Prosody and Subject Traces*

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Complementizer-trace (C-t) effects are of continuing interest because their grounding in universal grammar would seem to be guaranteed by poverty-of-the-stimulus considerations, as pointed out by Pesetsky (1982a:298). In particular, such effects are observable even in languages where extraction from tensed complement clauses is disfavored in general and speakers can therefore be assumed to have had little or no input involving the relevant constructions during acquisition (Pesetsky 1982a:298-299 (Russian), Rizzi 1990:44,119(fn.10) (North German dialects)). The great variety of proposals concerning C-t effects evident in the literature, however, suggests strongly that the phenomenon is still poorly understood. Within Principles and Parameters Theory, while the accounts of Chomsky 1986 and Rizzi 1990 may each in their day have had something like the status of a "standard" analysis, the demise of the ECP with the transition to the Minimalist Program has meant that no account can claim that status today.

In the present paper, based on data that involve contrasts in phonological phrasing, I propose a prosodic account of C-t effects, claiming that traces of nonlocal subject extraction are subject to the condition that they be adjacent to a prosodic boundary of a certain degree of strength.[1] The same condition will be seen to account for the ungrammaticality of "*wanna*-contraction" across a subject trace, another well-known phenomenon for which poverty-of-the-stimulus considerations suggest an account in terms of universal principles. The proposed analysis presupposes a level of representation at which empty categories--in particular, *wh*-traces--and prosodic information are present simultaneously. I argue that there is independent support for such an internal interface level, here called "Prosodic S-Structure", and propose that it is the result of the first step of a two-step spellout process.

The paper is organized in the following way: section 1 reviews the data showing that C-t effects have counterparts with *wh* and P in place of C and thus constitute a proper subset of a set we will refer to as "X-t effects". It then argues, using data involving right node raising, that all such effects are ameliorated by the interpolation of an Intonational Phrase (IntP) boundary between X and t. Section 2 introduces the assumptions about prosodic constituency and the syntax-phonology interface upon which we will rely. Section 3 presents the proposed analysis of X-t effects, followed by a discussion of subject-object extraction asymmetries not covered by that analysis and the licit C-t sequences of relative clauses and clefts. Section 4 extends the analysis to *wanna*-contraction, and section 5 adduces evidence from prosodic restrictions on the double object construction (DOC) for the proposed level of Prosodic S-Structure. Section 6 concludes the paper with comments on directions for future research.

1 X-t Effects

1.1 X = C, *wh*, P

The most widely discussed example of a C-t effect, the *that*-t effect of English, is illustrated in (1) (here and below, we write variables but omit their antecedents (both intermediate traces and empty operators) when those are null).

(1) a. That's the guy Tom's been saying [that Sue really likes t].

b. *That's the guy Tom's been saying [that t really likes Sue].

While the ungrammaticality of (1b) has not infrequently been taken to illustrate a general (i.e. UG-based) prohibition on the extraction of (embedded) subjects (for a recent example, see Lightfoot 1999:245,248), it is clear that, even in English, extraction is possible from the majority of embedded subject positions. Thus, if the C of (1b) is null, as in (2a), extraction is unproblematic, and this remains true even if a higher complement clause contains an overt C, as in (2b).

(2) a. That's the guy Tom's been saying [t really likes Sue].
b. That's the guy I suspect [that Jim thinks [t really likes Sue]].
c. That's the guy I'm wondering [how PRO to prove [t really likes Sue]].

In fact, as (2c) illustrates, subjects (like complements) are extractable from infinitival *wh*-islands as long as the subject trace is initial in CP. Examples like those of (2), then, make it clear that what is problematic about C-t effects is not subject extraction per se, but rather the local sequence of complementizer plus subject trace.

It is well-known that effects parallel to C-t effects arise with extraction from clauses containing interrogative elements in Spec(CP); we may call these "*wh*-t effects" ((3a) involves extraction of a complement from a tensed *wh*-island, but the resulting degree of unacceptability is negligible).

(3) a. That's one problem Jim can't figure out [how they're gonna solve t].
b. *That's one problem Jim can't figure out [how t is gonna be solved].

It is perhaps less widely appreciated that parallel effects arise as well with extraction from adjunct clauses introduced by elements we will assume to be of category P (in (4)-(6) below, *if*, *when*, and *while*). This is particularly clear when extraction of a complement from an adjunct clause, in apparent violation of Huang's (1982) CED, is completely or almost completely acceptable, as in the (a) sentences of (4)-(6).

(4) a. That's one meeting I'll be really happy [if they cancel t].
b. *That's one meeting I'll be really happy [if t is canceled].

(5) a. ?That's one problem Sue's going to be relieved [when they solve t].
b. *That's one problem Sue's going to be relieved [when t is solved].

(6) a.??That's the kind of problem Jim always falls asleep [while the teacher's explaining t].
b. *That's the kind of problem Jim always falls asleep [while t is being explained].

The P of (4)-(6) are monosyllabic, but essentially the same degree of subject-object asymmetry shown by those examples can be demonstrated with disyllabic P:

(7) a. ?That's one problem Jim's going to bite his nails [until they solve t].
b. *That's one problem Jim's going to bite his nails [until t is solved].

(8) a.??That's one film Sue wants to be in her seat [before they start t].
b. *That's one film Sue wants to be in her seat [before t starts].

It is clear, then, that C-t effects in the strict sense, as in (1b), constitute a proper subclass of a set that includes both *wh*-t effects and what may be called the "P-t effects" of (4)-(8). When necessary, we will refer to the members of the larger set as "X-t effects", where we assume that t is initial in IP and X is initial in the next higher maximal projection, either CP or PP.

1.2 Right Node Raising and the Amelioration of X-t Effects

Right Node Raising (RNR) is, informally, a operation reducing sentential coordinate structures whose conjuncts can be divided into a shared final portion or "pivot" (Postal 1998:97) that is typically a constituent (but see Abbott 1976) and initial portions, contrasting in whole or in part, that are typically not constituents. Limiting ourselves to the case in which there are precisely two conjuncts, the input of the operation can thus be represented as [A C Conj B C], where C is typically a constituent but A and B are not. RNR deletes the first occurrence of C, at the same time inserting an Intonational Phrase (IntP) boundary, realized phonetically by a high boundary tone (Liberman 1975, Pierrehumbert 1980) and a pause of variable duration, at the right edge of the elements A and B. Where IntP boundaries are represented by commas, then, the output of RNR is of the form [A, Conj B, C]. In the analysis of Postal 1974:125ff., the pivot is extracted from its base position in each conjunct and right-adjoined to the root node; Postal (1998:ch.4) has recently revived an extraction analysis of RNR.

Starting with Wexler and Culicover (1980), however, many authors have adduced reasons to believe that an RNR pivot has not in fact moved from its base position in the second (more generally, final) conjunct. These reasons include (1) extraction of the pivot would typically violate island constraints (Wexler and Culicover 1980:301); (2) extraction of the pivot would at the same time incorrectly bleed island constraints with respect to extraction FROM the pivot (Wexler and Culicover 1980: 301-302); (3) extraction and raising of the pivot would incorrectly bleed condition C (Levine 1985); and (4) extraction of the pivot would make it difficult to account for cases of VP anaphora that target a VP of which the pivot, in its base position, is a proper subpart (McCawley 1982:99-100). On the basis of such facts, we will adopt the Wexler and Culicover (1980:303) analysis of RNR, according to which that operation consists of deletion of the pivot from the first conjunct (more generally, from nonfinal conjuncts). As discussed in more detail in section 2.3, we assume this deletion to be a PF operation.

There are two characteristics of RNR constructions that will be crucial for our purposes. The first is the intonational phrasing of the output, described above. The second is that in a sequence of X + IP, where X is C, P, or Spec(CP), the left boundary of the pivot may fall either to the left or to the right of X. These two characteristics are illustrated by the pair of examples (9)-(10), where X = C.[2]

(9) Jim suspects, and Tom's been saying, that Sue really likes Pat.

(10) Jim's been wondering if, and Tom's been saying that, Sue really likes Pat.

As expected, extraction of an object from the pivot of either (9) or (10) is unproblematic:

(11) That's the guy Jim suspects, and Tom's been saying, that Sue really likes t.

(12) That's the guy Jim's been wondering if, and Tom's been saying that, Sue really likes t.

Extraction of a subject from the pivot of (9) or (10), on the other hand, would be expected to produce a C-t effect. This expectation is clearly borne out in the former case: (13) is even more obviously unacceptable than a non-RNR counterpart like (1b):

(13) *That's the guy Jim suspects, and Tom's been saying, that t really likes Sue.

Subject extraction from the pivot of (10), however, produces a result that is arguably not significantly different in degree of acceptability from its object-extraction counterpart (12).

(14) That's the guy Jim's been wondering if, and Tom's been saying that, t really likes Sue.

Given our assumption that RNR involves no movement, the C-t sequence of (13) and the C-t sequence of (14) differ only in phonological phrasing--specifically, in whether or not an IntP boundary intervenes between C and t. It would seem, then, that C-t effects can be ameliorated merely by guaranteeing that C and t are in different intonational phrases.

Let us verify this suggestion with a second set of examples, this time including cases with zero C. In the three subject-extraction examples of (15), the crucial case (15a) with the configuration C $[_{IntP}$ t differs minimally both from (15b), which has zero C, and from (15c), which shows the configuration $[_{IntP}$ C t.

(15) a. That's the meeting I've been wondering if, and Jim's been saying that, t is going to be canceled.
b. That's the meeting I've been thinking, and Jim's been saying, t is going to be canceled.
c. *That's the meeting I've been thinking, and Jim's been saying, that t is going to be canceled.

In (15c), as in (13), the C-t effect is particularly clear. In (15b), of course, no such effect is present. (15a), finally, is clearly comparable to (15b) rather than to (15c) in degree of acceptability.

(15a) is also minimally different from (16a), which involves object extraction from a clause whose C is followed by an IntP boundary. And just as in the case of (15b), while there is no question of a C-t effect in (16a), the acceptability level of that sentence seems comparable to that of (15a). (16b) and (16c), like (16a), differ from the corresponding sentences of (15) in involving object rather than subject extraction.[3]

(16) a. That's the meeting I've been wondering if, and Jim's been saying that, they're going to cancel t.
b. That's the meeting I've been thinking, and Jim's been saying, they're going to cancel t.
c. That's the meeting I've been thinking, and Jim's been saying, that they're going to cancel t.

(15a) and (15c) involve *that*-t sequences, but reversing the order of the conjuncts in (15a) makes it clear that the same contrast can be demonstrated for *if*-t sequences. (17a), like (15a), shows the configuration C $[_{IntP}$ t and is arguably unproblematic, in sharp contrast to

(17b), which has the configuration $[_{IntP}$ C t. In particular, (17a) seems comparable in acceptability to the minimally different (17c), which involves object extraction and therefore shows no C-t effect. (17d), finally, minimally different from (17b) in involving object extraction rather than subject extraction, provides confirmation that there is no reason to attribute any part of the unacceptability of (17b) to the CP (as opposed to IP) status of the pivot.

(17) a. That's the meeting Jim's been saying that, and I've been wondering if, t is going to be canceled.
b. *That's the meeting that I've been wondering, and Jim seems to know, if t is going to be canceled.
c. That's the meeting Jim's been saying that, and I've been wondering if, they're going to cancel t.
d. That's the meeting that I've been wondering, and Jim seems to know, if they're going to cancel t.

We may conclude that the amelioration of the *that*-t effect that results from separating *that* and t by an IntP boundary holds for C-t effects in general.

Let us now verify that the ameliorative effect of an IntP boundary is seen in the case of *wh*-t effects and P-t effects as well (in (18)-(20) below, no attempt is made to indicate the degree of unacceptability that characterizes even those members of the paradigm that show no X-t effect). (18a) displays the configuration *wh* $[_{IntP}$ t and is arguably unproblematic, in contrast to (18b), which shows the configuration $[_{IntP}$ *wh* t. In particular, (18a) seems comparable in acceptability to the corresponding ECM subject extraction example (18c) and to the CP pivot ECM subject extraction example (18d).

(18) a. That's the proposition Jim's still wondering whether, but Sue already knows how, t was proved to be consistent with the axioms.
b. *That's the proposition Jim's still wondering, but Sue already knows, how t was proved to be consistent with the axioms.
c. That's the proposition Jim's still wondering whether, but Sue already knows how, they proved t to be consistent with the axioms.
d. That's the proposition Jim's still wondering, but Sue already knows, how they proved t to be consistent with the axioms.

Similarly, (19a), with the configuration P $[_{IntP}$ t, groups in terms of acceptability not with the $[_{IntP}$ P t example (19b), but with the object extraction examples (19c) and (19d).

(19) a. That's the meeting Sue said she would be happy if, but Jim was angry when, t was canceled.
b. *That's the meeting Sue was happy, but Jim was angry, when t was canceled.
c. That's the meeting Sue said she would be happy if, but Jim was angry when, they canceled t.
d. That's the meeting Sue was happy, but Jim was angry, when they canceled t.

The same is true, finally, for examples (20), with disyllabic P, although here the acceptability differential between the P-t effect (b) sentences and the corresponding object extraction (d) sentences may not be as great as in (17)-(19).

(20) a. That's the problem Sue said she would resign unless, and Jim was frantic until, t was taken care of.
b. *That's the problem Sue was depressed, and Jim was frantic, until t was taken care of.
c. That's the problem Sue said she would resign unless, and Jim was frantic until, they took care of t.
d. That's the problem Sue was depressed, and Jim was frantic, until they took care of t.

It seems undeniable, however, that the amelioration resulting from interpolation of an IntP boundary that we first observed with the *that*-t effect extends to X-t effects in general.[4]

In section 1.1 above, we verified that that the sequence X-t, where t is the trace of nonlocal subject extraction, is normally associated with ungrammaticality for X ε {C, *wh*, P}; we used the term "X-t effect" for this ungrammaticality. We then, in 1.2, saw that the configuration (21a) below, where an IntP boundary intervenes between X and t, arguably fails to show the X-t effect. In particular, we showed that (21a) is comparable in acceptability to two minimally different configurations that could not in principle show X-t effects, namely (21b), where X does not occur (when that configuration is available), and (21c), in which X and t are nonadjacent.

(21) a. X $[_{IntP}$ t
b. $[_{IntP}$ t
c. $[_{IntP}$ X ... t

We conclude that the principle of grammar that excludes X-t sequences in general must exempt those of the form (21a). In section 3, we will propose a constraint that is capable of making the required distinction.

2 Framework

In this section, we introduce the assumptions on which our account of X-t effects will depend. Section 2.1 presents the basic tenets of the theory of prosodic phonology (Selkirk 1984:26ff., Nespor and Vogel 1986, Hayes 1989), section 2.2 is a more detailed consideration of cliticization, and section 2.3 proposes an account of the syntax-phonology interface.

2.1 Prosodic Phonology

The theory of prosodic phonology is based on the postulation of a hierarchy of prosodic categories C_1, C_2, ..., C_n. We will assume this hierarchy to satisfy two kinds of condition. First, it is "grounded" at either end by the pair of assumptions (22):

(22) a. C_1 is the category U(tterance).
b. C_n is the category W(ord).

An Utterance may be defined as a continuous stretch of phonetic material that is bounded at either edge by the complete cessation of vocalization but contains no such boundary internally. A Word may be defined as a phonetically realized lexical item, where the lexicon is taken to include the output of inflectional processes (Chomsky 1995:195). An inflected form is thus a W, but a bound stem or an empty category like pro is not. Since there is no prosodic category smaller than W, word-internal juncture is taken to be the responsibility of the lexical phonology (Hayes 1989:206-207).

The second condition we assume the prosodic hierarchy to satisfy is often called the Strict Layer Hypothesis (SLH). This we state as in (23):

(23) For all k ($1 \leqq k \leqq n-1$), each C_k is composed of one or more instances of C_{k+1}, and each C_{k+1} is contained in a unique instance of C_k.

(22) and (23) together have the consequence that any Utterance is exhaustively parsed on every level and that a boundary of level k is also a boundary of level k+1 ($1 \leqq k \leqq n-1$) and thus of all lower levels as well. In practice, C_2 is the Intonational Phrase (IntP), referred to in section 1.2, and C_3 is the Phonological Phrase (PhnP), well established as the domain of rules like Chi Mwi:ni Shortening (Kisseberth and Abasheikh 1974, Selkirk 1986, Hayes 1989), Italian Radoppiamento Sintattico (Nespor and Vogel 1986:ch.6), and the English Rhythm Rule (Hayes 1989). The PhnP corresponds roughly to a lexical XP, and there is by consensus a prosodic domain corresponding roughly to a lexical X_0 as well. Following Nespor and Vogel (1986) and Hayes (1989), we will call this domain the "Clitic Group" (CG); in works like Selkirk and Shen 1990, the domain in question is the "Prosodic Word". The CG is thus C_4, and the W is C_5.

For any language L, the question of how the Prosodic Hierarchy C_1, ..., C_5 is realized in L is essentially the question of the factors that determine phrasing or parsing in L at the four levels U, IntP, PhnP, and CG; such factors might in principle be universals, parameter values, ranked constraints, or idiosyncratic characteristics of L or of individual lexical items. In the remainder of this section, we will sketch some of the factors that determine prosodic phrasing in English, concentrating on those that will be relevant to our account of X-t effects. We limit our discussion to the three domains CG, PhnP, and IntP.

A first approximation to the principles that determine PhnP and CG-level phrasing in English is achievable very simply in "edge-based" or "alignment" terms (see Selkirk 1986, Selkirk and Shen 1990, Truckenbrodt 1995, 1999, among others), as in (24):

(24) a. Align the right edge of a PhnP with the right edge of each lexical XP.
b. Align the right edge of a CG with the right edge of each lexical X^0.

(24) will for instance convert the syntactic representation (25) to the prosodic representation (26):

(25) The $[[\text{girl}]_N]_{NP}$ $[[\text{read}]_V$ the $[[\text{book}]_N]_{NP}$ to the $[[\text{boy}]_N]_{NP}]_{VP}$

(26) $[[\text{The girl}]_{CG}]_{PhnP}$ $[[\text{read}]_{CG}$ $[\text{the book}]_{CG}]_{PhnP}$ $[[\text{to the boy}]_{CG}]_{PhnP}$

Our discussion of cliticization in section 2.2 will take (24b) as a point of departure.

At least some languages arguably display flexibility in phrasing at the PhnP level depending in part on constituent length. Thus, in English and Italian, a complement may belong to the same PhnP as an immediately preceding head (as in (26)) just in case it is nonbranching (Nespor and Vogel 1986:185)--i.e., consists of a single CG (Hayes 1989:217-218). Flexibility of phrasing is far more pronounced at the IntP level, where constituent length and speech rate determine a large proportion of IntP boundaries. What will be important for our purposes, however, is intonational phrasing that depends only on syntactic factors. This "obligatory" intonational phrasing is typically marked, in that it involves placing an IntP boundary in the

middle of what would otherwise be a lower-level constituent. This is illustrated by the RNR example (27):

(27) Jim's been wondering if, and Tom's been saying that, Sue really likes Pat. (=(10))

The complementizer *that* would normally belong to the same CG and PhnP as what follows. In (27), however, since *that* and *Sue* are separated by an IntP boundary, they will, under the SLH, be separated by a PhnP boundary and a CG boundary as well. In order to capture such facts without postulating readjustment rules to correct preliminary CG-level and PhnP-level parses that turn out to be mistaken, we will assume that syntactically conditioned ("obligatory") IntP boundaries are specified by the point at which the principles that determine CG-level and PhnP-level phrasing apply. The domain on which construction of those lower-level constituents takes place will thus be the (obligatory) IntP. Since intonational phrasing that depends on constituent length and speech rate will arguably never break up what would otherwise be a lower-level constituent, we will make no assumptions about how it is realized.

2.2 Cliticization

The main purpose of this section is to examine CG-level phrasing in English. Before raising that issue, however, it is important to distinguish two types of cliticization. The best-known cases of cliticization in English involve desyllabification, as in the auxiliary of (28a), application of word-internal phonological constraints, such as the degemination shown by (28b), or both, as in the voiceless copula alternant of (28c):

(28) a. She will scream. → She'll scream.
b. I want to go. → I wanna go.
c. Pat is here. → Pat's here.

Cases like those of (28) arguably involve cliticization at the level of the word rather than at the level of the clitic group—that is, incorporation of the cliticizing element, or clitic, into a neighboring W rather than a neighboring CG. In (28a), to begin with, the difference between the reduced and unreduced forms cannot be accounted for in terms of the placement of CG boundaries, since the entire utterance consists of a single CG in either case. In (28b), degemination of *t* (feeding flapping) guarantees single-word status for the host-clitic combination, given that geminates are stable across word boundary (*take the meat to him*; *wait to declare it*; *seat-type*). The same is true of the voicing assimilation of (28c). Since W-level cliticization will be discussed in section 4, we will not treat it further here.

We have suggested (24b) above as a first approximation to an account of CG-level phrasing (alternatively, CG-level cliticization) in English. (24b) can be seen as making two claims. The first is that there is a one-to-one correspondence between CGs and lexical, as opposed to functional, X^0s. This claim is not specific to an alignment account of CG-level phrasing; it is also an element of the acccount of Nespor and Vogel (1986:154) and that of Hayes (1989:208). We will adopt this claim here as well, referring to the lexical X^0 corresponding to a given CG as the host of that CG and to the other members of the CG, all functional X^0s, as clitics.[5]

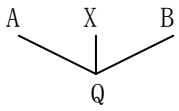
The second claim made by (24b) is that functional X^0s are all proclitic in English. In fact, while procliticization at the CG level is clearly the unmarked case, there is a great deal of arguably regular encliticization as well. This is illustrated in (29); presumed CG-level phrasing is shown, and CG-level enclitics are underlined:

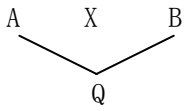
(29) a. [She read <u>it</u>]$_{CG}$ [to Jim]$_{CG}$ (cf. [She read]$_{CG}$ [to the boy]$_{CG}$)
b. [She talked <u>to him about it</u>]$_{CG}$ [the next day]$_{CG}$
c. [I wonder]$_{CG}$ [what she talked <u>to him about</u>]$_{CG}$ [on the train]$_{CG}$
d. (That's the kind of problem I can never figure out) [who to talk <u>to about</u>]$_{CG}$

Where node X shares k category memberships with node Y just in case the cardinality of the set of nodes dominating both X and Y is k, the choice between enclisis and proclisis for a CG-level clitic is made in Hayes 1989 on the basis of which of the two adjacent hosts it shares more category memberships with. In the uniformly right-branching structures widely postulated for multiple-complement VPs (and for VPs that include adjuncts) since Larson 1988, however, this criterion will not be helpful, since a given terminal node will share at least one more category membership with any terminal node on its right than with any terminal node on its left.

We suggest that the generalization governing the cases of enclisis in (29) is that the enclitic functional heads all have complements that are void of lexical material—complements, that is, that are either empty or are themselves functional (following Abney (1987:281-284), we assume pronouns to be of category D). Given that we are assuming the domain of CG construction to be the (obligatory) IntP, this generalization will also cover the enclitic complementizer of an example like (27) above. Before we actually state the principle(s) we take to govern CG-level phrasing, however, there is one further issue to deal with.

Like syntactic constituency, prosodic constituency may of course in general be represented either in the form of a labeled bracketing or in the form of a tree structure. Here we will adopt tree structures as our official mode of representation, although we will continue to use labeled bracketings in many cases for convenience. A major reason to prefer tree structures is that we will want to distinguish between representations of type (30a) and those of type (30b), both of which would be [$_{Q}$ A X B] in labeled bracketing format (on the advantages of a tree structure versus a lableled bracketing representation, see also fn.11):

(30) a. 

b. 

In particular, as explained in section 2.3 below, we will assume the status of empty categories in prosodic representations to be parallel to that of X in (30b). Correspondingly, we will state the principles governing CG-level phrasing in terms of autosegmental association of CG nodes with W nodes, as in (31):

(31) a. Associate a CG node with the W corresponding to every lexical X^0.
b.1. Associate to the CG node on the left (i.e. encliticize) the members of a maximal sequence of unassociated Ws whose complements are free of lexical material.
2. Associate to the CG node on the right (i.e. procliticize) all unassociated Ws.

Principles (31a), (31b1), and (31b2), applied in that order, will account for the CG-level phrasing seen in examples (25), (26), (27), and (29).

2.3 The Syntax-Phonology Interface: Prosodic S-Structure

In this section, we will look at the properties that the syntax-phonology interface must be

assumed to have in order to make possible a prosodic account for the X-t effects of section 1. First, we repeat examples (13) and (14) from section 1 as a representative minimal pair for the effect of intonational phrasing on the acceptability of *that*-t sequences, writing the empty operator antecedent of the subject trace that was omitted above:

(32) *That's the guy O_i Jim suspects, and Tom's been saying, that t_i really likes Sue.

(33) That's the guy O_i Jim's been wondering if, and Tom's been saying that, t_i really likes Sue.

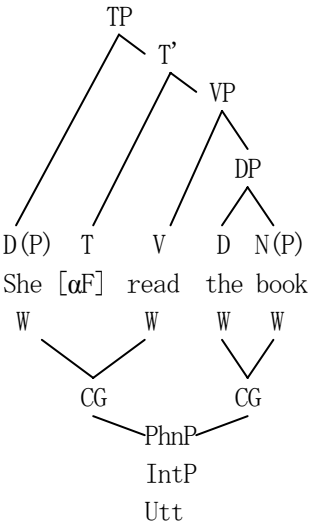
The intuition we want to pursue is that the crucial difference between (32) and (33) is that while the trace of (32) is internal to a CG because of the procliticization of *that*, the trace of (33), being adjacent to an IntP boundary, is thus a fortiori adjacent to a CG boundary. We will want to say, in other words, that the trace of (32), not being adjacent to CG boundary, violates a restriction that we will call the Prosodic Licensing Constraint (on Subject Traces), or PLC. The PLC will have to be able to see prosodic structure, of course, but it will also have to be able to see traces and to distinguish the subjects from the non-subjects among them. Further, since it must not exclude traces bound by an operator in the local Spec(CP), as illustrated in (34), it must be able to distinguish local from non-local subject extraction.

(34) That's the guy O_i that t_i likes Sue.

A priori, it might be imagined that the rules of the syntax-phonology mapping destroy syntactic structure at the same time as they establish prosodic structure. Clearly this will not be possible if we are to state the PLC in something like the form just suggested. We will thus assume henceforth that the rules that establish prosodic structure leave syntactic structure temporarily untouched, resulting in a representation, here called "Prosodic S-Structure" (PSS), that shows both the syntactic constituency and the prosodic constituency of the string of terminal elements of the syntactic representation and in that sense constitutes a grammar-internal interface between the computational system and the phonology.

More concretely, we will assume syntactic constituency and prosodic constituency to be displayed at PSS on separate planes of an "autosegmental" representation, with the string of syntactic terminals forming the common core or skeleton of that representation. On this conception, the PSS representation of (25) above, for example, will take the following form:

(35)



The PLC will be stated on PSS, after which phonetically unrealized terminals and indications of syntactic structure will be erased and the resulting representation will enter the phonology proper. We are proposing, then, that spellout takes place in two stages, the first involving the addition of prosodic structure and the second the erasure of syntactic structure, rather than having these two operations take place simultaneously.

Let us consider in more detail the treatment of empty categories at PSS, assuming (Chomsky 1995:202) that traces of overt movement are copies of the moved element that undergo PF deletion. To begin with, we have no reason to question the position (Selkirk 1984:370ff., Nespor and Vogel 1986:48ff., Truckenbrodt 1995, 1999) that the principles that determine prosodic constituency are insensitive to empty categories. In no case, that is, will prosodic constituency depend on the presence or absence in the string of terminal elements of either an item that is marked for PF deletion or one that is phonologically null as a lexical property (i.e. has no phonological features), such as pro. Since this means that the principles determining prosodic structure must distinguish, given a chain of copies resulting from overt movement, the copy that will be phonetically realized from those that will not, we will assume that copies subject to PF deletion are so marked. In particular, we will assume a feature [±P(honetically) R(ealized)]; traces will then be copies that are marked [-PR].

In view of our earlier definition of a W(ord) as a phonetically realized lexical item, empty categories will not be assigned W status--that is, they will not be linked by association line to any W node. As a result, they will not be integrated into higher-level prosodic constituents either. This is exemplified by the feature complex [αF] of (35), which is not linked to a W node and thus does not belong to a W or to any higher-level constituent. At the same time, however, the place of an empty category in the string of terminal elements is guaranteed by its place in syntactic structure. As a result, at every level C_k of prosodic structure, a given empty category will be located either internal to a C_k or between two adjacent C_ks, depending on whether the closest terminal elements on either side of it that do have W status belong to the same C_k or different C_ks; empty categories will in that sense be "in" the prosodic representation even though they are not "of" it. The feature complex [αF] of (35), for instance, is located between two Ws, since the terminal elements on either side of it belong to different Ws, but internal to a CG, since the terminal elements on either side of it belong (through membership in their respective Ws) to the same CG.

A final assumption concerning empty categories relates to deletion of the type seen in RNR. Again following Chomsky (1995:202-203), we will assume that in cases of deletion where the full form is a nondeviant utterance with interpretive properties parallel to those of the reduced form, only the full form reaches LF, the deletion, along with any other phonetic consequences, being an (optional) PF operation.[6] We will take the implementation of deletion in such cases to involve two steps, the first being marking of the material to be deleted as [-PR] and the second being the erasure of empty categories and syntactic structure that occurs, as indicated above, on entry to the phonology proper. In the case of RNR, the first of these steps will be accompanied by construction of the three "obligatory" IntPs that characterize the output of deletion; CG-level and PhnP-level prosodic structure will then be "tucked under" the IntP nodes in question in the manner of the "top-down" construction of stress grids discussed by Hayes (1995:116), following van der Hulst (1984:178-182).

3 X-t Effects: Analysis

In 3.1, building on the framework introduced in section 2, we present an account of the X-t

effects of section 1 in terms of a Prosodic Licensing Constraint (PCC) on subject traces. 3.2 is devoted to residual cases of subject-object extraction asymmetries that are not covered by the PCC. 3.3, finally, discusses locally A'-bound subject traces, to which the PCC does not apply.

3.1 The Prosodic Licensing Constraint

Let us return to examples (32) and (33). At spellout, the relevant aspects of the syntactic structure of (32) will be as in (36):

(36) That is the guy $[_{CP}\ 0_i\ [_{IP}[_{IP}$ Jim suspects $[_{\underline{CP}}\ 0_i$ that $[_{IP}\ 0_i$ really likes Sue]]] and

$[_{IP}$ Tom has been saying $[_{CP}\ 0_i$ that $[_{IP}\ 0_i$ really likes Sue]]]]

The terminals of the first occurrence of the pivot *that really likes Sue* will be marked [-PR], with two consequences: that phrase will be ignored in the construction of prosodic structure, and the sentence will be organized into three IntPs, with sentence-internal IntP boundaries falling at the right edge of nonpivot elements. Along with the assignment of CG boundaries, the result will be the prosodic representation (37) (for simplicity, we omit PhnP boundaries and empty categories other than the subject trace, here a copy of the moved operator):

(37) $[[$That's$]_{CG}$ [the guy$]_{CG}$ [Jim$]_{CG}$ [suspects$]_{CG}]_{IntP}$

$[[$and Tom's$]_{CG}$ [been saying$]_{CG}]_{IntP}$ $[[$that 0_i really$]_{CG}$ [likes$]_{CG}$ [Sue$]_{CG}]_{IntP}$

The corresponding representations for (33) will be (38) and (39), respectively:

(38) That is the guy $[_{CP}\ 0_i\ [_{IP}[_{IP}$ Jim has been wondering $[_{\underline{CP}}\ 0_i$ if $[_{IP}\ 0_i$ really likes Sue]]] and

$[_{IP}$ Tom has been saying $[_{CP}\ 0_i$ that $[_{IP}\ 0_i$ really likes Sue]]]]

(39) $[[$That's$]_{CG}$ [the guy$]_{CG}$ [Jim's$]_{CG}$ [been wondering if$]_{CG}]_{IntP}$

$[[$and Tom's$]_{CG}$ [been saying that$]_{CG}]_{IntP}$ 0_i $[[$really$]_{CG}$ [likes$]_{CG}$ [Sue$]_{CG}]_{IntP}$

As indicated above, the intuition we want to pursue is that the subject trace of (37) is excluded because it is internal to a CG; this problem does not arise with the subject trace of (39), which falls between two CGs. At the same time, we must insure that the excluded trace in (37) is the trace of nonlocal subject extraction. Using "Ω" ("operator") to stand for the trace whose environment is at issue, we state these conditions in (40) below. (40a) gives the environment of the excluded trace on the syntactic plane of the PSS representation, while (40b) gives its environment on the prosodic plane:

(40) Prosodic Licensing Constraint on Subject Traces (PLC)

$*\Omega_i$ when simultaneously in the environments (a) and (b):
a. $[_{CP}\ \Omega_i$ X $[_{IP}$ Y $[_{IP}$ __
b. $[_{CG}$ A __ B] (condition: A and B each contain at least one σ but no CG boundary)

(40a) and (40b) together provide that an element in Spec(IP) that is bound from a nonadjacent

Spec(CP)--in other words, the trace of nonlocal subject extraction--is excluded if it is separated on both sides from the closest CG boundary by at least one syllable (we will see in section 4 why (40b) must be stated so as to require a syllable rather than simply a non-null stretch of phonological material). (40) will exclude the subject trace of (36)-(37), but not that of (38)-(39), as desired.

The above examples involve extraction from finite complements and the resulting *that*-t sequences. The PLC (40), however, will arguably extend to the full range of X-t effects considered in section 1. The reason is that the X of those X-t sequences is always a functional rather than a lexical category. In the case X = C and and the case X = P, this is uncontroversial; let us look more closely at the case X = *wh*.

Single-word interrogatives can be divided into "nominal" *who* and *what* and "adverbial" *where*, *when*, *how*, *why*. As with pronouns, it is natural to take *who* and *what* to be D, particularly since the latter freely takes an NP complement (*what book(s)*). This suggests a treatment of adverbial interrogatives as degree words (Deg), the functional category argued by Abney (1987:298ff.) to be the head of AP (where A includes adverbs and quantifiers as well as adjectives in the narrow sense). This suggestion is supported by the fact that, just as *what* freely takes an NP complement, *how* freely takes as a complement any of the three types of AP (*how big*, *how quickly*, *how much*). If single-word interrogatives are all D or Deg, *wh*-t effects, like C-t and P-t effects, will fall under the PLC (on phrasal interrogatives, see section 3.2 below).

The PLC will also explain the amelioration of C-t effects associated with the intervention of an adverbial constituent before the trace that has been discussed by Bresnan (1977:194 (fn.6)), Culicover (1993a,1993b), and many others. Such adverbial constituents will typically end in a lexical X^0 and thus occur at the right edge of a CG; this is true, for instance, of Culicover's (1993b:557-558) examples *for all intents and purposes*, *just yesterday*, and *in her opinion*. We will also want a CG node to be associated with a contrastively stressed functional category, given that amelioration is observed in cases like (41) as well:

(41) That's the guy O_i I suspect that to HER t_i will be cordial.

To obtain this result, we must assume that rules that create prosodic structure are sensitive to indications of contrastive stress, and in particular that they treat a functional X^0 with contrastive stress in the same way as they do a lexical X^0. This is an independently motivated principle; for example, it will be necessary in order to predict that contrastive stress on *him* in *She talked to him about it* (see (29b)), which otherwise constitutes a single CG, results in the CG-level phrasing (42):

(42) $[\text{She talked}]_{CG}$ $[\text{to HIM about it}]_{CG}$

Concerning amelioration with negative adverbials, as in (43) (cf. Culicover 1993b:558, (6)), we follow Rizzi (1997:316) in taking the paradigm (44)-(45) to indicate that preposing of a negative operator (focus phrase) triggers T-to-C movement when a non-subject has been extracted just as it does when there is no extraction, but fails to do so in cases of subject extraction.

(43) That's the guy I said that under no circumstances would run.

(44) a. That's the woman 0_i that only then did [he acknowledge t_i]
b. *That's the woman 0_i that only then [he acknowledged t_i]

(45) a. *That's the man 0_i that only then did [t_i acknowledge her]
b. That's the man 0_i that only then [t_i acknowledged her]

The subject trace in (43) thus precedes *would* and, being located at CG-boundary (i.e. between two CGs) rather than internal to a CG, is not excluded by the PLC, as desired.[7]

3.2 Residual Cases

We have discussed a wide range of cases in which asymmetry between the extractability of objects and that of subjects will be predicted by the PLC. There are, however, several types of subject-object asymmetry that the PLC will not cover. In this section, we will review representative examples, suggesting that some are the result of independently motivated principles and that others are incompletely understood. To begin with, consider contrasts like that of (46):

(46) a. ?That's the book [$_{CP}$ 0_i [$_{IP}$ I'm wondering [$_{CP}$ [which guy]$_j$ [$_{IP}$ t_j read t_i]]]]
b. *That's the guy [$_{CP}$ 0_i [$_{IP}$ I'm wondering [$_{CP}$ [which book]$_j$ [$_{IP}$ t_i read t_j]]]]

Because the subject trace in (46b) is preceded by a lexical X^0, it will occur at CG boundary, and will not be excluded by the PLC. It would seem, however, that something like Pesetsky's (1982b) PCC will be necessary to account for contrasts involving double DP-extraction like that of (47), and the same constraint will cover the contrast of (46).

(47) a. That's the problem [$_{CP}$ 0_i [$_{IP}$ I don't know [$_{CP}$ who$_j$ [$_{IP}$ PRO to talk to t_j about t_i]]]]
(cf. (29d))
b. *That's the guy [$_{CP}$ 0_i [$_{IP}$ I don't know [$_{CP}$ what$_j$ [$_{IP}$ PRO to talk to t_i about t_j]]]]

That prosodic factors are powerless to rescue a case like (46b) is underlined by the severe unacceptability of the corresponding RNR example (48) and that of the embedded topicalization example (49) (cf. Rizzi 1997:310, (82b)); in both cases, the sentence must be excluded in spite of the fact that its subject trace is preceded by an IntP boundary:

(48) *That's the guy 0_i I've been wondering [which book]$_j$, and Sue has been trying to find out [what magazines]$_k$, [t_i read $t_{j/k}$ last week]

(49) *That's the guy 0_i I suspect that [this book]$_j$, [t_i knows t_j very well]

Next, consider the "surprising" asymmetries of Pesetsky (1984) (see Browning 1987:295-301, Rizzi 1990:95-98). We have assumed, to begin with, that just as there is no subject-object asymmetry in (50), which involves extraction from a finite complement, there is none in (51), where that finite complement has been embedded under an infinitival interrogative complement (cf. (2c) above):

(50) a. That's the guy 0_i I think [Jim denounced t_i]
b. That's the guy 0_i I think [t_i denounced Jim]

(51) a. That's the guy 0_i I'm wondering whether to believe [Jim denounced t_i]

b. That's the guy O_i I'm wondering whether to believe [t_i denounced Jim]

When, however, the interrogative clause of (51) is changed to a finite clause with a subject referentially distinct from that of the matrix clause, reducing considerably the acceptability of object extraction, the acceptability of subject extraction is reduced by a yet greater margin, resulting in a subject-object asymmetry that will not be covered by the PLC (cf. Rizzi 1990:95, exx. (45a)-(45b)):

(52) a. ??That's the guy O_i I'm wondering whether Sue believes [Jim denounced t_i]
b. ?*That's the guy O_i I'm wondering whether Sue believes [t_i denounced Jim]

Examples parallel to (52) can be constructed involving finite complements of a V that belongs to an adjunct or complex DP island rather than a tensed *wh*-island (see Browning 1987:297). Only slightly different are the examples of (53), which involve finite complements of N:

(53) a. ??That's the testimony O_i I need to know the reason [the witness retracted t_i]
b. ?*That's the witness O_i I need to know the reason [t_i retracted his testimony]

The observational generalization covering examples (50)-(53) would seem to be that (a) when complement extraction is completely acceptable, so is subject extraction, modulo X-t effects; (b) when the acceptability of complement extraction begins to deteriorate, that of subject extraction deteriorates at an even faster rate. This generalization will apply as well to examples like those of (54), which involve extraction from a finite interrogative clause whose Spec(CP) is of the form [$_{DegP}$ Deg AP]:

(54) a. ?That's the guy O_i I need to know [how badly [Jim injured t_i]]
b. ??That's the guy O_i I need to know [how badly [t_i injured Jim]]

The generalization in question is captured at one level by Browning's proposal (1987:298-300) to relativize subjacency to the position of the chain root (Rizzi's account (1990:96-98) depends on a head-government requirement that we are not adopting here). It seems fair to say, however, that further investigation of the phenomenon is called for.

3.3 Local Subject Extraction

Because we are accounting for X-t effects in terms of the PLC, we have no compelling reason to postulate a head-government condition on traces (and thus no reason to question the minimalist claim (Chomsky 1995) that no such condition exists). The general approach to trace-licensing that it is natural for us to assume can thus be characterized roughly that as that of Rizzi 1990:ch. 3 minus the head-government requirement. "Referential" A'-traces, first of all, are subject only to a binding condition (see, however, the discussion of referentiality and related notions in Chung 1994:sec. 7-8 and the references cited there). All other traces are subject to the Minimal Link Condition, essentially the antecedent government of Rizzi 1990 and much earlier work (like Rizzi, we abstract away from Subjacency). In this context, the fact that the PLC affects only long-distance subject extraction means that extraction of subjects to the local Spec(CP), like extraction of complements, needs to satisfy only the binding requirement. Local subject extraction in this sense "come[s] for free" in the system we are assuming, rather than "requir[ing] a special mechanism" (Rizzi 1990:64).

One immediate result of this position is that nothing needs to be said about the failure of the complementizers of relatives and clefts--in particular, English *that*--to induce C-t effects: because subject extraction is local in these cases, no such effects are predicted by our system. The claim that local subject extraction requires no special licensing mechanism, however, is in conflict with the conclusions of Rizzi (1990:64) and Koopman (1983:367-368, 1984:37) and thus requires further discussion.

Following Rizzi's survey (1990:sec. 2.6) of subject extraction strategies, let us examine the likely repertory of ways in which languages could deal with the requirement imposed by the PLC, given the pragmatic desirability of allowing long-distance subject extraction in some form. First, it is clear that the PLC must be taken to represent not an inviolable constraint of UG, but something like a default parameter setting, since it can clearly be overridden on a language-specific basis, either for C-t effects in particular (the dialect of English described by Sobin 1987) or for both C-t and *wh*-t effects (see the Norwegian examples of Hellan and Christensen 1986:5). Cases in which the X of X-t is overtly marked to indicate subject extraction but otherwise left intact must also, given the formulation of the PLC in section 2.2, be considered cases of "PLC override". The classic example of this phenomenon is French, where the *que/qui* alternation brings the C of long-distance subject extraction from a finite clause (*Qui penses-tu qui vient?*) into line with that of the local case (*l'homme qui vient*), with the result that subject and non-subject extraction are morphologically distinguished. This device, while intuitively enhancing identifiability of the subject trace, does not circumvent the PLC as stated above. It seems likely that the PLC should be reformulated so as not to apply to such cases, but space limitations preclude pursuing that project here.

Setting aside cases of override, it is possible to distinguish at least three ways in which long-distance subject extraction could be realized consistent with the PLC. First, to the extent that the X of X-t is subject to independently motivated deletion, the zero alternant could be required in cases of long-distance subject extraction; this is the strategy, applicable only to finite complements, exemplified by the majority dialect of English. The second strategy is use of a resumptive pronoun, with the result that the PLC, which specifies a [-PR] input, is rendered inapplicable. The third strategy is extraction from a position in which the problematic configuration does not arise, such as the (typically sentence-final) VP-adjoined position (Rizzi 1990:63) of Italian and other null-subject languages (it remains, of course, to verify that the position in question is in fact invariably adjacent to CG-boundary in all the relevant languages).

Rizzi's evidence that local subject extraction is like long-distance subject extraction in requiring a special licensing mechanism, which incorporates the evidence of Koopman, consists of languages for which the strategy employed for long-distance subject extraction is demonstrably used for the local case as well. This is true in particular of Romance null-subject languages, with, as we have seen, extraction from VP-adjoined position, and of Vata, which employs resumptive pronouns. In effect, the argument is that if local extraction were unproblematic, languages should not go to the trouble of employing a marked strategy for it, where the unmarked subject-extraction strategy may be understood to be a trace in the canonical subject position (i.e. the position of nominative case assignment/checking) and the absence of any restriction on the surrounding environment (in particular, on the realization of C). Several considerations, however, suggest an alternative interpretation of the phenomenon of marked strategies for local subject extraction.

First, it would seem that that phenomenon must be considered cross-linguistically rare. For the case of (local) relativization, certainly, the survey of Keenan and Comrie (1977) shows that resumptive pronouns are rarer for subjects than for nonsubjects, and conversely that traces ("gaps") are commoner for subjects than for nonsubjects. While questions have been raised about aspects of Keenan and Comrie's Noun Phrase Accesibility Hierarchy (for some discussion and references, see Newmeyer 1998:316-320), their conclusion that in relative clauses, extraction from subject position is "easier" than extraction from any other position seems robust.

Second, as the variation shown by the Scandinavian languages (Hellan and Christensen 1986:4-6) suggests perhaps most clearly, strategies for long-distance subject extraction tend to be idiosyncratic, in the sense of being underdetermined by or uncorrelated with the rest of the grammar, and (presumably as a result) historically unstable. Insofar as a distinction between a UG-determined core and a marked periphery (Chomsky 1981:7-8) is tenable, this suggests peripheral status for such strategies.

Third, where a marked strategy for local subject extraction is found, it would seem always to be identical to the strategy for nonlocal subject extraction. While perhaps unsurprising in itself, this fact, in conjunction with the other two just cited, opens the way to an account of marked strategies for local subject extraction as straightforward generalizations of the strategies for nonlocal subject extraction employed by the respective languages in question. Insofar as they represent rule-like peripheral phenomena rather than parameter settings or universal principles, strategies for nonlocal subject extraction might be expected to be subject to occasional generalization in the manner of traditional rules.[8] This, then, is what we propose has happened in languages like Italian and Vata.

We have claimed that, subjacency aside, traces of local subject extraction, like traces of complement extraction, are subject only to a binding requirement, and that languages that seem to show otherwise display generalization to the local case of their strategy for nonlocal subject extraction. If this is so, no issue of trace-licensing arises, as we have already observed, with respect to the C-t sequences of relatives and clefts, in English or in general. A separate issue, however, does appear to arise with respect to relative *that* before a trace, namely that of why it is not only possible, but obligatory.[9]

There is evidence, however, (McCawley 1998:433 and sources cited there), that the observationally adequate formulation of the restriction in question does not in fact refer to traces. As illustrated by (55), relative *that* is apparently undeletable before anything other than an overt subject:

(55) the girl *(that) hopefully Jim will marry

Whatever the precise status of the restriction in question, then, it arguably has no intrinsic connection with subject extraction and is thus orthogonal to the topic of the present paper.

4 Subject Traces and *to*-Contraction

It is natural to ask what evidence there might be apart from X-t effects that the licensing of subject trace is sensitive to prosodic considerations. A well-known paradigm that comes to mind in this connection is that of (56):

(56) a. Who$_i$ do [you want [PRO to beat t$_i$]] (want to ～ wanna)
b. Who$_i$ do [you want [t$_i$ to win]] (*wanna)

The irreducible fact about the paradigm (56) is the incompatibility of the trace of (56b) with *to*-contraction. The standard EST and PP Theory account of this incompatibility, which goes back to a proposal of Baker and Brame 1972, has been that the trace in question blocks contraction in the same way an overt DP would, by disrupting the relation of adjacency between *want* and *to* that contraction requires. Since DP-traces (Pullum and Postal 1978:12-13) and intermediate traces in Spec(CP) (Lightfoot 1976:575ff.) demonstrably do not block *to*-contraction, the distinguishing characteristic of those traces that do has been taken, since Jaeggli 1980 and Chomsky 1980, to be Case.

Doubt is cast on the idea that encliticization of *to* to *want* in (56b) is blocked by the intervening Case-marked trace, however, by the failure of Case-marked trace to affect the operation of a wide range of phonological rules, including encliticization processes apparently parallel to *to*-contraction. Reduction of the auxiliary *is*, for example, operates with impunity across such traces, whether they are in subject or object position:

(57) a. Who$_i$ do [you think [t$_i$ is coming to the party]] (think is ～ think's)
b. The boy [O$_i$ [I told you about t$_i$]] is coming to the party. (about is ～ about's)

Such evidence has led to a consensus among students of the syntax-phonology interface, referred to above in section 2.3, that empty categories do not affect the application of phonological rules, either by disrupting relations of adjacency or by introducing junctural elements (equivalently, prosodic boundaries) across which such rules cannot apply.

An alternative tack to take with respect to the contrast of (56) would be to claim that contraction is effected by a rule that refers explicitly to the syntactic distinction involved. For example, following Postal and Pullum 1982:130, it would be possible to write an equi-subject condition into the rule so that it would apply only in cases of control or raising (the latter as in e.g. *The fur usta fly around here on Monday mornings*). Such an approach, however, is open to the objection that it abandons the attempt to derive the difference between (56a) and (56b) from general principles of grammar.[10]

We have seen that the standard (Chomsky-Jaeggli) account of the incompatibility of trace and contraction in (56b) identifies the trace as the causal factor: when trace intervenes, contraction is precluded. The analysis of X-t effects proposed in section 3 above, however, suggests a reversed perspective: rather than the trace rendering contraction unacceptable, it is contraction that renders the trace unacceptable, by placing it internal to a W (cf. the discussion of (28b) above) and thus, a fortiori, internal to a CG. Such a perspective would allow an account of the contrast in (56) in terms of a general principle of grammar which at the same time respects the consensus that empty categories do not affect the syntax-phonology mapping or the application of phonological rules.

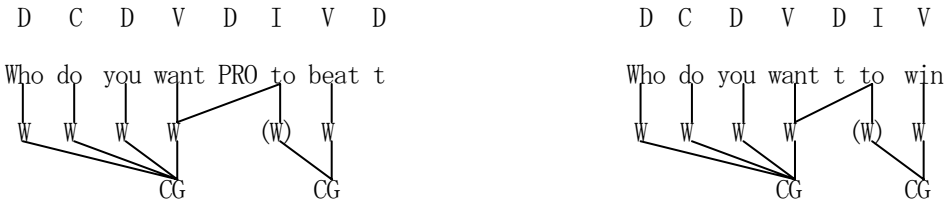
Let us then look at the way the contracted and uncontracted variants of (56a) and (56b) will be derived in the framework of section 2. It is natural, first of all, to assume that the W-level cliticization reflected in *wanna* is the result of the failure of infinitival *to* to achieve or maintain W status (i.e. its failure to be assigned a W node) and its consequent incorporation into the W of the neighboring V (cf. e.g. Anderson 1992:201). We will take the lack of a W node corresponding to infinitival *to* in contracted forms to be the result of a

deletion rule ("W-deletion") that operates on PSS representations. W-deletion is conditioned by the identity of the preceding verb (*I wanna/*menna call him*; *I gotta/*regretta tell ya*), by tempo and register, and by syntactic factors: notably, it does not apply when either *to* or the preceding verb is part of a coordinate structure (Postal and Pullum 1982), a condition that does not hold, for instance, of auxiliary reduction (Carden 1983). The rule that incorporates *to* into the neighboring V, which reflects the generalization that W-level cliticization in English (*to*-contraction, *not*-contraction, auxiliary reduction) is always encliticization, will be (58):

(58) Associate to the W node on the left any [+PR] terminal unassociated with W.

In the case of (56a) and (56b), for example, W-deletion will apply to the parenthesized W of the (abbreviated) representations (59a) and (59b), respectively, with consequent erasure of that W's association lines; (58) will then in each case supply the association line that represents the incorporation of *to* into the W of *want*.[11]

(59) a.



When the versions of the representations (59) that have undergone W-deletion and (58) are submitted to the PLC (40), the t of (59b) will satisfy both clauses of that constraint, and will thus be excluded. As a result, no representation that could surface as *Who do you wanna win?* will enter the phonology. (59a), on the other hand, will not be excluded by the PLC; after empty categories and syntactic structure are erased and the resulting representation is submitted to the phonology, the /an/ sequence of the word /wanttuw/ will become a nasalized vowel and the medial consonant will undergo degemination and flapping. Depending on the further application of vowel reduction (see Selkirk 1972:125) and change of the flap to a stop, that word will emerge as one of the variants [wãɾuw]~[wãɾə]~[wãnuw]~[wãnə].

We have claimed that the paradigm (56) receives a natural account in terms of the PLC and thus that the apparent equi-subject constraint on *to*-contraction—equivalently, the fact that it applies across PRO or DP-trace but not across wh-trace--need not be stipulated. We have yet to consider, however, the question of how our system will handle auxiliary-reduction examples like those of (60):

(60) a. Who do you think's coming to the party? (= (57a))
b. Who do you think'll come to the party?

In (60a), W-level encliticization of the auxiliary to the preceding verb has clearly occurred, just as in (28c) above. (60b), on the other hand, arguably involves an irregular allomorph of *will* that, like the full form of that auxiliary, is a CG-level proclitic as a result of (31b2). On these assumptions, the CG-level structure of the two examples will be as in (61a) and (61b), respectively:

(61) a. $[\text{Who}_i \text{ do you think-t}_i\text{-s}]_{CG}$ $[\text{coming}]_{CG}$ $[\text{to the party}]_{CG}$
b. $[\text{Who}_i \text{ do you think}]_{CG}$ t_i $[[\text{əl}] \text{ come}]_{CG}$ $[\text{to the party}]_{CG}$

The trace of (61b), being located at CG-boundary, will clearly escape being excluded by the PLC. The same is true of the trace of (61a), since what separates it from the nearest CG-boundary is less than a syllable. (61a), then, illustrates the implicit claim of the PLC that anything less than a syllable intervening between a trace and CG-boundary is "transparent" for the purposes of trace-licensing.

5 Prosodic Restrictions on the Double Object Construction

In accounting for the data of section 1, we were led to postulate in section 2 a level of representation Prosodic S-Structure (PSS) at which syntactic and prosodic information coexist and which, as we have noted, can be characterized as a grammar-internal interface between the syntax and the phonology. Such a level, however, represents a departure from "conceptual necessity" (Chomsky 1995:169), and can be accepted only to the extent that it has empirical support (on the topic of such a level, see also Chomsky 1995:220). In section 4, we examined another data paradigm that we claimed is naturally accounted for in terms of the framework of section 2. In the present section, we present one further piece of evidence for PSS, in the form of a generalization that we claim can be stated only over a level of representation that has simultaneous access to prosodic constituent structure and *wh*-traces.

As has been observed (see e.g. Selkirk 1984:393-394), there are prosodic restrictions on the acceptability of the double object construction (DOC). First, while a reduced pronoun in the second object position is typically impossible, its acceptability improves substantially if the first object is also a reduced pronoun, as in (62d) below:

(62) a. *I gave JIM it.
b. *I gave HIM it.
c. *I GAVE Jim it.
d. ?I GAVE him it. (*him* [m])

With an unreduced (nonreducible) pronoun in second object position, it is sufficient that the first object be unstressed:

(63) a. ?*I gave JIM that.
b. ?*I gave HIM that.
c. I GAVE Jim that.
d. I GAVE him that.

Finally, with a (contrastively) stressed pronoun in second object position, even a stressed first object is acceptable (for the intonation pattern of the two stressed monosyllables in (64a) and (64b), the basic possibilities are (omitting boundary L) (a) HL HL, (b) HL (downstepped) HLH, (c) HLH HL, where HLH items are topical and HL items are focal):

(64) a. I gave JIM THAT.
b. I gave HIM THAT.
c. I gave Jim THAT.
d. I gave him THAT.

The observational generalization that emerges from (62)-(64) is that the DOC is grammatical if and only if the second object is at least as prominent as the first object; the one idealization assumed by this generalization is the treatment of case (62d) as grammatical.

Where P(C), for any constituent C, is the number of asterisks assigned to the metrically most promiment syllable of C, we may state this constraint as (65):

(65) $[_{VP}$ V NP_1 $NP_2]$ $\quad$ *[P(NP_1) > P(NP_2)]

Let us now look at the acceptability of A'-extraction from the first object position of the DOC. Such extraction is sometimes taken to be unconditionally impossible (Wexler and Culicover 1980:275); in fact, it arguably displays a sensitivity to prosody that parallels that seen in (62)-(64). (As context for the questions (66)-(68), we assume a scene in which two people are looking at photographs of items known to have recently been given away as gifts by one of them.)

(66) (That's a really nice vase.) *Who$_i$ did you GIVE t_i it?

(67) (Can I ask you a question?) [Pointing at a photograph] ?*Who$_i$ did you GIVE t_i that?

(68) (My god!) [Pointing at a photograph] Who$_i$ did you give t_i THAT?

(66) shares with the sentences of (62) the property of having a reduced pronoun in the second object position; like (62a)-(62c), it is totally impossible. (67) shares with (63) the property of having an unreduced but unstressed pronoun in the second object position; like (63a)-(63b), it is close to completely unacceptable. (68), finally, shares with the sentences of (64) the property of having a (contrastively) stressed pronoun in the second object position; like those sentences, it seems essentially acceptable.

In isolation, (66)-(68) might be viewed as evidence that the licensing of *wh*-trace in the first object position of the DOC is subject to prosodic conditioning--that is, to a constraint like the PLC. Comparing (66)-(68) with (62)-(64), however, it seems clear that the same constraint that governs the latter--(65), that is--will account for the former as well, as long as it can "see" the trace in the first object position, and as long as that trace is marked as focal. Under these assumptions, we would expect (66) to have the same status as (62a)-(62b), (67) to have the same status as (63a)-(63b), and (68) to have the same status as (64a)-(64b); the judgments we have given for (66)-(68) bear out these expectations precisely.

We thus have evidence for a level at which *wh*-traces and prosodic information are present simultaneously that is of a slightly different sort from that we saw in sections 2 and 3. The basic datum is that the prosodic acceptability of the interrogative sentences (66)-(68) depends not on the surface forms of those sentences but rather on a more abstract level, one that corresponds to the output of DP-movement and the input to *wh*-movement (cf. the NP-structure of van Riemsdijk and Williams 1981). (66), for example, must be excluded on prosodic grounds, but if the constraint that is to exclude it cannot see its trace, that constraint will have no way to distinguish it from a perfectly acceptable example like *When did you see it?* Alternatively, the prosodic acceptability of the question (66) depends on the prosodic acceptability of a possible answer to that question. No matter how this dependency is conceptualized, capturing it will involve reference to a level of representation that includes both traces and prosodic information--a level, that is, that has the characteristics of the level PSS proposed in section 2.

6 Conclusion

We have provided a prosodic account of the ungrammaticality of X-t sequences that identifies the trace as the problematic element of the sequence. There is in principle another type of prosodic account that would identify X as the problematic element. Such an account would claim that the X of X-t sequences is blocked from prosodically associating to the left by the CG boundary there, and blocked from associating to the right by the trace. X would then be prosodically stranded, and would violate the general condition that all phonological material must be integrated into every level of prosodic structure, a consequence of the SLH (23).

In fact, it is not difficult to see why a trace-licensing account of the sort represented by the PLC offers a more plausible approach to the explanation of X-t effects than would an account in terms of t blocking the integration of X into a clitic group and in that sense stranding it. We saw in sections 2 and 3 that the PLC does not apply to the trace of local subject extraction. It is easy to show that there is no parallel restriction involving object traces, either: the trace t_j of (69) is internal to a clitic group but unproblematic.

(69) That's the problem [O_i [I don't know [who$_j$ [PRO to talk to t_j about t_i]]]] (= (47a))

On a blocking/stranding account, it would be hard to explain why the capacity of a trace to block integration of a functional category into a clitic group should vary according to the position of the trace. On a trace-licensing account, however, the differential behavior of traces in different positions is at least potentially comprehensible. If we think of trace-licensing as essentially a matter of identification, it seems plausible that it should be more difficult to license a trace of nonlocal subject extraction than either a trace of local subject extraction, where the distance between operator and variable is minimal, or an object trace, associated as the latter is with a theta-marking head (with respect to object traces, of course, this is the intuition behind the theta-government clause of the classical ECP (Chomsky 1986:17)).

The PLC claim that ("referential") argument traces are excluded if (a) they are subjects and (b) they have a nonlocal antecedent and (c) they are internal to a clitic group is equivalent, under De Morgan's Laws, to a disjunctive ECP (applying to arguments only) with three disjuncts: argument traces are licensed if (a) they are complements or (b) they have a local antecedent or (c) they occur at CG-boundary. It would be possible to take the position that a disjunctive trace-licensing condition of this sort is ipso facto an admission of ignorance and thus unsatisfactory (cf. e.g. Rizzi 1990:76-77 on the classical ECP). But because of the equivalence of a disjunctive trace-licensing condition and a conjunctive trace-exclusion condition, and given that X-t effects represent (modulo subjacency) the only major group of argument traces that need to be excluded, that position would amount to the requirement that we be able to identify a single factor, rather than a conjunction of three, that is responsible for X-t effects. It is not clear that there is any particular a priori plausibility to such a requirement.

The picture of the PLC that emerges is thus that of a constraint that operates to rule out an argument trace only if three conditions each of which plausibly reduces trace identifiability are met simultaneously. Clearly, more research will be needed to determine the cross-linguistic validity and possible parameterization of that principle. Another question raised by the above discussion concerns the relation between the constraint responsible for X-t effects and that responsible for the observed restrictions on *to*-contraction in English, in

particular with *want*. We have presented the two phenomena as the result of the same constraint, an account which generates the prediction that the distribution in the population of exceptionality with respect to the two phenomena should coincide.

Since X-t effects involve CG-level cliticization and *wanna*-contraction involves W-level cliticization, however, there are at least two additional possibilities. One is that the two phenomena are the result of parallel but distinct constraints; in this case, we would expect to see a random relationship between the respective distributions of the two phenomena in the population. Another possibility is that there is a single constraint that is parameterized according to the prosodic level at which constituent-internal traces are disallowed. In this case, we would expect to find speakers who allow traces of long-distance subject extraction internal to CG but not internal to W--i.e. speakers who fail to show X-t effects but who do disallow *wanna*-contraction over *wh*-trace--but not the reverse. The relative distribution in the population of speakers who are exceptional with respect to the two phenomena in question is thus another topic on which more research is needed.

Notes

*A note presenting the data of section 1 of the present paper appeared as de Chene 1995. I would like to thank Michal Starke for detailed comments on that note and Liliane Haegeman, Richard Kayne, Ryo Oba, Luigi Rizzi, and especially Chris Tancredi for helpful discussion at earlier stages.

[1]Previous phonology-based accounts of the *that*-t effect include that of Culicover 1993c (see also Culicover and Levine 1995) and that of Hasegawa 1993 and Hasegawa et al. 2000. For Culicover, trace must be right-adjacent to a stress peak, except that an enclitic may intervene, as in *Who were you shouting at t.* Since *that* is incapable of cliticizing leftward across a CP boundary, the t of *that*-t sequences fails to meet this condition. For Hasegawa, the phonological dependency of *that* on the element to its right is incompatible with a gap between them; a *that*-t example can thus include no gap corresponding to the interrogative in Spec(CP) and is consequently uninterpretable--in effect, an instance of vacuous quantification. The essential intuition behind the present analysis is parallel to that of Hasegawa.

[2]The observation that the left boundary of the pivot may intervene between C and IP, as in (10), dates from Bresnan 1974. The fact that complementizers occur "stranded" in such examples in spite of the fact that they are not strandable by movement (see (i) below) constitutes an argument for a non-movement analysis of RNR parallel to that involving prepositions in Irish offered by McCloskey (1986).

(i) What does he know (*whether/*if/*that) t?

[3](16b) is largely free of the inhibiting effect of RNR on *that*-deletion noted (following H. Lasnik) by Postal (1974:128 (fn.35)) and evident in (i), which is minimally different from (16b)-(16c) in not involving extraction:

(i) I've been thinking, and Jim's been saying, ??(that) they're going to cancel the meeting.

[4]The parallel behavior of the entire class of X-t effects poses problems for accounts of the *that*-t effect that do not generalize beyond that special case. One type of account with this property treats the zero C alternant observed with nonlocal subject extraction in English as simply a language-specific morphological fact--roughly, the form finite C happens to take in the context $[_{CP}\ t_i\ \_\ [_{IP}\ t_i$. The *wh*-agreement analysis of Watanabe (1996:189-191) and the Agr-as-head-governor analysis of Rizzi (1990) are of this type. A second type of account that is specific to the case X = *that* is the economy-based or OT type, under which the sequence *that*-t is not absolutely ungrammatical, but merely disfavored with respect to ϕ-t (Deprez 1994, Grimshaw 1997:414-416). Such an account predicts, other things being equal, that when no zero alternant exists (i.e. whenever X ≠ *that*), X-t should be acceptable, contrary to fact.

[5]Given that the term *clitic* is typically reserved for elements that are prosodically deficient or phonologically dependent, this must be considered an extended use of the word: while, as functional heads, CG-level clitics will typically be stressless monosyllables, and in that sense phonologically dependent, this is by no means invariably the case, as Selkirk's (1984:352-354) lists of monosyllabic and bisyllabic function words make clear. There is one phonological property arguably shared by all functional categories, however, namely the inability to take noncontrastive primary or sentential stress. This is illustrated for

because in (i). (ia) represents the unmarked assignment of primary stress; if primary stress is assigned to *because*, as in (ib), that stress is necessarily interpreted as contrastive.

(i) a. She's UPSET because of it.
b. She's upset BECAUSE of it.

[6]Conversely, of course, cases where putative full and reduced forms differ in interpretive properties cannot in fact be handled by deletion. A corollary of this latter principle we will assume below is that across-the-board extraction from a sequence of conjuncts must involve only a single operator rather than representing the PF reduction of a form with multiple operators. This is shown by the fact that the interpretations of (ia) and (ib) are distinct--in particular, (iia) and (iib), respectively:

(i) a. I need to know who Jim likes and Sue hates
b. I need to know who Jim likes and who Sue hates

(ii) a. I need to know [(?x)[[Jim likes x] and [Sue hates x]]]
b. I need to know [(?x)[Jim likes x] and (?y)[Sue hates y]]

[7]The contrast (i), parallel to (45), shows that just as in the case of T-to-C movement triggered by a preposed negative operator, T-to-C movement in questions does not apply in cases of subject extraction (for an analysis reconciling this fact with the obligatory nature of T-to-C when a non-subject is extracted, see Rizzi 1996, 1997:317):

(i) a. *Who$_i$ did [t_i leave]?
b. Who$_i$ [t_i left]?

It might seem at first glance as if the ungrammaticality of (ia) should receive an account in terms of something like the PLC. If (ia) is excluded prosodically, however, presupposing T-to-C movement with subject extraction, examples like *Who has left?* and *Who is leaving?* will be excluded as well. Since the subject extraction of (i) is local, the PLC will in fact have nothing to say about it, arguably as desired.

[8]The French complementizer alternation referred to above quite clearly represents generalization in the opposite direction: relative *qui*, originally the nominative form of the relative pronoun, was first reanalyzed as C and then extended to the case of nonlocal subject extraction.

[9]This restriction is dialect-specific: as McCawley (1998:480 (fn.4)) points out, it is regularly violated up to the time of Shakespeare and in contemporary African-American English.

[10] A syntactic approach arguably free from this defect is that of Roberts (1997). For Roberts, cliticization of *to* to a preceding verb is head movement, blocked in (56b) but not in (56a) by the *for* which is necessary to Case-mark the subject trace and which is assumed to survive to PF. There are potentially at least two kinds of examples, however, in which *to*-contraction is impossible but there will be no *for* to block head movement. Consider first that minority of speakers which allows contraction in (56b) as well as in (56a) (Pullum and Postal 1979:704-705). To describe this dialect, it will presumably be necessary to postulate early (i.e. pre-spellout) deletion of *for*. This, however, will allow cliticization not only in (ia) (cf. (56b)), but also, contrary to fact, in (ib):

(i) a. Who do [you want [(for) [t to win]]]
b. We want [(for) [Jim to win]]

Next, note that Roberts' analysis predicts that any verb marked for *to*-contraction that also takes an IP infinitival complement will allow (as in (ib)) contraction over an overt subject. A candidate for such a verb is *intend*, which at least for some speakers has the fast speech *to*-contraction form *intenna* in control constructions (Andrews 1978:264); that *intend* allows an IP infinitive is clear from "passive raising" examples like (ii):

(ii) $[\text{My remarks}]_i$ were intended $[t_i$ to be helpful$]$

As long as *intenna*, like *wanna*, is possible across PRO but not across trace (Andrews (1978:265) expresses doubts about this, but the facts seem relatively clear), the derivation of the former, like that of the latter, will involve head movement for Roberts. (The rules effecting phonological reduction are arguably different in the two cases, however: after *n*, flapping applies to *t* but not to *d* (e.g. *twenty* vs. *trendy*)). We conclude that Roberts' account of *to*-contraction will at least potentially overgenerate contracted forms.

[11]Note that it would be difficult to state this sequence of operations in terms of the labeled bracketing (i):

(i) $[[\text{Who}]_W$ $[\text{do}]_W$ $[\text{you}]_W$ $[\text{want}]_W]_{CG}$ PRO $[[\text{to}]_W$ $[\text{beat}]_W]_{CG}$ t

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