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PARASITIC GAPS*

0. INTRODUCTION

In this paper, I will discuss a phenomenon that I will refer to as 'parasitic gaps'[1]. Tentatively, we can define a parasitic gap as a gap that is dependent on the existence of another gap, which I will henceforth refer to as the 'real gap', in the same sentence. By a gap, I understand an empty node that is necessarily controlled by a lexical phrase somewhere in the sentence. It follows from this definition that a parasitic gap will only occur if there is a filler-gap dependency elsewhere in the sentence and the parasitic gap is interpreted as controlled by that filler. The characterization of parasitic gaps rules out gaps that arise as the result of a pronoun deletion rule. In languages like Japanese and Turkish, which have rules of optional pro drop, a gap may act just like a deictic pronoun and be interpreted as referring to something salient in the context. In languages like English and Swedish, from which I will draw the data for this discussion, optional pro drop does not occur and gaps are controlled sentence internally. Here are some examples of sentences with parasitic gaps. For perspicuousness, I will, when possible, indicate the parasitic gap by _____$_p$.

(1)   Which articles did John file _____ without reading _____$_p$?
(2)   This is the kind of food you must cook _____ before you eat
       _____$_p$.
(3)   Which girl did you send a picture of _____ to _____?
(4)   Which boy did Mary's talking to _____$_p$ bother _____ most?

Some of these examples have been previously noted in the literature, but I'm not aware of any systematic attempt at assessing the relevance of parasitic gaps to grammatical theory. This will be the main purpose of this paper.

Sentences with parasitic gaps show that one filler may control more than one gap. The same is true for sentences with simultaneous extractions out of coordinate structures. In Section 1, I will discuss some reasons for not subsuming parasitic gaps under coordinated extractions and point to a general parsing problem posed both by parasitic gaps and by gaps in coordinate structures. The distribution of parasitic gaps is

shown in Section 2, and in Section 3, I address the question of what the
licensing conditions for parasitic gaps are. In Section 4, I illustrate the
nature of these gaps. I further argue that they fall naturally into an
optional and an obligatory class (Section 5) and show how obligatory
parasitic gaps interact with Postal's cross-over constraint (Section 6).
Certain interesting restrictions on parasitic gaps are discussed in Section
7. In Section 8, I discuss a proposal by Chomsky and Lasnik (1977) for
similar cases. Some implications for sentence processing are drawn out
in the final section.

1. PARASITIC GAPS AND 'COORDINATE GAPS'

First some terminological clarifications. In talking about long distance
dependencies, I will use the terms 'filler' and 'displaced constituent' to
refer to topicalized constituents, heads of relative clauses, and preposed
interrogative phrases, i.e., constituents which according to a trans-
formational analysis would have been 'moved' from their deep structure
position. The surface position of such fillers, viz., as leftmost sisters of
S, is not a possible deep structure position, a fact that presumably is
recognized and utilized by the parser (Fodor, 1978).

   In general there is a one-to-one correspondence between fillers and
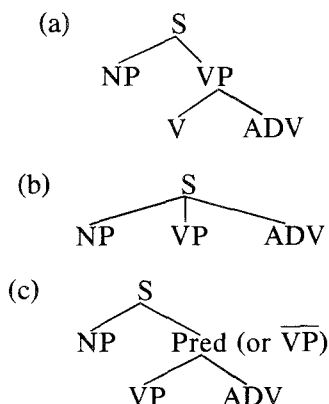gaps. One notable exception is when a gap occurs in a coordinate
structure, as in (5)

   (5)   Who$_i$ did you say [$_s$[$_s$John liked _____$_i$] and [$_s$Mary hated
            _____$_i$?]]

(5) illustrates what I will call 'coordinate gaps'. Williams (1978) shows
that such sentences can be derived by one single application of a
transformation given a factorization of the string into parallel structures
where the conjunction and Comp nodes play a crucial role. Gazdar
(1981) shows how the same facts can be handled in a non-trans-
formational grammar and uses the coordination facts as an argument for
using 'slashed categories' in the grammar.
   The question is now whether parasitic gaps are amenable to similar
analyses. We note that in (1) and (2), the parasitic gap occurs in an
adverbial clause. It is irrelevant to the present argument exactly where
in the tree the adverb is attached. In fact, different types of adverbial
clauses are probably attached at different heights in the tree and all three
structures in (6) are motivated. (See Reinhart (1976) and Williams (1978)

for discussion.)

(6)   (a)   S
                          ╱ ╲
                        NP   VP
                              ╱ ╲
                             V   ADV

            (b)   S
                          ╱ | ╲
                        NP   VP   ADV

         (c)   S
                       ╱ ╲
                     NP   Pred (or $\overline{VP}$)
                          ╱ ╲
                        VP   ADV

In none of the structures illustrated in (6) does the attachment of the adverbial clause involve coordination of two constituents of the same syntactic category. Consequently, there is little syntactic motivation for analyzing sentences (1) and (2) in a similar fashion to (5).

Semantically the adverbial clauses act as modifiers on VP or S. It follows that they will be of a different type than the argument they apply to, and hence cannot be coordinated with these. Rather they are often analyzed, as for instance in Montague grammar, as functions that take either VP meanings or S meanings as arguments and yield results of the same type. The examples in (3) and (4) provide even less ground for a coordination analysis. In (3), there are two gaps in two distinct argument positions of the verb 'send'. Since 'send' subcategorizes for both a direct and an indirect object, it is not possible to analyze the arguments as a conjoined structure. Example (4) shows that a parasitic gap may in fact precede the real gap. In this case, the parasitic gap occurs inside the subject NP and the real gap in the direct object NP. One will be hard put to analyze such a structure as an instance of coordination. Further evidence that (1)–(4) do not involve across-the-board dependencies comes from the fact that sentences formed by replacing the parasitic gaps with full NP's are grammatical, as illustrated in (1') and (4'),

(1')   Which articles did John file _____ without reading more than
        their titles?
(4')   Which boy did Mary's talking to the policeman bother _____
        most?

If these sentences involved dependencies into coordinate structures, replacing a gap with a full NP would lead to a violation of the coordinate

structure constraint and the sentence would be ungrammatical, as in the case of (5′).

(5′)   *Who did you say John liked ____ and Mary hated Bill?

There thus seem to be good grounds not to assume that the examples in (1)–(4) involve underlying conjunctions. I take it then that Williams' and Gazdar's across-the-board approaches will not be applicable to these cases.

There is one respect, however, in which parasitic gaps and coordinate gaps are alike, namely in the demand of increased flexibility that they put on the parser. Examples like (1) through (5), where one filler must be linked with more than one gap, show that a theory of gap filling cannot consist simply of the assumption that a recognized filler is put in some special location, call it HOLD, until a gap of matching category is detected. When a gap has been identified, the filler is retrieved from HOLD and 'plugged into' the gap. The examples given above show that the filler must in some sense be 'available' across conjunctions and also into a variety of non-conjoined domains.

2. The distribution of parasitic gaps

When I started to collect judgments on sentences with parasitic gaps, it became painfully clear to me that there is a lot of variation among speakers. Some speakers are very restrictive about which positions they accept parasitic gaps in, others are much more permissive. This makes indicating the status of the example sentences rather problematic. Rather than marking the sentences with some combination of stars and/or question marks, I will continue to just give the examples and leave it up to the reader to supply the judgments. All example sentences, except when the parasitic gap is explicitly marked as ungrammatical, are acceptable to some speakers.

The interesting fact about the variation in judgments is that it is not at random but seems to follow a relative ordering. That is, given two sentences with parasitic gaps in different types of domains, people in general agree on which sentence is more acceptable. This suggests that we can order the domains in which parasitic gaps can occur into an accessibility hierarchy.[2] People who accept parasitic gaps in one type of domain, generally accept gaps in any domain higher up on the hierarchy, but there is a lot of individual variation as to how far down the hierarchy parasitic gaps may occur. A tentative, incomplete formulation of the hierarchy is given in (7).

(7)   *Accessibility hierarchy for occurrences of parasitic gaps*

```
manner adverbs    ⌉        v = more accessible than
     v            |
temporal adverbs  ⎬     untensed domains
     v            |
purpose clauses   ⌋

     v                    v

that⌉clauses      ⌉
than⌋             |
     v            |
when  ⌉           |
because⎬clauses   ⎬     tensed domains
cond. if⌋         |
     v            |
relative clauses  |
indirect questions⌋
```

The ordering in (7) is based on a relatively small sample of ranked examples and is in no way intended to be exhaustive, only suggestive. Most likely the category of '*that* clauses' should be broken down further depending on properties of the embedding verbs such as factivity and +/− emotive, cf. Ross's notion of "variable strength" (Ross, 1971). Certain factors cut across the categories in the hierarchy. For instance, temporal clauses appear to be pretty accessible parasitic gap domains, regardless of whether they are tensed or not. No one seems to find a significant contrast in acceptability between (2), repeated here, and its untensed counterpart (8).

(2)   This is the kind of food you must cook _____ before you eat

        _____*p*.

(8)   This is the kind of food you must cook _____ before eating

        _____*p*.

The hierarchy bears a certain similarity to the accessibility charts developed by Keenan (1975) and Keenan and Comrie (1977) but differs in that we are here primarily interested in different types of subordinate clauses, not in NP positions. One question that is brought up both by Keenan and Comrie's work on accessibility to relativization and the hierarchy in (7) is to what extent there is a correlation between the accessibility hierarchies and experimental findings that different types of clauses vary both in processing load and processing depth (cf. Bever and Townsend, 1979). A somewhat related question is whether real gaps and

parasitic gaps are handled by the same processing strategies. In a later section we will discuss examples which seem to show that the parser recognizes both the occurrence of a gap and its 'status', i.e., whether it is a possible real gap or not. Before addressing these issues, let me present some more examples to give some justification for the hierarchy in (7).

The contrast between different types of adverbial clauses and complements is illustrated in the examples in (9) through (11), taken from Ross (1967, Chapter 4). Ross observes that the acceptability of a gap in a certain context is inversely correlated with the goodness of a pronoun, interpreted as coreferent with the filler, in the same position. The judgments on the examples are Ross's, the gap indications are mine.

(9)   The curtain which Fred tore _____ in rolling _____$_p$/$^?$it up was the kind gift of my maternal Aunt Priscilla.

(10)   I suspect that the contract which I wanted to peruse _____ before filing $^?$_____/$^?$it away may have had loopholes.

(11)   The blintzes which Sasha is gobbling _____ down faster than I can reheat $^?$_____/ them are extremely tasty, if I do say so.

Ross suggests that these kinds of examples can be derived by a pronoun deletion rule. The difference in acceptability of the gaps in (9) through (11) can then be accounted for by assuming that the rule is obligatory in (9), optional in (10) and not applicable in (11). Note that the proposed deletion rule must make reference to intended interpretation of the pronouns since a pronoun can only be deleted if it is understood to refer to whatever the filler refers to. Ross also notes that "it is theoretically possible to relativize any number of NPs at once, although the resulting sentences are somewhat less than felicitous" (Ross, 1967, p. 105). He gives the following sentence:

(12)   The contract which I want to peruse _____ before damaging _____$_p$ while filing _____$_p$ is written on Peruvian papyrus (Ross, 4.156b).

Another example illustrating the possibility of multiplying parasitic gaps was brought to my attention by B. Partee and given here in (13).

(13)   Here is the man who meeting _____ convinced Mary that beginning to love _____ would make her end up hating _____.

Further examples, which I believe illustrate the decreasing degree of acceptability, are given in (14) through (17). (15) was suggested by B. Partee.

(14)   Here is the influential professor that John sent his book to
        _____ in order to impress _____$_p$.
(15)   Which professor did you persuade the students of _____ to
        nominate _____ for the Distinguished Teacher's Award?
(16)   Which students did you persuade some friends of _____ to
        write to _____?
(17)   Which students did you persuade _____ to invite us to come
        and see _____$_p$?

Sentences where the parasitic gaps occur in tensed subordinate clauses
are even more marginal, which might indicate that, at least for English,
the distinction between untensed and tensed domain is important for
determining the likelihood that a parasitic gap will be acceptable.

(18)   Who did you tell _____ that we were going to vote for _____$_p$?
(19)   Which colleague did John slander _____ because he despised
        _____$_p$?
(20)   This is the professor that you must say hello to _____ if you
        run into _____$_p$.
(21)   How many students did John inform _____ whether we had
        accepted $^{???}$_____$_p$/ them or not?
(22)   This book, it would be stupid to give _____ to [$_{NP}$ someone [$_{\bar{S}}$
        who already has read *_____/ it]].

If the ordering in the accessibility hierarchy in (7) reflects facts about
processing, we would expect it to hold across languages, at least across
languages with similar structures. Indeed, relevant parts of the hierarchy
apply to Swedish and Norwegian as well, but in these languages the
major break between acceptable and unacceptable domains does not fall
between tensed and untensed structures, as in English, but somewhere
further down.

3. WHAT LICENSES PARASITIC GAPS?

We now turn to the question: What factors can trigger the occurrence of
a parasitic gap? First, I want to reemphasize a point made in the
introduction, namely that parasitic gaps do not arise through some
optional pronoun deletion rule of the type that applies in languages like
Japanese, Portugese, and Turkish. In these languages, a pronoun may
delete if the referent is highly salient in the context. In languages like
English and Swedish, however, subcategorization restrictions may not
be violated even if the argument is totally predictable from the preceding
context. Consider the English and Swedish dialogues in (23).

(23)   Q: What happened to John?   Vad hände med John?
        A: Someone hit *_____/ him.   Någon slog *_____/ honom.

Although the context uniquely determines the referent of the pronoun
'him', it cannot be left out. This shows that gaps must be controlled
sentence internally. However, not any sentence internal phrase will
qualify as a controller, as the following examples illustrate.

(24)   John filed a bunch of articles without reading *_____/ them.
(25)   Mary's talking to *_____/ him bothered John a lot.

Even if there is a plausible antecedent for the gap in the same
sentence, the subcategorization requirements cannot be violated. It
appears that the good examples of parasitic gaps all occur in sentences
where there is another gap, due to a filler-gap dependency in the same
sentence, and the parasitic gap is interpreted as controlled by the filler.
So far all good examples have involved constituent questions, rela-
tivizations, or topicalizations, i.e., constructions where the filler occurs
as leftmost sister of a sentential node. A first hypothesis might be that
only fillers in the designated location, leftmost sister of S, license
parasitic gaps. When we look at other dependencies besides leftward
dependencies, this hypothesis turns out not to be correct, for instance,
parasitic gaps may also be triggered by Heavy NP Shift[3], as illustrated in
the following examples, suggested by Tom Wasow.

(26)   John offended _____$_i$ by not recognizing _____$_i$/ him$_i$ im-
        mediately, [$_{NP_i}$ his favorite uncle from Cleveland].
(27)   Susan always files _____$_i$ without reading _____$_i$/ them$_i$
        properly, [$_{NP_i}$ all the memos from the lowlevel ad-
        ministration].

A number of speakers find these sentences approximately as acceptable
as some of the leftward dependency sentences. Similar sentences in
Swedish are better with a parasitic gap than with a pronoun that is
understood as coreferent with the rightward moved phrase, and some
speakers apparently get the same contrast in English. It seems that the
possibility of having a coreferent pronoun in the intervening position
increases if the adverbial clause is taken to be a parenthetical and set off
from the rest of the sentence by heavy intonation breaks. Furthermore,
leftward dependencies involving *tough* Movement and *too/enough* con-
structions also license parasitic gaps, a fact first noticed by A. Zaenen.
In these cases, the controller for the gap occurs in subject position.

(28)   These papers were hard for us to file _____ without reading
        _____$_p$.

(29)   This book is too interesting to put _____ down without having finished _____$_p$.

Examples (26) through (29) show that it is not the position or the nature of the filler that determines the possibility of having a parasitic gap. The filler may be to the right or to the left, attached as leftmost sister of S or occurring in an argument position inside S. Rather, what seems to be relevant is that there is a controlled gap in the sentence, i.e., an obligatory consistuent that is not lexically realized, but which is interpreted as controlled by a lexically realized phrase in the sentence. However, it's not sufficient to say that there has to be another control relation in the sentence. In recent proposals within trace theory (Chomsky, 1975, 1977; Chomsky and Lasnik, 1977) constructions like Passive, Equi, and Raising are analyzed as involving movement of a NP which leaves an empty position, coindexed with the moved constituent. If in fact the gap left behind by any movement rule could act as a trigger for parasitic gaps, then we would expect parasitic gaps in sentences with Passive, etc. But as can be seen in (30) through (32), the traces left behind by NP Movement do not license parasitic gaps.

(31)   John$_i$ was killed t_i by a tree falling on *_____$_p$/ him.
(31)   Mary$_i$ tried t_i to leave without John's hearing *_____$_p$/ her.
(32)   Mary$_i$ seemed t_i to disapprove of John's talking to *_____$_p$/ her.

It appears that the relevant property which distinguishes between sentences like (1) through (4) and (26) through (29) where parasitic gaps are allowed, and sentences like (30) through (32), where they are not, is that the real gaps in the former sentences arise through non-local dependencies, whereas the traces in (30) through (32) involve local dependencies. By a non-local or unbounded dependency I mean a dependency that holds over an arbitrary domain and whose description requires the use of an essential variable.

To summarize briefly the theoretical significance of this contrast, we can say that the parasitic gap phenomenon shows that there is at least one process in the grammar which is sensitive to a distinction between local and non-local dependencies. Consequently, the parasitic gap facts provide an argument against subsuming wh-type movement and NP-type movement under one and the same rule and for making a systematic distinction in the grammar between bounded and unbounded processes.[4] Ideally, for languages that have parasitic gaps we might want to be able to refer to the property of licensing parasitic gaps as a diagnostic for unbounded phenomena. In the theoretical framework of Chomky (1981),

apparent unbounded phenomena like *wh*-movement, are analyzed as
resulting from iteretive applications of cyclic movements. However, one
could claim that parasitic gaps are sensitive not to the distinction
between local and non-local dependencies, but to the distinction be-
tween caseless and case-marked traces.

It is also worth noting that it appears to be the actual presence of a
real gap that licenses a parasitic gap and not just the presence of a
wh-phrase. In sentences where there is no gap because the *wh*-phrase
occurs in situ, as in an echo-question, (33), or in a multiple question (34),
no parasitic gaps are allowed.[5]

(33)   John filed which articles, without reading *____/them?
(34)   I forget who filed which articles, without reading *____/them.

4. THE PARASITIC NATURE OF CERTAIN GAPS

I now want to turn to some properties of parasitic gaps which may give
some justification for talking about 'real' and 'parasitic' gaps. In several
of the examples given above, the parasitic gaps appear in domains that
are considered to be extraction islands in the language. Although some
of these domains may not be absolute islands, it is clear that the
extraction site indicated by the parasitic gap is in some sense less
accessible or more marked than the site of the real gap. One way of
establishing this ranking of accessibility between a real gap and a
parasitic gap in a given sentence is to look at what happens when each
of the gaps is plugged up. Consider the following triples of sentences. In
the b-version, the real gap has been filled with a lexical NP, and in the
c-version the parasitic gap has been plugged up.

(35)(a)   Here is the paper that John read ____ before filing ____ₚ.
   (b) ?Here is the paper that John read his mail before filing ____.
   (c)   Here is the paper that John read ____ before filing his mail.
(36)(a)   Who did John's talking to ____ₚ bother ____ most?
   (b) ?Who did John's talking to ____ bother you most?
   (c)   Who did John's talking to Mary bother ____ most?

It is generally agreed that the b-versions are considerably worse; that
is, sentences where what I have indicated as the parasitic gap in the
a-version must be understood as the real gap, because this is the only
gap in the sentence, are quite bad. This shows that a parasitic gap does not
survive easily as an independent gap.[6] Instead of plugging up each of the
gaps, we can establish the same point by substituting an intransitive verb

in the clause with the real gap, thereby eliminating the possibility of a gap there and forcing the parasitic gap to be reanalyzed as a real gap. In trying out examples to test this point, I noticed an interesting feature which might provide some impressionistic evidence for what the gap searching strategies of the parser look like. Consider a sentence like (37).

(37)   Who did you sneeze, after meeting _____?

Tom Wasow reports that when he first heard this sentence, he found himself reanalyzing 'sneeze' as a transitive verb which would allow for a real gap immediately after it. Similarly, in cases where the main verb is optionally transitive, as in the case with 'leave', listeners say that they tend to take the transitive reading, for instance in (38)

(38)   Who did you leave (_____), before seeing _____?

although this makes the sentence semantically implausible.

The processes illustrated by the ways (37) and (38) are understood, may be indicative of how the parser uses knowledge about what syntactic domains are possible extraction domains on line during comprehension. It seems that the parser's expectation to find a matching gap within a certain domain sometimes leads it to choose a particular syntactic analysis which turns out to be incompatible with the interpretation of the sentence as a whole. But some of the previous examples show that the parser is not limited to gap detection in expected domains, a point we will return to in Section 9.

5. OPTIONAL AND OBLIGATORY PARASITIC GAPS

So far in our discussion we have treated all occurrences of parasitic gaps in a similar fashion. However, they seem to fall naturally into two types, both on structural grounds and in terms of their relative obligatoriness. The two types can be distinguished by the properties summarized in (39), for 'optional' parasitic gaps, and in (40), for 'obligatory' parasitic gaps.

(39)   *'Optional' parasitic gaps*
 (i)   follow the real gap
 (ii)   primarily occur in (untensed) adverbial and complement clauses
 (iii) are in almost free variation with unstressed personal pronouns, which are understood to be coreferential to or bound by the filler.

(40)   *'Obligatory' parasitic gaps*
  (i)   precede the real gap
  (ii)   primarily occur in gerunds and noun complements
  (iii)   can normally not be replaced by a coreferential pronoun without significant loss of acceptability.

The fact that not all occurrences of parasitic gaps have the same status, but that certain gaps are perceived as more obligatory was demonstrated in a small survey that was carried out at Stanford University during January 1981.[7] 28 subjects were presented with five pairs of sentences, differing only in that one version had a parasitic gap where the other had a pronoun. The subjects were asked to decide which of the sentences sounded 'most natural' for them. I will here give the sentences used in the survey, indicating next to them the number of subjects that preferred that version.

(41)(a) This is the kind of food$_i$ you must cook _____ before you eat
         _____$_p$ (15)
    (b) before you eat it$_i$ (13)
(42)(a) Which girl$_i$ did you send a picture of _____ to _____?   (19)
    (b)   a picture of her$_i$ to _____?   (13)
    (c)   a picture of _____ to her$_i$?   (2)
(43)(a) Susan always files _____ without reading _____ properly,
         [$_{NP_i}$ all the memos from the lowlevel administration.]   (12)
    (b) Susan always files _____ without reading them$_i$ properly,
         [$_{NP_i}$ all the memos from the lowlevel administration.]   (16)
(44)(a) Which boy$_i$ did Mary's talking to _____$_p$ bother _____ most?
                                                                      (15)
    (b)   to him$_i$ bother _____ most?
                                                                       (8)
(45)(a) Which student$_i$ did your attempt to talk to _____$_p$ scare _____
         to death?   (17)
    (b) talk to him$_i$ scare _____ to death?   (8)

Notice that in examples (41) through (43), which according to the proposed classification illustrate optional parasitic gaps, the subjects are almost equally divided between preferring gaps and preferring pronouns. This distribution should be contrasted with the results in (44) and (45), where the responses show a strong tendency to prefer the version with a parasitic gap. Although the sample of constructions investigated was small, the trend seems quite clear. I expect that in a larger experiment, we would find a significant effect of the position of the parasitic gap with respect to the real gap.

In English, the obligatory type of parasitic gaps arises primarily inside complex subjects e.g., in PP complements, noun complements, and gerunds. In Scandinavian languages, the range of constructions that allow for parasitic gaps is broader. For instance, parasitic gaps occur quite frequently in relative clauses that modify a NP that precedes the real gap, as can be seen in (46).

(46)(a) Räkna upp de filmer som [NP alla [s̄ som sett _____p/$^?$dem]] tyckte bra om _____.
 List those films that everyone who has seen _____/ $^?$them liked _____ a lot.

 (b) Kalle är en kille som [NP| ingen [s̄ som träffat _____p/$^?$honom]] kan tåla _____.^{8}
 Kalle is a guy who no one who (has) met _____/$^?$him can stand _____.

(47)(a) [PPTill himlen] är det inte säkert att [NPalla [s̄som längtar [PP_____p/dit]]] kommer [PP _____].
 To heaven it is not certain that everyone who longs _____/there get _____.

 (b) [APFattig] vill [NPingen [s̄som någonsin varit [AP_____p/$^?$det]]] bli [AP_____] igen.
 Poor no one who has even been _____/$^?$it wants to become _____ again.

(47) illustrates that the parasitic gap phenomenon is not limited to NP gaps but extends to PP and AP gaps as well. For certain speakers of English, similar examples are not totally excluded. Wynn Chao provided me with (48) and Janet Fodor with (49). Note that in both cases the head NP is non-specific.

(48) This is the type of book that [NPno one [s̄who has read _____p]] would give _____ to his mother.

(49) Here is the boy who [NPeveryone [s̄who has met _____p]] thinks _____ is clever.

6. OBLIGATORY PARASITIC GAPS AND THE CROSS-OVER CONSTRAINT

At this point, the obvious question to ask is: Why is it that the second type of parasitic gaps doesn't seem to allow free alternation with a personal pronoun? One interesting point about examples like (44)–(45) and (48)–(49) in English and (46)–(47) in Swedish is that a pronoun in the

position of the parasitic gap would violate Postal's cross-over constraint
(Postal, 1971) and Jacobson's leftmost constraint (Jacobson, 1977). Ac-
cording to this constraint, a pronoun cannot be understood as bound by
a *wh*-phrase that has crossed over it. In a question like (50), 'he' cannot
be understood as bound by 'who',

(50)   Who$_i$ did he$_{*i,j}$ claim _____$_i$ had won?

but must be taken to refer freely. In the examples we have been dealing
with here, the pronoun would occur inside a NP, not as an argument of
the main verb directly, and would hence be an instance of so-called
'weak cross-over'. Nevertheless, many speakers do not like pronouns in
these contexts. In fact, a majority prefer a gap, as shown by the scores
indicated in (44) and (45). The subject's tendency to avoid the version
with a coreferential pronoun seems to indicate that to some extent the
cross-over constraint has been grammaticized and is operative among
speakers of English. By using the option of a parasitic gap, the speaker
gets around violating the constraint. We can contrast this way of avoiding
the utterance of an ungrammatical sentence with the use of resumptive
pronouns. It is often assumed that inserting a resumptive pronoun may
'save' a sentence which would otherwise violate an extraction island.
Sentences like (44) and (45) show that the opposite strategy is also
available. A sentence that would violate a constraint is 'saved' or at least
considerably improved, if the pronoun is replaced with a gap.

I proposed earlier that the position of the parasitic gap with respect to
the real gap might be an important variable for determining its relative
obligatoriness. This suggests one line of explanation for the distribution
of parasitic gaps which ties in quite straightforwardly with the way
people interpret pronouns and gaps during speech processing. Ten-
tatively, I would like to suggest that the alternation between pronouns
and parasitic gaps is closely connected with the fact that personal
pronouns are inherently ambiguous between a deictic reading and a
bound reading on which the pronoun is bound by some other NP in the
sentence. As soon as a listener hears a pronoun, he presumably searches
his discourse model for a likely referent or enters a new referent. A gap,
on the other hand, must be interpreted as controlled by a displaced
constituent in the same sentence and the listener must not go outside the
sentence to find a referent. In most cases, the filler-gap assignment is
uniquely determined by the syntactic rules of the language, perhaps
augmented by parsing-motivated No-ambiguity constraints (cf. the dis-
cussion of nested and intersecting assignments in Fodor (1978) and
Engdahl (1979, 1981)). By not pronouncing a pronoun, the speaker in

effect makes sure that the listener does not go outside the sentence to supply a referent, hence he prevents the hearer from computing a possible but unintended interpretation for the sentence.[9] If this argument holds up, we would expect pronouns that are likely to be affected by the non-coreference rules of the language to drop out more often than pronouns in contexts where the non-coreference requirements don't apply. Consequently in a sentence with an unbounded filler-gap dependency, plausible candidates for being deleted would be those pronouns that are most likely to be understood as disjoint in reference from the filler according to restrictions on anaphora such as the cross-over constraint. In order to turn this suggestion into a more convincing argument we need to investigate to what extent the constraints on cross-over and the appearances of parasitic gaps are correlated for individual speakers. We also need to look at contexts where a pronoun cannot be deleted for some other reason. For instance, it appears that many speakers who find a referent pronoun in (51a) impossible accept a coreferent possessive pronoun in a similar sentence.

(51)(a) Which student$_i$ did your attempt to talk to him$_{*i,j}$ scare _____$_i$ to death?

(b) Which student$_i$ did your threat to talk to his$_i$ parents scare _____$_i$ to death?

In (51b) where a deletion is impossible because of the general condition on recoverability (loss of possessive case) and where there is no alternative way of expressing the desired meaning, a pronoun is accepted. The contrast between (51a) and (51b) illustrates in my opinion the trade-off between the expressor's needs and the precise formulation of grammatical constraints discussed by J. Fodor (Fodor, 1980).

It follows from this way of looking at the interaction between the cross-over constraint and the expressor's needs that the parasitic gap strategy would not be used to avoid violations of strong cross-over. In these cases, there is another, more straightforward way of expressing the same message or asking the intended question, in the latter case by questioning the first position directly. The reason (52a) does not have the reading marked by the coindexing is that there is a simpler way of asking

(52)(a) *Who$_i$ did he$_i$ claim _____$_i$ had won?

(b) Who$_i$ claimed he$_i$ had won?

that question, viz. as in (52b).

Another factor that might lie behind the tendency to 'not pronounce' a coreferent pronoun inside a constituent in a main clause preceding the

real gap is the fact that the referent of a pronoun in a main clause tends
to be resolved immediately. Bever and Townsend (1979) report on a
series of experiments which show that main clauses in general are
completely interpreted, whereas subordinate clauses receive a more
shallow interpretation. Bever and Townsend take a full interpretation of
a clause to involve, among other things, assignment of referents to all
referring expressions in the clause, including pronouns. Although none
of the experiments bear directly on pronoun interpretation, Bever and
Townsend suggest that the fact that subordinate clauses are only in-
completely interpreted would account for the tendency to postpone
assignments of referents to pronouns occurring in them. On the basis of
Bever and Townsend's findings, we would expect listeners to be more
likely to defer reference assignments to pronouns in explicit subordinate
clauses such as those introduced by complementizers and subordinating
connectives. This observation is consistent with the fact that in all
languages, backwards anaphora is possible in subordinate clauses, if at
all.[10] In general, this way of looking at pronoun resolution ties in quite
straightforwardly with the formulations of the non-coreference facts
given by Lasnik (1976) and Reinhart (1976, this issue). A pronoun that
precedes and commands or c-commands other NPs is likely to occur in
an initial main clause, and hence tends to be interpreted immediately.

7. RESTRICTIONS ON PARASITIC GAPS

We now turn to constructions where parasitic gaps are excluded, al-
though the preconditions seem fulfilled. Consider (53) through (56)

> (53)   Which articles _____ got filed by John without him reading
>   *_____$_p$/them?
> (54)   Who _____ sent a picture of *_____$_p$/himself?
> (55)   Who _____ remembered talking to *_____$_p$/himself?
> (56)   Who _____ remembered that John talked to *_____$_p$/him?

In none of these sentences are parasitic gaps allowed. A pronoun,
personal or reflexive, is required. In these examples, the real gap occurs
in subject position. A first hypothesis would be that questioned matrix
subjects are not 'moved' and consequently don't leave gaps, in which
case there would be no reason to expect a parasitic gap. However, if we
question a non-matrix subject, which would give rise to a non-local
filler-gap dependency, a parasitic gap still is not possible.

> (57)   Which articles did you say _____ got filed by John without him
>   reading *_____$_p$/them?

(58)   Who did you say _____ was bothered by John's talking to
       *_____$_p$/him?

It is interesting that there is no doubt about the unavailability of
parasitic gaps in examples (53) through (58). Similarly, Swedish coun-
terparts with parasitic gaps are completely impossible. The clear judg-
ments on these examples show that, even if the acceptability range for
parasitic gaps varies a lot, the phenomenon is not hopelessly fuzzy. On
the contrary, people have quite strong intuitions about where parasitic
gaps may not occur. These intuitions, together with the overlap in
intuitions about possible parasitic gaps, provide evidence that we are
here dealing with a systematical grammatical principle.

How, then, can we explain the unavailability of parasitic gaps in (53)
through (58)? One possible explanation, suggested by Janet Fodor, is
that parasitic gaps require some kind of parallelism is grammatical
function, that is, a real object gap only licenses a parasitic object gap,
etc. Hence, we would only expect subject gaps to licence subject
parasitic gaps, and a relevant example would be a sentence like (59),
proposed by J. Fodor.

(59)   This is the student everyone thinks _____ is clever because
       John said $^?$_____$_p$/he was clever.

Although making the gaps parallel in function might improve the exam-
ples somewhat, most people reject the parasitic gap in (59). Furthermore
it turns out that there are good examples where a real subject gap
licenses a parasitic object gap. The following example was suggested by
Alan Prince.

(60)   Which caesar did Brutus imply _____ was no good while
       ostensibly praising _____$_p$?

A real subject gap may also license a parasitic gap in an oblique position,
as in (61), following a suggestion by Janet Fodor

(61)   Who did you say John's criticism of _____$_p$ would make us
       think _____ was stupid?

These examples show that it is not the case that there is a subject-object
asymmetry with respect to parasitic gaps.[11] What, then, is the relevant
difference between a sentence like (57) which is clearly out, and (60)
which is quite good? In both types, the relative position of the filler with
respect to the real gap remains the same, but the structural relations
between the real gap and the parasitic gap differ, as we can see by
looking at a partially bracketed representation.

(57')   Which articles did you say [$_S$___ got filed by John [$_{AdvP}$
          without him reading *___$_p$/them?]]
(60')   Which Caesar did Brutus imply [$_S$___ was no good] [$_{AdvP}$
          while ostensibly praising ___$_p$?]

In (57') the real subject gap c-commands everything that is in the
embedded S, including the adverbial phrase which contains the parasitic
gap. In (60') on the other hand, the real gap does not c-command the
parasitic gap since the 'while' clause is attached at a higher VP. The
unacceptable (58) differs from the acceptable (61) in the same respect;

(58')   Who did you say [$_S$___ was bothered by John's talking to
          *___$_p$/him?]
(61')   Who did you say John's criticism of ___$_p$ would make us
          think [$_S$___ was stupid?]

It turns out that the configurations where parasitic gaps are disallowed
are exactly the configurations which have been taken to require non-
coreference (cf. Lasnik (1976) and Reinhart (1976)). If NP_1 c-commands
NP_2 and NP_2 is not a pronoun, then NP_1 and NP_2 are non-coreferent.
Such a restriction would rule out coreference between 'he' and 'John' in
(62), given a normal use of this sentence, as well as binding of 'he' by
'every man' in (63).

(62)   He talked to John
(63)   He thinks every man will win.

If we assume that the relation between the real gap and the parasitic gap
is some form of anaphoric linking, and furthermore parasitic gaps are
understood to be necessarily coreferent with the real gap (i.e., with the
filler that controls the real gap) then it would not be surprising if
parasitic gaps were excluded just in those contexts where the anaphora
rules of the language assign disjoint reference. We can summarize this
restriction as in (64).

(64)   A parasitic gap may not be c-commanded by the real gap.[12]

It is at present an open issue whether non-coreference should be handled
by rules in the grammar or not. T. Reinhart in an extremely interesting re-
statement of the anaphora question (Reinhart (this issue)) proposes that
the non-coreference facts follow from Gricean requirements on rational
use of language, and suggests that the non-coreference rules be replaced
by pragmatic strategies which govern decisions about intended core-
ference.[13] If a speaker avoids using the options of expressing core-

ference in a context where bound anaphora is possible, then he didn't
intend his expressions to corefer. Reinhart summarizes the rules for
bound anaphora as in (65), ignoring certain requirements.

(65)   Bound anaphora is possible if a given NP c-commands a
        pronoun (Reinhart, this issue (66a))

Using Reinhart's notion of bound anaphora, it turns out that we can
account for the cases where parasitic gaps are excluded if we apply (65)
strictly, i.e., if we assume that only pronouns can be interpreted as
bound anaphors in her sense. If you don't take the option of using a
pronoun in a context like (62) or (63), but instead use a full NP, you get a
non-coreferential reading. Similarly, in sentences like (53)–(56), if we
don't take the option of using a pronoun, but instead use a gap, we
should get a non-coreferent interpretation of the gap. However, since
gaps must be controlled sentence-internally in languages like English and
Swedish, this is not a viable option. This would explain why these
sentences are no good with parasitic gaps.

It follows from Reinhart's principle in (65) that anaphora is not
possible if neither NP c-commands the other and in those contexts,
non-coreference is not excluded. This is for instance the case in (66) and
(67) which are parallel to (60) and (61), which permit parasitic gaps.

(66)   Brutus managed to imply that he$_i$ was no good while osten-
        sibly praising Julius Caesar$_i$
(67)   They said that John's criticism of her$_i$ would make us think
        Mary$_i$ was stupid.

There thus appears to be a correlation between the positions where
bound anaphora can occur and the positions where parasitic gaps are
excluded. Following Reinhart, we can account for this correlation by
appealing to general principles for the interpretation of intended non-
coreference. If this is in fact the case, we would expect the correlation
between subject extractions and the impossibility of parasitic gaps
which we noted above in connection with examples (53)–(56) to be just
an instance of this more general principle. We would expect parasitic
gaps to be excluded also in other context where bound anaphora is
possible. This prediction turns out to be correct, as can be seen in the
following examples.

(68)   Which slave did Cleopatra give _____ to *_____$_p$/himself?
(69)   Which slave did Cleopatra give _____ *_____$_p$/himself?

It turns out that this inverse correlation between the unavailability of

bound anaphora and the possibility of parasitic gaps is very close. We now turn to further cases where they pattern together. As Reinhart notes in Appendix II, there are exceptions to the generalization in (65). For instance, NPs in certain types of PPs behave as if they c-command a pronoun outside it.

(70)   I talked to John$_i$ about himself$_i$

(71)   I talked to every boy$_i$ about his$_i$ result

The availability of bound anaphora here leads us to expect that parasitic gaps should be impossible, and this turns out to be correct.

(72)   Who did you talk to _____ about *_____$_p$/himself?

If the PP is embedded inside a NP, however, bound anaphora is excluded, as seen in (73).

(73)   I sent a picture of Mary$_i$ to her$_i$/*herself

Since non-coreference is possible, we expect a parasitic gap also to be possible; this is in fact the case as already illustrated in (3), repeated here as (74).

(74)   Which girl did you send a picture of _____ to _____$_p$?

It appears that in exactly those configurations where (65) does not seem to be a necessary condition for bound anaphora, (64) is insufficient to rule out unacceptable parasitic gaps. It is interesting to note that in a language like Swedish where object control of reflexives is more limited than in English, and hence bound anaphora in a context like (70) is impossible, a parasitic gap is quite good.

(70′)   Jag   talade med Johan$_i$ om   *sig/honom$_i$
         I   talked to   Johan about   REFL/him

(72′)   Vem brukar du sällan tala med _____ om _____$_p$?
         Who do you seldom talk   to _____ about _____?

However, in those contexts where object controlled reflexives are possible, parasitic gaps are avoided (see Hellan (1980) for a characterization of the domain for object control of reflexives in Norwegian which also applies to Swedish).

(75)   Jag såg dig köra Johan$_i$ hem   till sig$_i$
         I   saw you take Johan home to REFL.

(76)   Johan$_i$ har jag ofta   sett dig köra _____$_i$ hem till *_____$_p$/sig$_i$
         Johan, I   have often seen you take _____ to   _____/SELF

Rather than taking (64) literally, we should understand it as an abbreviation for those contexts where bound anaphora is excluded in the language in question.[14] It makes the correct predictions in a number of cases which differ only minimally, as we will now see. For the generalization in (64) to hold for examples involving adverbial clauses as in (1) and (2), we must assume that the VP has the structure illustrated in (77).

(77) $[_{VP'}[_{VP}V\ X][_{AdvP}]]$

We assume that the minimal VP contains only direct arguments of the verb. For instance, an agentive by-phrase will count as an argument of the verb and will attach inside the minimal VP, whereas an adverbial by-phrase will attach at VP'. Since a direct object real gap only c-commands a parasitic gap inside the minimal VP, we would expect to find a contrast in sentences with parasitic gaps in by-phrases depending on how these are interpreted. This prediction seems to be borne out in view of the examples in (78) and (79).

(78)   Which Caesar did Cleopatra say $[_S$____ $[_{VP}$was impressed $[_{PP}$by her singing to *____$_p$/him]]]
(79)   Which Caesar did Brutus imply $[_S$____ $[_{VP}$was senile]] $[_{PP}$by mimicking ____$_p$ in public?]

In (78), where the parasitic gap occurs within the minimal VP, and hence is c-commanded by the real gap, a parasitic gap is impossible. In (79), where the adverbial by-phrase modifies a higher VP, a parasitic gap seems pretty good.[15] The reader is invited to verify that bound anaphora is indeed possible in (78) but not in (79) as predicted by the inverse correlation we found between bound anaphora and parasitic gaps.[16]

8. COMPARATIVES

Comparative constructions provide another context where it is possible to get more than one gap depending on a single filler. These facts were brought up in Bresnan (1977) and were further discussed in Chomsky and Lasnik (1977). Some examples are given below:

(80)   A man who Mary called ____ an idiot as often as June called ____ a cretin (Bresnan, 1977: (55)).
(81)   The books that Mary read ____ as often as Bill read ____/them (Chomsky and Lasnik, 1977: (191d)).

First we note that these cases, just like some of the previously discussed cases, cannot be analyzed as resulting from an across-the-board ap-

plication of *wh*-movement. It is possible to extract from only one of the
constituents involved in the comparative construction, as shown in (82).

(82)   A man who Mary called _____ an idiot as often as June called
        Bill a cretin.

Extraction out of the second conjunct only is less acceptable, which
shows that that domain probably constitues a fairly strong extraction
island. Chomsky and Lasnik observe that the phenomenon of across-
the-board deletion does not bear on these types of examples and suggest
that they arise through a stylistic pronoun deletion rule which they
formulate as in (83).

(83)   In "paired structures" ... optionally delete a pronoun in the second member of
        the pair if trace appears in the corresponding position in the first member;
        acceptability of the result varies from high to low as the position of the deleted
        item ranges from the end to the beginning of the clause. (Chomsky and Lasnik,
        1977, p. 492)

The principle in (83) would apply to a structure like (84) and delete the
pronoun 'him'.

(84)   A man$_i$ who Mary called t_i an idiot as often as June called
        him a cretin.

However, the principle in (84) is insufficient in several respects. We note
that the deletion is made contingent upon the presence of a trace in a
corresponding position. But, as we showed earlier, not all traces qualify
to license parasitic gaps. On Chomsky and Lasnik's formulation we
would expect a sentence like (85) to be good.

(85)   John$_i$ was called t_i an idiot as often as Mary called *_____/him
        a cretin.

The fact that the deletion in (85) is impossible follows according to our
analysis from the fact that only non-local dependencies can license
parasitic gaps. As mentioned above in Section 3, this could be captured
in the framework of Government-binding theory (Chomsky, 1981) by
making parasitic gaps sensitive only to case-marked traces. We note
furthermore that the principle specifically refers to the output of a
movement rule. We have found that parasitic gaps can occur in con-
structions that are normally not analyzed as involving any movement,
such as the *too*-deletion case in (29).[17]
   A more serious objection to Chomsky and Lasnik's principle (83), is
that it relies on a notion of 'paired structures' and can thus not account
for those occurrences of parasitic gaps where there is no parallelism

involved, in particular occurrences of what I have called obligatory parasitic gaps in positions preceding the real gap, such as in (4), repeated here as (86) and in (87).

(86)   which boy$_i$ did Harry's talking to _____$_p$/$^{??}$him$_i$ bother _____$_i$ most?

(87)   Which city$_i$ do the people from _____$_p$/$^{??}$it$_i$ always talk about _____$_i$?

(83) also fails to account for examples like (3), repeated here as (88) where the real gap and the parasitic gap occur inside the same VP.

(88)   Which girl did you send a picture of _____ to _____?

Chomsky and Lasnik note that deletions that occur at the end of the clause are better than deletions earlier in the clause. With respect to positions inside the VP, it is not clear that there is any systematic difference. Chomsky and Lasnik find a deletion of the direct object in (89) unacceptable. However, in a structurally similar sentence, (90), the deletion is less offensive.

(89)   the books that you gave _____ to Mary as often as Bill gave $^?$_____/them to Sue (Chomsky and Lasnik, 191b).

(90)   the children that you take _____ to school as often as I take _____ to church.

However, when we look at gaps in subject position, most examples sound quite bad, as for instance (91) and (92).

(91)   Who do you think [$_S$_____ hates John as much as $^{??}$_____/he hates Mary?]

(92)   Who would you say [$_S$_____ would drive to work more often than $^{??}$_____/he would take the bus?]]

Note that in (91) and (92) the first gap c-commands the second gap, a condition that we have previously found to block a parasitic gap. In order to test whether this condition is applicable in comparative constructions as well, I tried to construct examples where the second conjunct is attached higher up where it would not be c-commanded by the first gap. (94) was suggested to me by M. Kay.

(93)   Who are you more convinced [$_S$_____ would show up] than _____ would fail to come?

(94)   Who are you more concerned [$_S$_____ would do the job] than _____ would benefit from the proceedings?

A number of speakers perceive a contrast between (91) and (92) on the one hand and (93) and (94) on the other. Notice furthermore that bound anaphora is possible in (91), but not in (93), as we would expect from the inverse correlation between parasitic gaps and bound anaphora.

(91')   I don't think any boy$_i$ hates Anne as much as he$_i$ hates Mary.

(93')   I am more convinced that no boy$_i$ would show up than that he$_{*i}$ would try to come

9. IMPLICATIONS FOR SENTENCE PROCESSING

In this section, I want to spell out what the existence and distribution of parasitic gaps can tell us about the strategies the human parser might employ during the processing of sentences with filler-gap dependencies. We noted earlier that the existence of coordinate gaps, as well as parasitic gaps, shows that the parser cannot simply remove a filler from HOLD and plug it into the first gap it encounters. Rather, it appears that a recognized filler has a special salience which obtains even after a gap has been found. This special status seems reserved for long distance fillers, which is not surprising in view of the fact, recently emphasized by Fodor (1980) that it would be in the parser's interest to limit the number of positions where gap-controlling fillers may occur, since this would make the task of distinguishing fillers from illegitimate extra constituents simpler.

We also noted above that parasitic gaps often occur in domains that are more or less inaccessible to ordinary extractions in the language. This shows that the parser's gap detecting strategies are not turned off inside an extraction island. Whereas adverbial clauses are generally considered to be extraction islands in English, examples like (1) and (2) show that parasitic gaps in these domains are accepted. Similarly, extractions out of subjects of tensed sentences usually result in ungrammatical sentences (cf. (36b)), but sentences where the subjects contain parasitic gaps, such as (36a) and (45) are surprisingly good. From looking at sentences with a parasitic gap preceding a real gap, as in (44) and (45), it becomes clear that one possible functional explanation for why there should be extraction islands in languages does not fit the facts. On such a theory, it would be useful for a parser that is trying to come up with a valid parse for a sentence to be able to distinguish between accessible and inaccessible extraction domains, because if the parser is faced with the possibility of postulating a gap inside such a domain, it can immediately discard that parse and try a different one.

But the facts seem to be that the parser detects the gap inside the island and proceeds to parse the rest of the sentence. Note, however, that the parser presumably also registers that the gap it has detected, is not a real or legitimate gap, and consequently that the filler cannot be assigned to it directly. Evidence for this comes from the contrasts between the b and c versions in (35) and (36). If no real gap in an accessible domain is found, which is the case in the b-version, the parser apparently recognizes that it has an unmatched filler and the whole sentence is rejected.

Finally, we note that since both leftward and rightward dependencies seem to license parasitic gaps, it appears that whatever strategies the parser uses for identifying and matching fillers and gaps, they can be extended to parasitic gaps.

10. CONCLUSIONS

In this article I have given an overview of the distribution of a certain type of null anaphors which seem to be *parasitic* on the presence of a syntactic gap in the sentence. Before we can draw any definte conclusions about the implications of this phenomenon for the analysis of particular languages as well as for grammatical theory, more research is needed in order to find out what types of languages allow parasitic gaps, in what contexts they occur, etc. Nevertheless, even in the absence of a more complete overview, it is clear that the phenomenon bears more or less directly on several issues that are central to grammatical theory and to the study of sentence processing. One of these issues is the distinction between local and non-local processes. Since parasitic gaps are licensed only by gaps arising in unbounded dependencies, we have an indication that local and non-local processes need to be distinguished at some level of the grammar. It also seems plausible that this distinction is correlated with different types of parsing principles.

I have argued in the paper that the appearance of parasitic gaps is not an inherently fuzzy phenomenon but that it lends itself naturally to a characterization along certain grammatical dimensions. Furthermore, we have seen that it is subject to systematic restrictions which pattern together with general principles for anaphora in the language. Consequently, an explicit formulation of the conditions on parasitic gaps might shed new light on how restrictions on regular extractions should be stated in the grammar. In this respect the parasitic gap facts will be directly relevant to evaluating the ways of formulating constraints that are available within current grammatical theories such as the Government-binding Theory, Generalized Phrase Structure Grammar, Lexi-

cal-Functional Grammar, and semantically based versions of Montague grammar. The parasitic gap facts may also provide some evidence for constituent structure, compare the contrasts between (78) and (79) above.

The characterization of parasitic gaps is also relevant to attempts at formulating and testing hypotheses about how the human parser operates when it parses a sentence with filler-gap dependencies. The existence of parasitic gaps shows that the parser must be assumed to have a great deal of flexibility in how it applies its filler-gap matching strategies. The difference in status between real gaps and parasitic gaps, as witnessed by the contrasts in (35) and (36), can be taken as an indication that the parser is sensitive to accessible and inaccessible gap domains, but that it is able to put off judgments of unacceptability until more of the sentence is available for processing. In addition, the existence of what I have called obligatory parasitic gaps might reflect the degree to which speakers are sensitive to a grammatical constraint like the cross-over condition. It will presumably be worthwhile to look more deeply into the interaction between non-coreference, cross-over, and parasitic gaps.

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NOTES

[1] Taraldsen (1980) independently introduces the same term for this phenomenon. David Perlmutter coined the term 'sympathetic deletion' for similar cases.
[2] Following a suggestion made by Herb Clark.
[3] It is not totally clear that Heavy NP Shift is an unbounded rule but see Gazdar (1981) for an argument that the apparent boundedness of rightward movement rules follows from parsing considerations.
[4] Compare Postal's distinction between cyclic and postcyclic rules and van Riemskijk and Williams's (1980) recent separation of NP movement from WH movement.
[5] These facts were pointed out to me by Jane Robinson and David Evans.

[6] As one reviewer points out, this test does not distinguish between the gaps in the Heavy NP Shift cases in (26) and (27).

[7] I am grateful to John Rickford and his sociolinguistic field methods class at Stanford for carrying out the survey.

[8] In Scandinavian languages, there is a clear contrast in acceptability of parasitic gaps inside relative clauses depending on whether they precede or follow the real gap, that is, depending on whether the gap is obligatory or optional according to (39) and (40). Whereas the parasitic gaps in (46) and (47) are good, in fact, clearly better than a pronoun in that position, a parasitic gap in (i) where the relative clauses modifies a NP that follows the real gap, is marginal at best.

(i)   Den här boken vore det dumt att ge _____ till [$_{NP}$ någon [$_S$ som redan har läst
$^?$_____/den]]
This book, it would be stupid to give _____ to someone who already has read
$^?$_____/it.

If a relative clause with a parasitic gap is extraposed to the right of the real gap, the result is good as illustrated in (ii).

(ii)   Räkna upp de filmer (som) [$_{NP}$ alla] tyckte bra om _____ [$_S$som såg _____$_p$/
$^?$dem]
List those movies everyone liked _____ a lot who saw _____$_p$.

This shows that the relevant ordering between the parasitic gap and the real gap must be determined with respect to surface structure. Note that the relative clauses in (46) and (47) are all restrictive. Parasitic gaps in non-restrictive relatives are unacceptable, even if the relative clause precedes the real gap, as illustrated below.

(iii)   Maja brukar Kalle, som ju känner *_____/henne väl, ofta gå på bio med

_____.
Maja, Kalle, who knows *_____/her well, often goes to the movies with _____.
(iv)   Här är boken som alla flickorna, ingendera av vilka hade läst ut *_____/den,
tyckte _____ var urdålig.
Here is the book that all the girls, none of which had finished *_____/it, thought
was very bad.

[9] This tendency applies quite generally, as was pointed out at the workshop by Larry Solan. Whereas (i) is ambiguous, with the non-coreferent reading being the preferred reading, (ii) is not.

(i)   John$_i$ likes his$_{j,i}$ writing books
(ii)   John$_i$ likes writing books.

The implicit subject of the gerund must be interpreted as John. In the Pisa lectures, Chomsky refers to the same tendency as the 'avoid pronouns' principle.

[10] For further discussion of the correlation between cross-over and backwards anaphora, see Cole (1974). Cole claims that there are (at least) five different dialects in English with respect to these facts.

[11] At the workshop, Joan Bresnan pointed out that the unavailability of parasitic gaps in (53) through (58) would follow automatically if we assume that parasitic gaps are derived via Right Node Raising; i.e., a sentence like (i) would be derived via (ii).

(i)   Which articles did John file _____ without reading _____$_p$?
(ii)   John filed _____, without reading _____, which articles?

Since Right Node Raising cannot apply to subjects, this predicts that none of the sentences in (53) through (58) could be derived. However, this account would rule out the good

examples (60) and (61), as well as earlier examples like (3) and (4), since none of them can be analyzed as involving Right Node Raising.

[12] The more general formulation that neither gap may c-command the other, (cf. Taraldsen (1980)) is equally correct. However, the situation where the parasitic gap asymmetrically c-commands the real gap will not arise, since in that case the parasitic gap would presumably occur in a more accessible extraction domain than in the real gap, and would, by the substitution test used above, be understood as the real gap.

[13] This much too brief summary does not do justice to Reinhart's careful argument. The reader is referred to her article for a full presentation. A very similar approach to the non-coreference issue is taken in Dowty (1980).

[14] At this point, it might be illustrative to compare this approach to accounting for restrictions on parasitic gaps with an account phrased in Government-binding theory terms. N. Chomsky and T. Taraldsen (personal communications) suggest that the non-occurrence of parasitic gaps in sentences like (53)–(58) in the text follow from the principles of binding theory. If you assume that parasitic gaps are *variables* in the technical sense of the term, defined in Chomsky (1981), and furthermore, it is assumed that variables cannot be coindexed with any term or variable in a c-commanding argument position then (53)–(58) are excluded. The latter assumption serves to exclude cases of strong cross-over as well. Because of its reliance on c-command, this account fails in exactly the same cases as (64) and (65) and consequently must be revised in a similar fashion, a fact also acknowledged by N. Chomsky.

[15] This contrast obviates a possible objection that could be raised against a claim that was made earlier in connection with examples (30) through (32). We claimed there that local dependencies, such as Passive, Equi, and Raising don't allow parasitic gaps. However, in these examples, it is also the case that the trace, which would presumably act as the real gap, c-commands the parasitic gap. Hence, one could argue that (30) through (32) are out by the principle stated in (64). But note that a parasitic gap is also impossible in (i) where it is not c-commanded by the trace.

   (i)   Brutus announced [$_S$ that Caesar$_i$ had been killed t_i] by showing *_____$_p$/him$_i$ in a coffin.

Furthermore, in a sentence like (ii) the *without* phrase may attach either to *try* or to *leave*.

   (ii)   Mary$_i$ tried t_i to leave without John's helping *_____$_p$/her.

On the reading where the *without* clause modifies Mary's trying, the trace does not c-command the parasitic gap. However, a parasitic gap is still not possible.

[16] Nomi Erteschik-Shir (pers. communication) has suggested an alternative way of looking at the distribution and characterization of parasitic gaps which makes use of the notion of *dominant position* (cf. Erteschik and Lappin (1979)). According to this proposal, extractions, i.e., real gaps, are only allowed out of positions, marked + DOM (by a rule of dominance interpretation that belongs to a set of interpretive rules). Erteschik-Shir suggests that cases where both gaps are in dominant positions should be best and consequently acceptable to most speakers and that cases where only the real gap is in a dominant position come next in acceptability. Provided we have an independent characterization of ± DOM positions, this would allow for a general characterization of a parasitic gap as the non-dominating of two gaps, or when both gaps are dominant, the second one. Given the close correlation between extraction possibilities and + DOM domains, this account seems quite plausible. It makes an interesting prediction in the case of dative shifted sentences. Erteschik-Shir claims that the indirect object position after Dative Movement must be − DOM, hence they should not allow for a real gap but only for a parasitic gap. This prediction seems to be borne out.

   (i)(a)   Who did Mary send _____$_p$ her book in order to impress _____?

(b)   ?Who did Mary send _____ her book in order to impress her colleagues?
(c)   Who did Mary send the publisher her book in order to impress _____?

We can contrast (i) with the non-shifted version (ii), where the same order of plugging up the gaps leads to opposite results.

(ii)(a)   Who did Mary send her book to _____ in order to impress _____$_p$?
(b)   Who did Mary send her book to _____ in order to impress you?
(c)   ?Who did Mary send her book to the publisher in order to impress _____?

One slight problem with Erteschik-Shir's account is that she assumes that untensed domains are usually dominant, which would account for the goodness of (35a). This does not fit with the fact that adverbial clauses are usually extraction islands (cf. 35b). It is also not clear to me how the apparently real distinction between optional and obligatory parasitic gaps would follow from this approach. It remains to be investigated whether the generalization captured in (64) can be recast using the notion of dominance.

[17] I owe this observation to Paul Postal.

[18] The same remarks apply to the account for similar data given in Grosu (1980). I did not become aware of Grosu's analysis until after I had finished the manuscript for this article. Grosu takes occurrences of parasitic gaps (without using this terminology) to come from analogical extensions of across-the-board type rules to 'coordinate-like non-coordinate structures' (Grosu, 1980, p. 22). His article contains several valuable observations but he does not consider such cases of parasitic gaps which do not lend themselves to an analysis based on coordination-like properties, nor does he address the issue of where parasitic gaps are systematically excluded which is discussed in Section 7.

[19] See Frazier, Clifton and Randall (1981) for an extensive discussion of the 'salient filler hypothesis' and for some very interesting experimental results.

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