjuncts are syntactically identical; the difference in the orientation of the reflexives is merely due to lexical ambiguity.

It is to be noted that the need to postulate reflexives interpreted as either **W** or **B(BW)C** is not specific for my proposal which divorces surface order from semantic order. On Steedman's assignment of verbal categories, subject-oriented direct object reflexives need to be **B(BW)C** if the verb has two complements. In fact, this interpretation, inspired by E. Jowsey, was suggested to me by Steedman to derive (41) his way:

(41)	**Mary**	**introduced**	**herself** = B(**BW**)C	**to Bill**
	S/(S!NP)	((S!NP)/PP)/NP	((S!NP)/PP)!(((S!NP)/PP)/NP)	PP
		(S!NP)/PP		

In other words, this ambiguity between **W** and B(BW)C is specific for 3rd argument oriented 1st argument reflexives, irrespective of which complement is taken to be 1st. The difference that category assignment to verbs makes is that Steedman's categories would require that we explicitly prohibit the **W** interpretation for such objects (or else we get the ungrammatical pattern illustrated in (24)) and substitute B(BW)C for it. On my categorization, B(BW)C is merely one additional option; no categorially justified interpretation needs to be prohibited. (And, as we have seen, only this treatment allows for complement oriented reflexives at all.) By "categorially justified" I mean this. **W** is a two-place function. Therefore any raised kind of category that can be looked upon as an at least two-place function can be interpreted as **W.** On the other hand, B(BW)C is a three-place function, wherefore it is only available as an interpretation to raised categories that can be looked upon as at least three-place functions. ((S!NP)/NP)!(((S!NP)/NP)/PP) can be interpreted in either way.

With this we have covered all the relevant cases of subject and complement oriented anaphors. Note that the same procedures will apply irrespective of whether the verb is finite or infinitival. **To hit himself** is interpreted as $\lambda x[\textbf{hit'xx}]$ just like **hits himself.** Whatever procedure makes sure that the matrix subject or object "controls" the infinitival "subject" will automatically provide the binder for the reflexive. Cf. Steedman (1985b).

4. PIED PIPING

Up until now prepositional anaphors have been taken to be syntactically primitive. **To himself** was just assumed to be a lexical PP with the interpretation $\lambda f \lambda x[f(\textbf{to } x)(x)]$. This is obviously not the final solution. Reflexivehood is a property to be attributed to bare **himself,** and it is to be guaranteed that the preposition that takes it as an argument preserves this property in its value.

In other words, we are dealing with pied piping. Pied piping is, of course, not particular to reflexives but is also operative in WH-expressions and quantifiers. A general scheme to handle it was suggested to me by Steedman: the pied piper must know in advance that there will be an extra function over it.

(42) If the standard raised category of NP is interpreted as **£**, its pied piper version is interpreted as C(B(B£)B). Cf. X!(X/NP) and (X!(X/PP))!(PP/NP).

Consider **himself** and **everybody** as pied pipers:

(43) $\mathbf{C(B(BW)B)} = \lambda g\lambda f\lambda x[f(gx)(x)]$

(44) $\mathbf{C(B(B(\lambda f\forall x[fx]))B)} = \lambda g\lambda h\forall x[h(gx)]$

B(BW)B introduces the extra function **g** (PP/NP) into the first argument and **C** merely changes the surface order in the result (as we have **talk about himself**, rather than **talk himself about**); and similarly for the quantifier. This gives us precisely the interpretation assumed above, so the derivation of, say, **Mary talks about herself** can be spelled out as follows. (**Mary introduces Bill to herself/himself** poses no new problem, so it will not be given.)

(45)
$$\begin{array}{llll}
\textbf{Mary} & \textbf{talks} & \textbf{about} & \textbf{herself} = \mathbf{C(B(BW)B)} \\
\mathrm{NP} & (\mathrm{S!NP})/\mathrm{PP} & \mathrm{PP/NP} & ((\mathrm{S!NP})!((\mathrm{S!NP})/\mathrm{PP}))!(\mathrm{PP/NP}) \\
\cline{2-4}
 & & & (\mathrm{S!NP})!((\mathrm{S!NP})/\mathrm{PP}) = \mathbf{W} \\
\cline{2-4}
 & & & \mathrm{S!NP}
\end{array}$$

Now that we have seen that anaphors may legitmately be prepositional, let us ask whether binders may be, too. It seems they may:

(46) **Mary talks to everybody about himself.**

Such examples constitute a notorious problem for the claim that the binder must c-command the anaphor, since the PP on top of **to everybody** is a branching node. The standard GB solution to this problem is to assume that **talks to** is reanalyzed as a complex verb in such cases and **everybody** acts like a direct object. The claim that examples like (46) may not refute the validity of the c-command requirement is corroborated by the fact that in case the binder is a WH-phrase, the preposition must be stranded:

(47)a.* **To whom did Mary talk about himself?**
b. **Who did Mary talk to about himself?**

The problem of (46) can be approached in the present theory in two ways.

First, notice that what we have so far does not allow the binder to be pre positional in the sense that it forms a constituent with the preposition. The reasons are twofold. On one hand, the reflexive interpreted as **W** or B(BW)C takes an argument of the verb as its binder. If that arument is complex, then the whole of it will be the binder. **To everybody** and, say, **brothers of everybody** do not differ in this respect. On the other hand, "binderhood" is not a property at all, so it is certainly not something that a complex expression may inherit from some part of it. This is a welcome result. Our proposal preserves the prominence condition on the binder not only in the sense that the binder may not be an argument lower in the hierarchy, but also in the sense that it may not be part of an argument higher in the hierarchy. Therfore we must follow GB in assuming that the raised PP **about himself** takes **talks to**, rather than **talks**, as one of its arguments. The exact execution will be discussed shortly. (Note, by the way, that binderhood could pied pipe in just one case: if we assumed the preposition **to** to be meaningless, i.e., if it were interpreted as **I**, λ**x.x**. In this case **to everybody** would be the same as **everybody**. But the contrast in (47) shows that this cannot be correct. If it were, **to whom** could serve as a binder.)

The other way to look at the problem of (46) is as follows.

The **W** interpretation of reflexives surely preserves the c-command requirement in its entirety. However, what prevents us from devising an interpretation for reflexives that allows the binder to be part of a "higher argument"? We might let the reflexive know in advance that its binder will be hidden in a PP and retrieve it. Essentially, this could be achieved by interpreting reflexives also as some (slightly reordered) version of the combinators S or ϕ:

(48) $S \equiv \lambda fgx.fx(gx)$ cf. connection
(49) $\phi \equiv B(BS)B \equiv \lambda fabx.f(ax)(bx)$

An S-reflexive would itself be prepositionless but its binder would be prepositional, and with ϕ, both the reflexive and the binder would be prepositional. Such interpretations would allow us to circumvent the second part of the c-command requirement: the binder could be a part of an argument higher in the hierarchy.

This is a serious problem because it raises the question to what extent this proposal deduces, rather than merely captures, the empirical properties of binding. Given that our combinators yield the power of the lambda calculus, we cannot expect our system to exclude the wildest binding relations in principle. In this strong sense the empirical properties of binding cannot be just deduced. We have two alternatives here. One is to say that it is an ad hoc property of anaphors that they have the **W**-kind of interpretation, rather than the S-kind. After all, these are lexical interpretations, and natural languages do not have every conceivable quantifier interpretation in the lexicon, either. Another possibility is to look for an empirical but in some sense still principled way to exclude S-reflexives. For instance, it may be conjectured that the division of labor between syntactic combinators and lexical combinators is even stricter than was tentatively suggested at the end of Section 2. Namely, we might observe that S is a combinator operative in syntax, while **W** is not. Maybe primitive combinators of a given system are not merely allowed in, but are also restricted to, syntax. I will not pursue this idea in this paper. Nevertheless, it seems like one quite reasonable line for further research. [9]

Let us now return to the problem how the complex verb **talks to** should come about. The easiest way to get the effect would be to require **talk** and **to** to compose in an ordinary fashion. Due to the argument order we are working with, however, this is impossible. **To** cannot compose with **talk**, regardless whether it is assigned the normal category PP/NP or the extravagant category (VP!(VP/PP))/NP:

(50) **talk** **to**
(VP/PPto)/PPabout PP/NP
- - - - - - - - - - - - - - - - *
- - - - - - - - - - - (VP!(VP/PPto))/NP *

This is in fact encouraging. Suppose **brothers of** is NP/NP etc. If to composed with **talk**, **brothers of** could also compose with **introduce**:

(51)* **Mary will introduce brothers of** $[$**everybody**$]_i$ **to himself**$_i$.

We must assume, then, that there is a real lexical item **talk to** of category (VP/NP)/PPabout. On the other hand, we will not assume the existence of any lexical item **talk about** (VP/NP)/PPto. The lack of such an item will explain why (52) is ungrammatical, even though it is generally understood that **talk** can be either (VP/PPto)/PPabout or (VP/PPabout)/PPto.

(52)* **Mary talked about everybody to himself.**

I expect that the absence of a lexical **talk about** has deeper reasons but I will not investigate the matter here. The absence of a lexical **introduce brothers of** seems quite natural.

At this point it seems necessary to return to a syntactic aspect of the verbal argument orders I assume, in conjunction with the assumption of lexical **talk to.** Steedman (1987) is able to predict all the following data correctly: 10

(53)a.* **Who did you entrust to — the heavy responsibility of...?**

(54)a. **What do you wonder who to talk to about?**
b. **Who do you wonder what to talk about to?**
c.* **What do you wonder who to talk about to?**
d.* **Who do you wonder what to talk to about?**

Providing that verbal categories reflect the neutral surface order of their arguments, (53a) as well as (54c,d) are strictly excluded. Now, using the converse orders I am assuming, the **talk** data of (54) will still be predicted correctly (the proof is left to the reader). However, (53a) will also predicted to be grammatical:

```
(55)  who                  you    entrusted    to      the heavy...
      (S/NP)/((S/NP)/NP)   S/VP   (VP/NP)/PP   PP/NP   NP
                                  ------------------
                                  (VP/NP)/NP        BBB
                           -------------------------
                           (S/NP)/NP
      ----------------------------------------------
      S/NP
      ------------------------------------------------------
      S
```

This may sound disastrous. Nevertheless, as I. Sag (p.c.) points out, (53a) improves significantly if we use **to the brother of:**

(53)b.? **Who did you entrust to the brother of — the heavy...?**

Whatever the account of the contrast between (53a) and (53b) should be, this possibility of improvement suggests that the pattern common to these two sentences should not be excluded in the strongest sense. Therefore, in this respect **entrust** as (VP/NP)/PP seems justified. Notice, however, another prediction my proposal makes. Given the fact that I have **talk to,** not only **talk,** as a lexical item, (54d) also has a legitimate derivation: **talk to** is (VP/NP)/PPabout. Therefore, we expect that (54d) can be improved exactly like (53a) can, but we do not expect the same for (54c), in the absence of lexical **talk about:**

(54)e.** **What$_1$ do you wonder who$_2$ to talk about pictures of$_1$ to$_2$?**
f.? **Who$_1$ do you wonder what$_2$ to talk to the brother of$_1$ about$_2$?**

My informants report that the predicted effect is in fact very strong. (Note, by the way, that the contrast in (54e,f) shows that improvement has nothing to do with performance factors related to length.)

After this excursus, let me point out that even if **to** and **brothers of** are unable to compose with the verb in sentences like (46) and (51), there are various undesirable possibilities for composition.

(56)a.* **Mary believes that John loves herself.**
b. **Who does Mary believe that John loves?**

(57)a.* **Mary talks about brothers of herself.**
b. **Who does Mary talk about brothers of?**

Of these, (56a) may arise if the functor **herself** applies to is **believes that John loves**, and (57a) may arise if the PP/NP **herself** uses in pied piping is **about brothers of**. While this latter pattern is in fact grammatical with **picture**-nouns, those obviously do not represent the general case.

5. LOCALITY AND PRONOUNS

Three properties of anaphors were listed in (9): the necessity for there to be a binder, the prominence condition on the binder, and the locality condition on the binder. I have argued that the **W** interpretation essentially captures the first two of these and can, at the same time, be handled in the same system that takes care of extraction and coordination etc.

Turning to locality now, it is to be observed that locality cannot appear as a natural condition in a system that includes composition and similar "unboundedness operations". If the treatment of anaphor binding is to be part of this system, we must resort to brute force to capture the locality condition. The brute force method is, basically, to require that **W** apply to functors that are lexical in some sense.

Without going into details with the precise definition of lexicality, let us ask how sad one should be about this. Is the locality condition part and parcel to the notion anaphor, where by "anaphor" we mean an item that must be bound by a c-commanding argument (i.e., which is interpreted as **W**)?

The existence of long-distance anaphors has for long been well-known. Most long-distance anaphors necessarily reside within NPs and are exclusively subject-oriented etc., that is, appear to have a rather peculiar restriction. A very interesting case from Modern Greek is reported by Iatridou (1986), however. Greek has two anaphors in the **W**-sense, of which **ton eafton tou** is to be bound locally, and **ton idhio** can be bound, as she puts it in GB terms, outside its governing category. The data Iatridou presents indicate that this latter long-distance anaphor does not exhibit the peculiar restrictions mentioned above. For example:

(58) **O Yanis**$_i$ **ipe** **ston Costa**$_j$ **oti** **i Maria** **aghapa** **ton idhio**$_{i/j/*k}$
said to that loves himself

This seems to indicate that locality can in general be divorced from the core notion of anaphor in the **W**-sense, contrary to what current theories suggest. The locality condition (lexicality requirement) may in fact be a brute force device employed by natural language to facilitate processing. Clearly, it is very useful for the hearer if binding ambiguities are reduced by having different forms for **W**; but there may be nothing more to it. While my proposal (as it stands, at least) is unrevealing with respect to what locality conditions different languages may impose on their anaphors, it may be taken to be revealing in the sense that it predicts locality to be a more or less ad hoc matter. And, besides exotic data like (58), acquisition studies seem to suggest that even "the English kid" thinks so.

There is another phenomenon that this proposal makes a prediction for, namely, bound versus unbound pronouns.

While anaphors (reflexives and reciprocals) must be bound, pronouns may or may not be. One important discovery has been that it is easier to characterize the conditions under which pronouns cannot be bound than the conditions under which they can. This discovery is built into the Binding Principles of GB as well as other theories. Compare the clauses for anaphors and pronouns:

(59) a. An anaphor must be bound (= coindexed with a c-commanding argument) in its governing category.
b. A pronoun must be free in its governing category.
c. A referential expression must be free.

Although factually correct, this formulation has something funny about it. If I contemplate about the meaning of **himself** (that is, about what distinguishes it from other NPs), the fact that **himself** must be bound will certainly come to my mind. If I contemplate about **him**, however, my first thought will certainly not be, 'Well, **him** is an item that cannot be bound to something too close to it'. In other words, the negative characterization given for pronouns is intuitively on a very different level than the positive characterization given for anaphors.

What does combinatory logic have to say here? As was pointed out above, it has no bound variable items. It does have free variables. But those are like any name: they start out free and remain free. This does not prevent them from coreferring with another name, though: the same thing may happen to have more than one way to name it, so to speak. And there are combinators like **W**, of course, which give the same effect as variable binding in usual theories.

The moral of this story seems to be the following. The items known as pronouns are multiply ambiguous. We must distinguish bound pronouns and free pronouns in the first place. Bound pronouns are members of the class of anaphors. As a very first approximation, they can be assigned a **W** kind of interpretation (and the anti-locality condition can be captured by making them obligatory pied pipers). Free pronouns on the other hand are essentially deictic and, given the assumptions above, are infinitely many ways ambiguous. (In comparison with the usual formulation, we may say that **he**[free] is not one variable to which infinitely many different values can be assigned but rather it represents infinitely many different variables, each having its value fixed once for all.)

On the grammatical side, the implications of this theory are in line with Reinhart's (1983). It is common to treat instances of "binding by a name" and "binding by a (possible) quantifier" in the same way. Reinhart separates true binding from mere coreference, observing that the prominence conditions in the former case are much stricter. This is what my proposal captures. It seems, therefore, that both the merits and the drawbacks of the present proposal for pronoun binding are essentially the same as hers. Strict limitation on space fortunately prevents me from discussing them in detail, however. 11

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This proposal for anaphors develops an idea sketched in Szabolcsi (1985, 1986). In discussing how to incorporate it into a joint paper (in progress), I received many valuable comments from Mark Steedman, as is indicated in the text.

NOTES

1 Connection is renamed "substitution" in Steedman (1985b, 1987).

2 These definitions are quoted from Curry--Feys (1958, 152-153), so I follow their notation. Recall that their logic is typefree.

3 Arnim von Stechow has kindly pointed out to me that my proposal is anticipated in Quine (1960), adopted in his (1979). I am duly ashamed of this gap in my philosophical education.

4 One composite combinator that is apparently operative in English is **BBB** (generalized composition). For instance, (54a,b) and (55) cannot be derived without it.

5 Michael Moortgat points out to me that VP/(VP/NP) needs to be restricted to simple **B/** in fact. Generalized composition, in conjunction with the pied piper categories of Section 4, would derive the string **to Mary** Bill interpreted as 'Mary to Bill'. The alternative proposed below avoids this unwanted consequence as well. I am grateful to him for discussion about this issue.

6 In GB terms we might say that two-complement verbs really have two complements but a small clause can be obtained via A-bar adjunction. This seems like having the cake and eating it, too.

7 **B!** might be expelled from syntax by assigning a special divided category to every raised category in the lexicon. While it may be ultimately useful to free syntax from any kind of disharmonic composition, note that the big empirical difference between **B/** and **B!** in English is that the latter appears to be quite generally available.

8 The reader may check that **B(BW)C** gives the same effect as if we **C**'d the verb, applied it to the object, and used **W** for the reflexive. The use of simple **C** would not in general solve our problems, though, and would not allow the derivation of (38) either.

9 It might be tempting to use **S** to interpret pronouns not strictly c-commanded by their binders. At least a simple adoption of this idea would have undesirable effects, however.

10 This is not literally true but, as far as verbal categorization is concerned, his grammar would indeed derive those results.

11 Another set of data that I cannot discuss here despite the fact that they are pertinent to the topic of this paper includes extracted anaphors, cf. Barss (1984):

(i) Which pictures of himself$_{i/j}$ does John$_i$ think Bill$_j$ likes?

(ii) Which stories of himself$_{i/*j}$ did John$_i$ publish without Bill$_j$ signing?

These are not too difficult to handle, however, given some extension of the proposal in the text.

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