

Some Optimality Principles of Sentence Pronunciation*

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Research on syntax in recent decades has focused on four overlapping topics:

1. the laws that govern the assignment of words to positions in a hierarchical syntactic structure;
2. the laws that govern the assignment of words to more than one position in hierarchical syntactic structure (movement or chain formation);
3. the interface between syntactic structure (including movement) and semantic interpretation;
4. the interface between syntactic structure (including movement) and phonological interpretation.

Progress has not been equally successful in each of these domains. In particular, although we have a fairly sophisticated understanding of some problems that fall under topics 1-3, our understanding of topic 4 is less impressive. One reason, I suspect, is our failure to separate questions about structure and movement in the strictest sense (topics 1-2) from related issues that also have a phonological side. A typical case is the assumption that the mechanics of movement itself decide whether pronunciation targets the head of a chain (“overt” movement), a trace in the chain (“covert” movement), or more than one position in the chain (“resumptive” pronoun configurations, *wh* copying etc.). Indeed, these distinctions are rarely even described as problems with a phonological face. Instead, they are generally treated as issues in the localization of “spell out” within the syntax.

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In this paper, I will explore some outlines of an alternative view. According to this view, the laws of movement are independent of the principles that determine pronunciation. The success of this view hinges crucially on the assumption that the relevant pronunciation principles interact in an *optimality theoretic* fashion. OT interactions might also be found in other areas of syntax (as claimed by some other papers in this volume), but I will nonetheless argue that the principles determining pronunciation form a coherent and possibly distinct subsystem of grammar. I proceed by sketching an analysis of some structure-related pronunciation principles that are *not* crucially motivated by movement. I then turn to certain problems that are related to movement, and note how my proposals solve these problems (reporting on work by Fox 1994 and Broihier 1995). In this way, I will argue that pronunciation issues transcend movement in a manner unexpected in standard approaches.

1. A universal of pronunciation

Many languages front the finite verb to a position plausibly analyzed as clause-initial C. Pronunciation reflects this movement in one of two ways. In some languages, the fronted verb is pronounced immediately to the *right* of the complementizer. (When this happens, the complementizer and the verb form a word-like unit, which cannot be interrupted by adverbs or other material.)

(1) **Pattern 1: complementizer-verb** (Irish)

Dúirt Seán [_{CP} go-bhfuil Cathal ag rince].

Said John that-is Charles -ing dance

'John said that Charles is dancing'

(Andrew Carnie, personal communication)

In other languages with V-to-C fronting, the complementizer is simply *unpronounced*. This is the pattern in German, as noted in Den Besten's (1983) classic study of verb-fronting in embedded clauses. Den Besten argued that German verb-second is substitution of the verb into C. His primary evidence was the complementary distribution of fronted verb and pronounced complementizer:

(2) **Pattern 2: complementizer unpronounced**

a. Hans sagte, **dass** er glücklich ist.

Hans said that he happy is

b. Hans sagte, er **sei** glücklich.

Hans said he is happy

- (3) a. Er benahm sich, als **ob** er noch nichts gegessen habe.
 he behaved himself as if he yet nothing eaten had
- b. Er benahm sich, als **habe** er noch nichts gegessen.
 he behaved himself as had he yet nothing eaten

There is a gap in the paradigm, however. I know of no language with V-to-C movement in which the complementizer is pronounced to the *right* of the fronted verb, as in the (concocted) “anti-Irish” and “pseudo-German” below:¹

(4) **Non-existent Pattern 3: verb-complementizer**

- a. Dúirt Seán [CP bhfuil-go Cathal ag rince].
 Said John is-that Charles -ing dance (“Anti-Irish”)
- b. Er benahm sich, als habe-ob er noch nichts gegessen.
 he behaved as had-if he yet nothing eaten (Pseudo-German)

This gap is reminiscent of the “Doubly Filled Comp Filter” of Keyser (1975) and Chomsky and Lasnik (1977), except that it is crucially sensitive to the linear ordering of complementizer and verb:

(5) **Verb-adjunction universal:**

- a. OK [CP *that* verb ...] b. *[CP verb *that* ...]

We now need to ask whether (5) is telling us something about syntactic structures -- i.e. that left-adjunction to C is impossible -- or whether (5) is telling us something about the *pronunciation* of structures. Suppose, for example, that the laws of movement allow both left-adjunction and right-adjunction to C, but not “substitution” for C. We would analyze languages like Irish as showing *right-adjunction* of V to C, and languages like German as involving *left-adjunction* of V. (The choice in a particular language might be dictated by the morphological features that drive movement, i.e. whether C receives a prefix or a suffix.) It would then fall to principles of pronunciation to tell us that when the verb is left-adjoined to C, the complementizer is not pronounced. Throughout this paper, I will use strike-outs to indicate non-pronunciation (which I will sometimes call *deletion* -- in this paper, a purely phonological notion):

- (6)a. [*that* verb] b. [verb *that*]

¹Guglielmo Cinque (personal communication) and Hale (personal communication) helped confirm this observation.

What fact about the configurations in (6) could be responsible for the effect of adjunction direction on pronunciation? One possibility would start with the observation that only in (6a) can pronunciation of CP *begin* with the complementizer. That is, a first approximation at the generalization underlying (6) might be (7):²

- (7) If the complementizer heading CP cannot be pronounced at the left edge of CP, it is unpronounced.

If (7) is on the right track, we would hope to find other patterns sensitive to the possibility of pronouncing the complementizer at the left edge of CP. In fact, other properties of the CP system in French and English provide such evidence.

2. The Left Edge of the French CP

Unlike English, French requires the pronunciation of complementizer *que* ‘that’ in embedded declarative clauses:³

- (8) a. Je crois *que* Pierre a faim.
I believe that Pierre is hungry.
b. *Je crois ~~que~~ Pierre a faim.

Standard proposals might attribute this fact to a filter against unpronounced complementizers in French or to the absence of a rule in French which would delete the complementizer. In light of (7), however, one might attribute this fact to a requirement that the first word in CP be a pronounced complementizer whenever possible. Let us call this requirement *Left Edge(CP)*, abbreviated LE(CP):

²McCloskey (1992) argues that Irish actually lowers C to I, rather than raising the inflected V to C. The argument centers around adjunction possibilities that place elements to the right of the complementizer in English, but to the left of the complementizer in Irish. Our proposal is neutral between C-lowering and I-raising, since the key question concerns whether CP starts with the complementizer — wherever position that complementizer may occupy. On the other hand, proposals to be discussed below entail that, contrary to McCloskey's conclusions, the adjoined elements in question must be CP-external so as not to trigger non-pronunciation of C (see section 8). I am grateful to Danny Fox for this point.

³The pattern reported here for French is found in other Romance languages, e.g. Standard Italian (Cinque 1981). Spanish shows a more complex pattern of facts, which I have not investigated in detail. If Fox's (1994) analysis is correct, the French pattern is also the pattern of Modern Hebrew.

- (9) **Left Edge(CP) [first version]:** The first pronounced word in CP is the complementizer that heads it.

Let us suppose that any element in the CP system (in fact, any word at all) can in principle be unpronounced (Chomsky and Lasnik, 1977). LE(CP), however, prevents deletion of the complementizer in (8). If this view is correct, one might find a different environment in which LE(CP) doesn't prevent deletion, but *requires* deletion. For example, when SPEC,CP is occupied by a phrase that could in principle be optionally deleted, LE(CP) will (in effect) force the deletion. Such a situation arises in relative clauses with a "simple" *wh* phrase in SPEC,CP that takes the head of the relative as its antecedent. French, like English, uses most of its interrogative *wh* words as relative operators, e.g. *qui* 'who' in examples involving pied-piping:

- (10) l'homme [avec *qui*] j'ai dansé
the man with whom I danced

But a relative clause without pied piping that one might expect to be introduced with *qui* cannot actually start with pronounced *qui*. Instead, the first pronounced word is the declarative complementizer *que*.⁴

- (11)a. *l'homme *qui* je connais
the man who I know

b. l'homme *que* je connais
the man that I know

If we assume that French finite relative clauses involve a *wh* phrase in SPEC,CP and a complementizer (*que*) in C, the data in (11) can be seen as a question of pronunciation resolved by LE(CP). In the CP system, there are four possible patterns of pronunciation: pronounce both SPEC and C, pronounce only SPEC, pronounce only C, and pronounce neither. (I follow Kayne 1977 in

⁴When the highest subject position is relativized, the relative clause is introduced by *qui* (Perlmutter 1971, p.101 footnote 2). This *qui* is not the animate *wh* word, but some functional head, generally argued to be a form of the complementizer (Kayne 1977, 267-269; Pesetsky 1982; Rizzi 1990, 56-60). Two arguments that this is correct are the ability of this *qui* (unlike the *qui* discussed elsewhere in this paper) to be inanimate (*la table qui est bleue* 'the table that is blue'), and the use of this *qui* to introduce embedded declarative clauses from which the subject has been extracted (*Qui crois-tu qui viendra le premier?* 'Who do you think that (*qui*) will come first?').

treating *que* as the complementizer in relative clauses.) The only acceptable pattern is the one that satisfies LE(CP) -- the pattern in which *wh* is deleted but *que* is pronounced:⁵

- (12) a. *l'homme qui que je connais
b. *l'homme qui ~~que~~ je connais
c. l'homme ~~qui~~ que je connais
d. *l'homme ~~qui que~~ je connais

Now let us return to (10), in which a prepositional phrase is pied-piped. Here, a different pronunciation pattern is observed, as (13) shows:

- (13) a. *l'homme avec qui que j'ai dansé
b. l'homme avec qui ~~que~~ j'ai dansé
c. *l'homme avec ~~qui~~ que j'ai dansé
d. *l'homme avec ~~qui que~~ j'ai dansé

There are two facts to observe about (13). First, not only does the acceptable pronunciation not satisfy LE(CP), but the complementizer *que* actually cannot be pronounced at all (in literary registers of French; I return to other registers below). This fact, of course, looks like the generalization in (6), and is the “classic” case of the “Doubly Filled Comp Filter”. Second, the pied piped *wh* phrase is obligatorily pronounced. This fact has often been attributed to a condition on deletion called **Recoverability (REC)**. While an elegant and accurate statement of Recoverability remains elusive, it is a condition that at least has the following properties:

- (14) **Recoverability:** A syntactic unit with semantic content must be pronounced unless it has a sufficiently local antecedent.

REC blocks deletion of *avec qui*, since the head of the relative -- while it is an antecedent for *qui* -- is not an antecedent for *avec qui*. *Avec qui* has no sufficiently local antecedent and has semantic content.⁶ *Qui* in (12), by contrast,

⁵I am assuming the traditional analysis of relativization in English and French, according to which movement brings a *wh* phrase close to its antecedent, the head of the relative. Alternative analyses (e.g. Vergnaud 1974; Kayne 1994) are probably also compatible with the main lines of my discussion (but cf. Kayne 1994, 88-89 for discussion from a different perspective).

⁶It is conceivable that REC might tolerate deletion of *qui* (stranding *avec*) in (10), depending on what structural distances fall under “sufficiently local” in (14). Whatever condition generally bars preposition stranding in French (and more generally, in non-complements) should block this pattern as well.

is deletable because the head of the relative is its antecedent, and the declarative complementizer *que* in (13) is deletable because it lacks semantic content.

The key observation is following: when REC blocks the only pronunciation that could satisfy LE(CP), the result is not a “Crash”, but a pronunciation that satisfies REC and tolerates a violation of LE(CP). This observation is actually quite old. Kayne (1977), explained (12) as the result of an obligatory rule “Rel-NP-Del” that deletes relative *wh* in Comp. Kayne wrote his rule so that it would only effect *wh* phrases of category NP, because of the facts in (13). He noted (p.272) that an alternative view that did not stipulate the applicability of *wh* deletion might explain the impossibility of structures like (13c) by an appeal to recoverability. He rejected that view because it would lead us to “expect [(13b)] to be ungrammatical as a violation of the obligatoriness of Rel-NP-Del”. His rejection of this alternative, however, left unexplained why cases of overt *wh* in French relatives largely coincide with cases in which deletion would be recoverable. Chomsky (1977:98; 1980:20) took the bull (almost) by the horns, making explicit how “obligatoriness” could be modified so as to avoid the problem noted by Kayne: “We now understand “obligatory deletion” to mean: delete wherever possible, that is, except where deletion is unrecoverable.”

This sort of interaction among components of syntactic analysis was novel at the time, and unfortunately was not explored further. Indeed, the discussion of *wh* and complementizer deletion prominent in the mid-1970s was almost entirely abandoned during the following two decades. Researchers simply did not know how to proceed with the investigation of principles that interact in ways unfamiliar within both traditional transformational grammar and the emerging Principles and Parameters theories. Since these sorts of interactions now play a prominent role in phonological proposals, it is perhaps profitable to reopen the suspended syntactic discussion of the 1970s.⁷

⁷Kayne (1977) argued for an obligatory transformational rule stated so as to delete *wh* phrases (even instances of pied piping) of the category NP. In this respect, his analysis makes a distinction not explained by our analysis (p.261)

- (i) l’homme avec la femme de qui tu t’es disputé
the man with the wife of whom you argued
- (ii) *l’homme la femme de qui tu as insultée
the man the wife of whom you insulted

Part of this contrast may be a more general condition blocking *wh* movement of complex NPs, e.g. a contrast among interrogatives that Kayne (p.294, note 9) calls “duller”:

- (iii) ?Je sais très bien avec la femme de qui tu t’es disputé.
I know very well with the wife of whom you argued

[continued]

Let us summarize. When the grammar decides how to pronounce a French CP whose structure is given by the syntax, it tolerates violations of LE(CP) -- but only when satisfying LE(CP) would entail a violation of REC. Furthermore, when LE(CP) must be violated (and only then) we find a fact such as that in (6) -- a requirement that the complementizer be unpronounced. In other work, I suggest that this last requirement is a special case of a more general constraint against pronunciation of function words, which I call **Telegraph (TEL)**:⁸

(15) **Telegraph:** Do not pronounce function words.

The interaction between REC, LE(CP) and TEL in French is quintessentially optimality-theoretic. The constraints are ranked as follows:

(16) **French:** REC >> LE(CP) >> TEL

(continued from prev. page)

(iv) ??Je sais très bien la femme de qui tu as insultée.

I know very well the wife of whom you insulted

There is some question as to how unacceptable (ii) really is (Michel Starke, personal communication). Cinque (1981, p.283 fn. 8), in a discussion of the very point under discussion here (Chomsky's notion of "deletion up to recoverability" vs. restriction of deletion to *wh* PPs), comments that examples like (ii) "do not seem to be impossible in very formal styles...It may be that the lower level of acceptability of object NPs in Comp is due to some other factor...In this case no motivation would be left for this interpretation of the obligatory character of the deletion vs. Chomsky's".

The "other factor" cited by Cinque may be related to the percolation of the *wh* feature relevant to relativization. Possibly relevant to the ultimate solution of the problem is the fact that certain restrictive relatives in English show the same dislike for non-PP pied-piping as French relatives, without showing the ban on pronunciation of simple *wh* phrases characteristic of French. This contrast is particularly visible in relative clauses whose head is quantificational or indefinite, where the pied-piped phrase does not start with *wh*:

(v)a. *He invited no composer a picture of whom Smith had painted.

b. He invited no composer whose picture Smith had painted.

(vi) *Every child talking to whom I had recommended was in the room.

⁸TEL ranked high favors telegraphic speech (as found in young children and certain aphasic adults), which recent research suggests involves non-pronunciation of function words rather than their omission from representations (Gerken and McIntosh 1993; Poeppel and Wexler 1993; Lonzi and Luzatti 1993).

Among the arguments in favor of this approach are the following:

- LE(CP) explains both the obligatory pronunciation of *que* in declaratives like (8) and the obligatory deletion of *wh* in simple relative clauses like (11).
- The interaction of REC and LE(CP) in an OT setting explains why LE(CP) is violated only when no recoverable deletion can satisfy LE(CP).
- TEL explains both the deletion of *que* in (13) and the apparently universal deletion of the declarative complementizer with left-adjunction of V to C.
- The interaction of LE(CP) and TEL explains why French *que* is unpronounced in embedded clauses only when LE(CP) is not otherwise satisfied, and is obligatorily unpronounced in that context.⁹

The three constraints (12) thus form part of a system that evaluates a set of possible pronunciations -- in particular, options for pronouncing and not pronouncing words. These form the *candidate set* evaluated by the constraints, as the tableau in (17) shows:¹⁰

⁹Rizzi (1990, 68-69) explains the “Doubly Filled Comp” phenomenon as a consequence of a feature clash between *+wh* overt *wh* phrases and *-wh* complementizers. Non-overt *wh* phrases are *-wh* in his system, thereby sidestepping the feature clash. The weakness of this explanation is the unexpectedness of a correlation between values for the *wh* feature and overtiness of the *wh* phrase. By contrast, the approach of this paper places considerations of overtiness where they seem to belong -- in a pronunciation system of the grammar -- rather than encoding them through strictly syntactic features like *wh*.

¹⁰For simplicity, I write as if the input to constraint evaluation lacked annotations of pronounceability. If the input is a *particular* pronunciation, then the constraints discussed throughout this paper are simply the set of constraints that are ranked higher than the relevant “Faithfulness” condition (Prince and Smolensky 1993).

(17) **Declarative que**

Candidates	REC	LE(CP)	TEL
Je crois [_{CP} que Pierre a faim]. I believe [_{CP} that Pierre is hungry] ✓			*
*Je crois [_{CP} que Pierre a faim].		*!	

(18) **Simple relative clauses in French**

Candidates	REC	LE(CP)	TEL
*l'homme [_{CP} qui que je connais] the man who that I know		*!	*
*l'homme [_{CP} qui que je connais]		*!	
l'homme [_{CP} qui que je connais] ✓			*
*l'homme [_{CP} qui que je connais]		*!	

(19) **Relative Clauses with Pied Piping of PP in French¹¹**

Candidates	REC	LE(CP)	TEL
*l'homme [_{CP} avec qui que j'ai dansé] the man with whom that I danced		*	*!
l'homme [_{CP} avec qui que j'ai dansé] ✓		*	
*l'homme [_{CP} avec qui que j'ai dansé]	*!		*
*l'homme [_{CP} avec qui que j'ai dansé]	*!		

French *questions* unsurprisingly also show the pattern in (19). Since interrogative *wh* has semantic content and no antecedent, REC blocks deletion:

¹¹The logic of our treatment of relative clauses with pied piping also eliminates a problem for the “Doubly-Filled Comp Filter”: the acceptability of the sequence *XP verb* in verb-second configurations (Rizzi 1990, 124 n. 27), since REC does not permit the deletion of a contentful verb. Furthermore, we expect genuine violations of the “Doubly-Filled Comp Filter” when the complementizer has semantic content. *Though*-preposing provides an example (*Angry at Bill though I think she is, ...*), if *though* is C and fronting targets SPEC,CP.

(20) Questions in French¹²

<i>Candidates</i>	REC	LE(CP)	TEL
a. *Je me demande [_{CP} quand que Pierre arrivera]. I wonder when that Pierre will arrive		*	*!
b. Je me demande [_{CP} quand que Pierre arrivera].		*	
c. *Je me demande [_{CP} quand que Pierre arrivera].	*!		*
d. *Je me demande [_{CP} quand que Pierre arrivera].	*!	*	

3. English Contrasted with French: Constraint Ties

If the system we are mapping resembles OT systems studied elsewhere, we expect that some language variation can be attributable to constraint re-ranking. Certain issues arise immediately. For example, if REC is ranked below a constraint like LE(CP), we expect instances of non-recoverable deletion, e.g. pronunciations like (13c). Such pronunciations are in fact attested in child French, discussed by Labelle (1990) (see Pesetsky 1996) for further discussion). Whether they are found in adult grammars is unknown at present. If not, it could be a sign that REC is not actually a constraint that evaluates candidates, but is a constraint on the candidate set itself (part of *GEN*, not *EVAL*, in Prince and Smolensky's terms). Alternatively, REC might be a ranked, violable constraint in principle, but functional pressure may minimize the likelihood of grammars in which it is actually violated (but see Fiengo and Lasnik 1972).¹³ If REC is ranked high, but TEL is ranked *above* LE(CP), the result is a language

¹²When *quoi* 'what' is the sole occupant of SPEC,CP it must delete, leaving complementizer *que* as the first pronounced word of CP (Koopman 1982).

(i) *Que* penses-tu 'What do you think?' (ii) **Quoi* penses-tu
Either *que* licenses recoverable deletion of *quoi*, for some idiosyncratic reason, or the structure contains an unpronounced antecedent for *quoi*, analogous to the head of a relative. The fact that embedded *what* questions resemble relative clauses supports the second possibility:

(iii) Je me demande ce que tu penses.
I wonder 'it' that you think

¹³It is sometimes suggested within phonology (e.g. by Flemming 1995, Steriade 1996) that phonological processes may arise from tensions between (1) constraints that maximize ease of articulation and (2) constraints that maximize accuracy of perception -- i.e. between speaker-oriented desiderata and hearer-oriented desiderata. One may detect a similar tension in the constraints discussed here, which either (A) maximize parsability and easy interpretability by hearer (by blocking non-recoverable deletion (REC) and requiring CP to start with its head (LE(CP))) or (B) minimize effort on the part of the speaker (by requiring non-pronunciation of purely grammatical words (TEL)). I am grateful to Teun Hoekstra (personal communication) for raising this point.

which minimizes pronunciation of complementizers. Such a language might be colloquial Haitian, as suggested by Michel DeGraff (personal communication). Languages like Chinese, which lack declarative complementizers, also come to mind (though varieties of Chinese do pronounce other elements that may be complementizers; see Cheng (1991)).¹⁴ I have not systematically investigated grammars with this ranking. Instead, I want to discuss the consequences of a different ranking relationship between LE(CP) and TEL, which seems to characterize English.

In English, unlike French, the declarative complementizer *that* is optionally deletable in most complement clauses. (I return below to some exceptions.)

- (21) a. I believe that Peter is hungry.
b. I believe ~~that~~ Peter is hungry.

Just as I argued for a relationship between the French retention of *que* in declaratives and the pattern of pronunciation in relatives, so we expect a relationship between the English patterns of pronunciation in these two clause types. In fact, simple relative clauses also show a greater range of pronunciation patterns in English than in French. While in French the only acceptable pattern involved deletion of *wh* and pronunciation of the complementizer, English allows three acceptable patterns. The only unacceptable pattern, in fact, is one in which both *wh* and *that* are pronounced:

- (22) a. *the person [*whom that* I met ___]
b. the person [*whom that-I* met ___]
c. the person [*whom that* I met ___]
d. the person [*whom that-I* met ___]

If we assume that LE(CP) and TEL are *equally ranked* (form a *constraint tie*) in English, we expect exactly the differences and similarities that we find:

- (23) **English:** REC >> LE(CP) = TEL

There are a number of relations between constraints that might informally be called a “constraint tie”, several of which will yield the right result for (21) and (22). I will introduce here the concept that appears to be correct in general. This will be important later in our discussion.

¹⁴No ranking of TEL AND LE(CP) produces a grammar which fails to conform to the Verb Adjunction Universal in (5), since a language with TEL ranked high suppresses all complementizers.

(24) **Constraint Tie:** The output of a set of *tied* constraints is the union of the outputs of every possible ranking of those constraints.

Consider the output of the tie between LE(CP) and TEL in English. The output of LE(CP)>>TEL (the French ranking) will be the French pattern: no *that*-deletion in declarative clauses, simple relative clauses with deleted *wh* and undeleted *that*. The output of TEL>>LE(CP) will include every relevant candidate in which the complementizer is unpronounced: *that*-deletion in declarative clauses, relative clauses with or without pronounced *wh* but always with unpronounced *that*. The union of these outputs is the output of the tie -- and strikingly correspond to the basic data of English, as tableaux for (21) and (22) make apparent, with the tie marked graphically:

(25) **Declarative complementizer *that***

<i>Candidates</i>	REC	LE(CP)	TEL
a. I believe [_{CP} that Peter is hungry]. [on ranking: LE(CP)>>TEL] ^{ES}			*
b. I believe [_{CP} that Peter is hungry]. [on ranking: TEL>>LE(CP)] ^{ES}		*	

(26) **Simple relative clauses in English**

<i>Candidates</i>	REC	LE(CP)	TEL
a. *the person [_{CP} who that Mary invited t to the party]		*	*!
b. the person [_{CP} who that Mary invited t to the party] [on ranking: TEL>>LE(CP)] ^{ES}		*	
c. the person [_{CP} who that Mary invited t to the party] [on ranking: LE(CP)>>TEL] ^{ES}			*
d. the person [_{CP} who that Mary invited t to the party] [on ranking: TEL>>LE(CP)] ^{ES}		*	

In (26), neither ranking of LE(CP) and TEL favors candidate (a), yielding the “Doubly Filled Comp” effect for English. The same is true in relative clauses with pied piping. Here, as in French, REC excludes all candidates that could satisfy LE(CP). This means that (tie or no tie) TEL gets to make the decision:

(27) **Relative clauses with Pied Piping of PP in English**

<i>Candidates</i>	REC	LE(CP)	TEL
*the person [_{CP} to whom that Mary spoke <i>t</i> at the party]		*	*!
the person [_{CP} to whom that Mary spoke <i>t</i> at the party] [on both rankings of TEL and LE(CP)]		*	
the person [_{CP} to whom that Mary spoke <i>t</i> at the party]	*!		*
the person [_{CP} to whom that Mary spoke <i>t</i> at the party]	*!		

4. Infinitival Relatives: More on Constraint Ties

We turn now to English infinitival relative clauses. They are of particular interest because their pronunciation patterns mirror with startling fidelity the pattern of French *finite* relative clauses -- including the obligatory deletion of *wh* “up to recoverability”:¹⁵

- (28) a. *I’m looking for a book which for Pro to read *t*.
 b. *I’m looking for a book which ~~for~~ Pro to read *t*.
 c. *I’m looking for a book ~~which~~ for Pro to read *t*.
 d. I’m looking for a book ~~which~~ ~~for~~ Pro to read *t*.
- (29) a. *I’m looking for a topic on which for Pro to work *t*.
 b. I’m looking for a topic on which ~~for~~ Pro to work *t*.
 c. *I’m looking for a topic ~~on which~~ for Pro to work *t*.
 d. *I’m looking for a topic ~~on which~~ ~~for~~ Pro to work *t*.

The pattern is exactly what we would expect if there were a special “LE(CP)-*to*” constraint, ranked higher than the tie between LE(CP) and TEL, favoring CP’s whose first pronounced word is *to*. If this were the solution, however, one might expect to find languages like English, except that the pattern of deletion in finite and infinitival relative clauses is reversed (LE(CP)-*to* tied with TEL; LE(CP) ranked higher). Perhaps it is not an accident that this alternative pattern has not been reported, as far as I know. As Danny Fox (1994) has pointed out, however, we can do better than positing a special LE(CP)-*to* constraint. We need to elaborate our approach in two respects.

¹⁵I assume that infinitival relatives like those in (28) and (29) contain an unpronounced complementizer *for* on the evidence of infinitival relatives like *a book for Mary to look at*. See section 8 of this paper for discussion.

The first elaboration concerns the semantic role of *to*. Infinitival relatives (and infinitival questions) are not semantically innocent. In particular, they are always understood as if they contained a modal. The identity of the modal is at least in part contextually determined:

- (30) a. I'm looking for a book to read. (can, might)
b. Bill found the words to say at the funeral. (should)
c. The person to visit in Cambridge is Sue. (must)

I do not have an explanation for the obligatory modal interpretation of infinitival relative clauses. Suppose, however, that the modal force is lodged in the word *to*, which occupies the same INFL or T position that is occupied by modal verbs in finite clauses (Emonds 1976, 221-224). If the modal force of these clauses is lodged in *to*, then REC (the highest-ranked constraint) will block the deletion of *to*. Consequently, successful infinitival relative clauses will always have incurred at least one violation of TEL, since they will always contain a pronounced instance of the function word *to*.

The second elaboration concerns *to* and LE(CP). It is still tempting to seek an explanation for (28) analogous to the explanation for the comparable facts of French finite relatives. Such an explanation would hold that *wh* is obligatorily deleted in (28) because it is somehow more desirable to start CP with the word *to* than it is to start CP with *wh*. I will adopt the simplest version of this idea, and suggest that LE(CP) is satisfied not only by CPs whose first pronounced word is the complementizer, but also by CPs whose first pronounced word is *to*. This would lead us to hope that *for* and *to* have some property in common, or else we would not expect LE(CP) to be equally well satisfied by a CP starting with either of them. For the purposes of this paper, I will assume that what they have in common is location.¹⁶ I propose that any pronounced function word lying on the path from V to the nearest C can satisfy LE(CP) if it is the first pronounced word of CP. In the terminology of Grimshaw (1991), any *extended projection* of V can satisfy LE(CP). I will describe such elements as

¹⁶This can be improved upon. I suspect that *for* and *to* are actually both members of the same complementizer-headed chain, much as in the earliest generative analyses (Rosenbaum 1967), in which case our previous formulation of LE(CP) can be retained. *For-to* dialects (Henry 1995) pose questions for this approach which I will not tackle here. Negative infinitival relatives like *a person not to visit* require treating *not* on a par with *for* and *to*. Alas, adverbs must be disregarded (*a person never to talk to*), or else assumed to be adjoined outside CP (see section 8 on Québec French, and footnote 2). The marginality of these relatives does not obscure the fact that deletion of *wh* is obligatory.

related to the verb and rephrase LE(CP) as (31), but we must understand this term as a promissory note for a future theory of these function words:

- (31) **Left Edge(CP) [revised]:** The first pronounced word in CP is a function word related to the main verb of that CP.

Before showing how this proposal explains the surprising behavior of infinitival relative clauses, let us re-examine the analysis of English finite relative clauses. Crucial to that analysis was the fact that the set of candidates which best satisfied LE(CP) was distinct from the set of candidates that best satisfied TEL. The best available candidates from TEL's point of view were candidates with the complementizer deleted. The best available candidate from LE(CP)'s point of view was the candidate with the complementizer undeleted (and *wh* deleted). No candidate or set of candidates simultaneously best satisfied both constraints.

If our observation about the semantics of *to* and our reformulation of LE(CP) are both correct, infinitival relatives present a different picture. Thanks to the unpronounced status of subject Pro, the deletion of complementizer *for* and *wh* allows LE(CP) to be completely satisfied by a CP whose first word is *to*: *a book which for Pro to read t*. Since *to* is undeletable when it has modal force (and since the function word *for* is deleted) such a pronunciation also gets as close to satisfying TEL as any candidate can which has not been excluded by REC. In other words, the candidate in which both *wh* and *for* have been deleted is a candidate that optimally satisfies both LE(CP) and TEL at the same time -- a phenomenon not seen in English finite relative clauses. Consequently, even though LE(CP) and TEL are tied, there is only one winning candidate -- the candidate in which both *wh* and *for* have been deleted.

(32)

<i>Candidates</i>	REC	LE(CP)	TEL
a. *a book which for Pro to read t		*	*for *to!
b. *a book which for Pro to read t		*	*to!
c. *a book which for Pro to read t			*for *to!
d. a book which for Pro to read t			*to
[candidates with deleted <i>to</i>]	*!		

When REC blocks the deletion of the relative *wh* phrase, LE(CP) simply cannot be satisfied. As with French finite relatives, a candidate is picked that best satisfies TEL. Since *to* is undeletable here, that candidate will include pronounced *to*, but will show *for* deleted:¹⁷

(33)

<i>Candidates</i>	REC	LE(CP)	TEL
a. *a topic on which for Pro to work t		*	**!
b. a topic on which for Pro to work t		*	*
c. *a topic on which for Pro to work t	*!		**
d. *a topic on which for Pro to work t	*!	*	*
[candidates with deleted <i>to</i>]	*!		

Infinitival questions have essentially the same analysis as (25). Recoverability blocks deletion of the *wh* phrase, since it has semantic content and lacks an antecedent. *For* is deleted, but *to* is not, as required by REC and TEL:

¹⁷English infinitival relative clauses, like French finite relatives, are marginally acceptable when the pied piped phrase is an NP and the *wh* word is not NP-initial.

(i) ??We're looking for a book the cover of which to use as an illustration in our Fall catalog.

(ii) ??Find me someone the mother of whom to invite to the conference.

Completely impossible are pied piped NPs introduced by *whose* or *which*:

(iii) *Find me someone whose mother to invite to the conference.

These facts, like the related French facts discussed in footnote 6, are not explained by our proposal. See footnote 6 for some contrasting data from finite relatives.

(34)

<i>Candidates</i>	REC	LE(CP)	TEL
a. *I wonder what for Pro to read t		*	**!
b. I wonder what for Pro to read t		*	*
c. *I wonder what for Pro to read t	*!		**
d. *I wonder what for Pro to read t	*!	*	*
[candidates with deleted <i>to</i>]	*!		

With the caveat that our treatment of *to* as satisfying LE(CP) needs to be better justified, the results sketched in this section provide support for our optimality-theoretic proposal. The facts of English infinitival relatives are superficially most peculiar. Why should English non-finite relative clauses show the pattern of French finite relative clauses? The discussion in this section suggests that the answer is to be found in the fact that the system for English favors a relative clause whose left edge is pronounced *to*, just as the system for French favors a relative clause whose left edge is pronounced *que*. The reason in each case is LE(CP). In French, high ranking for LE(CP) by itself caused the needs of LE(CP) to predominate in pronunciation (up to recoverability, of course). In English, where the needs of LE(CP) do not necessarily predominate over the needs of TEL, the engine of explanation is the observation that an infinitival relative clause with Pro subject can optimally satisfy *both* LE(CP) and TEL if *wh* and *for* are deleted.

5. ECP Effects: Is the Best Good Enough?

The interest of our proposal comes from the demonstration that a small set of simple constraints, interacting in an optimality-theoretic fashion, explain many of the fairly intricate pronunciation properties of the CP system in English and French. One might object, nonetheless, that the presentation so far does not require Optimality Theory, but simply demonstrates some complexity internal to LE(CP) -- a default clause corresponding to our TEL (Michael Brody, personal communication). The objection takes some extra force from the possibility (discussed earlier) that REC is not a ranked, violable constraint, but a general condition on input. If that is the case, then we have been dealing so far with only two rankable constraints -- TEL and LE(CP) -- too small a number, perhaps, to motivate general principles of constraint interaction. For this reason, I will try to demonstrate the optimality-theoretic interaction of pronunciation principles through an examination of another constraint on pronunciation that affects the CP system. In this way, we can see some

evidence that there is genuine “computational depth” to the optimality-theoretic interactions among pronunciation principles.

The constraint I have in mind blocks deletion of the complementizer that heads a non-complement CP, for example in the subject sentences of (35c-d):

- (35) a. Sue believes [that the world is round].
b. Sue believes [~~that~~ the world is round].
c. [That the world is round] is believed by everyone.
d. *[~~That~~ the world is round] is believed by everyone.

Stowell (1981) and Kayne (1981) proposed that these are ECP effects: an instance of a general prohibition on phonologically null categories in ungoverned positions. This hypothesis is quite plausible, but the discussion that follows will not extend easily to other phenomena traditionally grouped under ECP (e.g. conditions on subject and adjunct traces). I leave this problem to future research, and use the name “Deletion in CP” (DCP) here to refer to the effect seen in (35d):

- (36) **Deletion in CP Principle [first version]:** The head of a CP may be deleted only if that CP is a complement.¹⁸

The proposals of Stowell and Kayne were made in the context of an analysis in which *wh* movement targets C rather than the specifier of C. If *wh* movement does target SPEC,CP, certain problems arise concerning the DCP (or ECP). In particular, in a non-OT setting, the DCP would block deletion of the complementizer of an embedded non-complement question. The data, of course, point in just the opposite direction. Non-complement questions require *deletion*, not pronunciation, of the complementizer. That is, the “Doubly Filled Comp” effect is found:

- (37) a. *[When that Peter will come] is unknown.
b. [When ~~that~~ Peter will come] is unknown.
- (38) a. *[What that Mary was doing there] we’d all like to know.
b. [What ~~that~~ Mary was doing there] we’d all like to know.

An OT backdrop eliminates the problem. What we see in these examples is the resolution of a conflict between DCP and TEL in favor of TEL. Recall the normal pattern of pronunciation in interrogative clauses. Since the *wh* phrase cannot be deleted, LE(CP) cannot be satisfied. Consequently, TEL gets to decide

¹⁸Matrix clauses either contain an unpronounced C forced by some constraint ranked higher than the DCP, or else they are IPs.

the output of the tie between LE(CP) and TEL. TEL favors deletion of the complementizer. In (37) and (38), DCP favors non-deletion of the complementizer -- but the requirements of TEL appear to win over the requirements of DCP. From the perspective adopted here, this is evidence that the DCP in (36) belongs to the system we have been discussing, and is ranked lower than TEL in English.¹⁹

(39) **English:** REC >> LE(CP) = TEL >> DCP

(40)

<i>Candidates</i>	REC	LE(CP)	TEL	DCP
a. *[When that Peter will come] is unknown.		*	*!	
b. [When that Peter will come] is unknown. ^{ES}		*		*

In (40), DCP is inert, as indicated by the shaded boxes. This is because the tie between LE(CP) and TEL yielded a single winning candidate. When the tie between LE(CP) and TEL yields more than one winning candidate, DCP does get the chance to decide the matter. This is the case in (35c-d), as (41) makes clear:

(41)

<i>Candidates</i>	REC	LE(CP)	TEL	DCP
a. [That the world is round] is believed by everyone] ^{ES}			*	
b. *[That the world is round] is believed by everyone]		*		*!

The role of DCP in (41) leads naturally to an extremely interesting, if slightly puzzling corner of our discussion. If one outstanding problem can be solved, what follows will constitute an extremely strong and interesting argument for the general proposal.

¹⁹For many, though not all, French speakers, non-complement embedded questions are impossible (Huot 1981, p. 128; additional data from responses to a query on the Linguist e-mail list). One might attribute this fact to high ranking for the DCP, but pronouncing the complementizer does not seem to help. This judgment is not explained by my proposals.

- (i) %[Quand ~~que~~ Pierre viendra] est inconnu.
- (ii) *[Quand que-Pierre viendra] est inconnu.

The problem concerns the effect of the DCP on relative clauses in English. DCP got a chance to exert its influence on pronunciation in (41) because it has a chance to evaluate more than one candidate. The same should be true in relative clauses like the one displayed in (26). Relative clauses are generally classed with adjuncts. Consequently, since DCP is offered a choice of relative clauses with both pronounced and deleted complementizers, we must ask why DCP does not exclude all candidates with an unpronounced complementizer in the relative clause. (This would yield the French pattern by another route.) To solve this particular problem, I will suggest that the relative clause in (26) is not an adjunct, but counts as a complement -- perhaps a second object of D (NP being the first object). If this suggestion is true, the candidates in which the complementizer is unpronounced do not violate DCP.²⁰

Let us now slightly expand our investigation to ask whether there might be relative clauses that are non-complements -- and to ask how the DCP might affect the pronunciation of such relative clauses. First, let us tinker with the DCP. One might wonder, for example, whether the DCP should care about the pronunciation of SPEC,CP (in addition to C). Suppose the DCP were better formulated as (42):²¹

(42) **DCP [second version]:** The head or specifier of a CP may be deleted only if that CP is a complement.

If this DCP were asked to evaluate a relative clause that is not a complement, it would license an interesting pattern of pronunciation. Consider the possible pronunciations of a finite relative clause with object relativization, and suppose this relative clause counts as a *non*-complement:

- (43) a. *whom that* I met
b. *whom that-I* met
c. *whom that* I met
d. *whom that-I* met

Among these candidates, the only one that completely satisfies the revised DCP is (43a). But if DCP is ranked lower than LE(CP) and TEL, (43a) has already

²⁰A major argument for the adjunct status of relative clauses was their status as islands (Chomsky 1986), but since relative clauses are also introduced by a *wh* operator, they are *wh* islands in any case.

²¹Alternatively, we might be dealing with a tie between two DCP-like constraints, one dealing with the head of CP and the other with its SPEC. Rerankings of these constraints predict patterns which I have not yet explored.

been excluded by the time DCP gets to evaluate candidates. Consequently, DCP can only evaluate (43b-d). Candidates (43b) and (43c) each violate the revised DCP once. In (43b), the complementizer is in violation of DCP. In (43c), the SPEC,CP position is in violation of DCP. On the other hand, (43d) displays two violations of DCP. The DCP cannot pick its first choice (43a), but if our system conforms to OT as developed in other work, it will settle for its second choices (43b-c) over its third choice (43d). We would find *wh*-relatives and *that*-relatives acceptable, but not relatives introduced by neither *wh* or *that*.

In fact, exactly this paradigm is found in many types of English finite relative clauses. It is found, for example, in stacked relatives, in relatives with closest subject relativization, in relatives with internal topicalization and, to some degree, in extraposed relatives:²²

(44) **Stacked relative clauses**

- a. *the person who you invited who that we know
- b. the person who you invited who ~~that~~ we know
- c. the person who you invited ~~who~~ that we know
- d. *the person who you invited ~~who~~ ~~that~~ we know

<i>the person who you invited...</i>	REC	LE(CP)	TEL	DCP
a. *...who that we know		*	*!	
b. ...who that we know		*		C *
c. ... who that we know			*	SPEC,CP*
d. *... who that we know		*		C * SPEC,CP *!

²²The problem of stacked relatives is more complex, as Hubert Truckenbrodt (personal communication) has pointed out. In particular, the second relative in the stack can be a “zero relative” when the first relative is “short”, especially if the first relative is infinitival or itself a zero relative. Rapid speech helps enormously. In (i) and (ii), the slightest hiatus before the second relative clause degrades the possibility of the zero pronunciation option. Example (iii) shows that the presence of lengthy complements to the head noun can cause even a first (non-stacked) relative to degrade as a zero relative. It looks almost as if the ability of a head to govern an empty element is time-limited.

- (i) We’re looking for something to read we can take with us on the plane.
- (ii) The guy you invited you really shouldn’t have is Mr. Smith.
- (iii) *We were discussing the proof of Fermat’s last theorem by a Princeton mathematician *Scientific American* had recently discussed.

(45) **Nearest-subject relativization**

- a. *the person who that arrived early
- b. the person who ~~that~~ arrived early
- c. the person ~~who~~ that arrived early
- d. *the person ~~who~~ ~~that~~ arrived early

(46) **Relative clauses with internal topicalization**

- a. *Barriers is one book which that to Sue I would never give.
- b. Barriers is one book which ~~that~~ to Sue I would never give.
- c. Barriers is one book ~~which~~ that to Sue I would never give.
- d. *Barriers is one book ~~which~~ ~~that~~ to Sue I would never give.

(47) **Extraposed relative clauses**

- a. *A man entered the room who that you all know well.
- b. A man entered the room who ~~that~~ you all know well.
- c. A man entered the room ~~who~~ that you all know well.
- d. *A man entered the room ~~who~~ ~~that~~ you all know well.

It looks as though simple object relativization -- generally taken as the "basic" example of relativization -- is actually exceptional in allowing the relative clause to count as a complement for the DCP. Virtually all other relative clauses count as non-complements. I do not understand the reason why simple object relativization is exceptional in this way. Important for our purposes is the fact that the revised DCP explains the patterns found, once we take for granted the existence of relative clauses that behave as complements and relative clauses that behave as adjuncts.

Furthermore, if we extend our discussion, we arrive at a promised exemplification of the optimality-theoretic character of the phenomena under discussion. We began our investigation of the DCP with complementizer effects in declarative clauses that straightforwardly showed the system picking the pronunciation that fully satisfies DCP. A similar demonstration was not possible in non-complement relative clauses. As I noted above, we can classify the candidates in such relative clauses according to how well they satisfy DCP:

- (48) a. wh complementizer: best
- b. wh ~~complementizer~~: second-best
- c. ~~wh~~ complementizer: second-best
- d. ~~wh~~ ~~complementizer~~: worst

In a non-complement relative clause, because DCP is ranked lower than TEL and LE(CP), DCP cannot pick its first choice candidate. On the other hand, when the output of the tie between TEL and LE(CP) includes the three candidates (48b-d), DCP does get to pick the second-best candidates over worse ones.

The logic of OT tells us that if the constraints ranked higher than DCP were to exclude not only the best candidates, but also the second-best candidates, the DCP would have to settle for the worst. In fact, we have already examined a construction in which LE(CP) and TEL pick a candidate that the DCP considers the *worst*: infinitival relatives in which both *wh* and *for* are deleted. Consequently, we should detect no DCP effect in this instance. In fact, this seems to be true. Although infinitival relatives in extraposed or stacked positions are somewhat delicate, the only acceptable pronunciation pattern for a stacked infinitival relative is that which is unacceptable in a finite relative:

- (49) a. *One possible book [that I own] [~~which that~~ you might work on *t* for the exam] is *War and Peace*.
 b. One possible book [that I own] [~~which for~~ Pro to work on *t* for the exam] is *War and Peace*.

(50)

<i>One possible book that I own...</i>	REC	LE(CP)	TEL	DCP
a. *... which for Pro to work on <i>t</i>		*	* <i>for</i> * <i>to</i>	
b. *... which for Pro to work on <i>t</i>		*	* <i>to</i>	* <i>C</i>
c. *... which for Pro to work on <i>t</i>			* <i>for</i> * <i>to</i>	* <i>SPEC,CP</i>
d. ... which for Pro to work on <i>t</i> ²³			* <i>to</i>	* <i>C</i> * <i>SPEC,CP</i>
[candidates with deleted <i>to</i>]	*!			

The different degrees to which DCP is satisfied by the winning candidate follow immediately from the independently motivated interaction of DCP with higher-ranked constraints. Recall that low ranking for DCP was suggested as a simple explanation for the fact that the DCP “gives way” to the effects of LE(CP) and TEL in interrogatives. I take this convergence of evidence as one indication that the proposal is on the right track.²³

²³The effect of the DCP on declarative *that* clauses might be captured within traditional Transformational Grammar by an optional rule of complementizer deletion whose structural description limits the rule to complement clauses. One would need to precede the rule by a rule which deletes *wh* in relative clauses, but one would also need a “Doubly Filled Comp” filter.

6. The Pronunciation of Traces

The discussion so far has been devoted to evidence for the pronunciation system in areas where movement is not crucially at issue. In this section, we turn to the pronunciation of structures that involve movement, and attempt to show that the same sorts of principles -- and, indeed, some of the very same principles, govern these aspects of pronunciation as well. In this way, we come close to redeeming the promise of the first section of this paper, though many issues will remain open.

Let us adopt the proposal popularized by Chomsky (1993) according to which movement (at least A-bar movement) is *copying*. As noted by Chomsky, this proposal helps us understand why "obligatory reconstruction" effects should exist, e.g. the Principle C effect seen in (51):

(51) *[Which picture of John_i]_j did he_i like *t_j*?

If the trace of *wh* movement is formally identical to its antecedent, the LF representation of (51) is actually (52). The unacceptability of coreference between *he* and *John* becomes a normal instance of Principle C on this analysis:

(52) *[Which picture of John_i]_j did he_i like [~~which picture of John_i]~~_j?

The overstriking in (52) indicates that the trace is unpronounced. In the context of this paper, it is natural to wonder whether the factors that determine this pronunciation pattern belong to the pronunciation system that we have been examining, arising from a constraint like **Silent Trace (SILENT-*t*)** below:

(53) **Silent Trace:** Do not pronounce traces.

Non-pronunciation of traces does not violate REC since the members of a multi-member chain share all relevant features. Pronouncing one member of a chain is as good as pronouncing any other member of the chain.

This proposal might offer an alternative to standard theories that attribute the distinction between "overt" and "covert" movement to the timing of phonological interpretation ("Spellout") and movement. These proposals assume that Spellout satisfies an inviolable SILENT-*t* constraint. Because of the inviolability of SILENT-*t*, "covert" movement must be analyzed as movement that takes place *after* Spellout in the course of the derivation. If SILENT-*t* is violable in an OT sense, then one can posit a simpler architecture for the interface between syntax and phonology in which the object interpreted by phonology is the fixed point LF, rather than a movable intermediate point in the derivation.

According to this proposal, "overt" movement is movement whose pronunciation obeys SILENT-*t*. "Covert movement" is movement whose pronunciation violates SILENT-*t*. Covert movement would arise when some pronunciation constraint ranked higher than SILENT-*t* makes pronunciation of the head of a chain impossible, and REC forces pronunciation of a trace position. For example, if *wh* phrases in English multiple questions undergo covert movement to SPEC,CP a constraint that blocks pronunciation of all but the first-moved phrase in SPEC,CP would force violations of SILENT-*t* for other *wh* phrases, yielding pronunciation of *wh* "in situ":²⁴

(54) Who ~~what to whom~~ do you think ~~who~~ gave what to whom?

In this paper, I will not develop this analysis of covert movement further.²⁵ Instead, I merely want to sketch some evidence that SILENT-*t* is a part of the pronunciation system we have been discussing. To this end, it is most interesting to show that the binary distinction "overt/covert" (arising from the timing of an inviolable version of SILENT-*t*) is actually part of a richer set of distinctions that arise from SILENT-*t* embedded among other principles of sentence pronunciation. Indeed, we have already seen an instance of movement that is, strictly speaking, covert, but does not follow from the traditional distinction. Relative clauses in which the *wh* phrase is unpronounced (optionally in finite relatives, obligatorily in infinitival relative clauses) display "covert movement", in that there is no phonological evidence for displacement. In the system we have developed, it is LE(CP) that encourages or requires non-pronunciation of the head of the *wh* chain, and SILENT-*t* that requires non-pronunciation of the tail of the *wh* chain.

So far, we have briefly examined pronunciations in which only the head of a chain is pronounced (classic "overt" movement), in which only a trace in a chain is pronounced (classic "covert" movement), and in which neither head nor trace is pronounced (another form of "covert" movement). In fact, there are also patterns of pronunciation in which pronunciation is accorded to both head and trace in a

²⁴The ordering of unpronounced *wh* phrases is given according to the pattern in Slavic languages, where the *wh* phrases would be pronounced in their moved positions. I have no evidence bearing on this point.

²⁵A version of this proposal is explored in some depth by Bobaljik (1995), with special reference to Object Shift phenomena. Brody's (1995) has in common with our proposal a non-derivational treatment of the overt/covert distinction, but differs in interesting ways from our approach. See also Legendre et al., this volume, for an OT approach that eschews the concept entirely. In their view, the appearance of covert movement arises when overt movement required by some constraint is blocked by a higher-ranking constraint.

chain. Constructions with resumptive pronouns furnish an example of this. Resumptive pronouns appear to be treated as traces in many respects. For example, Engdahl (1985) noted that resumptive pronouns license parasitic gaps. Her Swedish examples were adapted to Hebrew (our sample language with widespread resumptive pronouns) by Sells (1984) (but see Shlonsky 1992, 462). (55a) shows a standard subjacency violation involving t_1 , remedied when this position is a parasitic gap licensed by an object trace in (55b). The key observation is (55c), where the parasitic gap is equally well licensed by an object resumptive pronoun:

- (55) a. * ha-ʔiša₁ [še [ha-ʔanashim₂ še šixnati t₂ levaker t₁]
the-woman₁ [that [the-people₂ that I-convincd t₂ to visit t₁]
tiʔaru et ha-bait.
described the house
- b. ʔha-ʔiša₁ [še [ha-ʔanashim₂ še šixnati t₂ levaker t₁]
the-woman₁ [that [the-people₂ that I-convincd t₂ to visit p-gap]
tiʔaru t₁
described t₁
- c. ʔha-ʔiša₁ [še [ha-ʔanashim₂ še šixnati t₂ levaker t₁]
the-woman₁ [that [the-people₂ that I-convincd t₂ to visit p-gap]
tiʔaru ota₁
described her₁

Likewise, McCloskey (1990) (whose Irish examples were adapted to Hebrew by Shlonsky 1992) noted that resumptive pronouns show the Principle C effects (Strong Crossover) characteristic of traces, not just the weaker non-coreference conditions characteristic of pronouns. In (57a), where *ʔet ha-ʔidiot* ‘the idiot’ is an epithet coreferent with *ʔoto* ‘him’, there is no bar to coreference. The epithet c-commands the pronoun, but Principle B is not violated. In (57b), where *ʔoto* is now an unpronounced trace of *wh* movement, an anaphoric relation with the epithet is impossible, as a consequence of Principle C or whatever accounts for Strong Crossover. Here, the key example is (57c), which shows a resumptive pronoun instead of the unpronounced trace. The pronoun behaves like the trace

in (57b), not like the pronoun in (57a). This suggests that LF treats the pronoun the same way it treats any other form of trace:²⁶

- (57) a. yidaŋti ?et ha-?idiot₁ še ha more yaxšil ?oto₁
 I-informed ACC the idiot that the teacher will-flunk him
- b. *Ze ha baxur še yidaŋti ?et ha-?idiot₁ še ha more
 this (is) the guy that I-informed the idiot that the teacher
 yaxšil ?oto₁.
 will-flunk him.
- c. *Ze ha baxur še yidaŋti ?et ha-?idiot₁ še ha more
 this (is) the guy that I-informed the idiot that the teacher
 yaxšil t₁
 will-flunk *trace*

On the other hand, resumptive pronouns are not generally in free alternation with unpronounced traces. A well-known generalization about resumptive pronouns restricts them to circumstances in which movement has crossed an island boundary (Shlonsky 1992, among many others):²⁷

- (58) a. *Which picture of John were you wondering [whether __ was going to win a prize at the exposition]?
- b. Which picture of John were you wondering [whether it was going to win a prize at the exposition]?

²⁶If this view is correct, interpretive differences between relative clauses with and without resumptive pronouns (e.g. Doron 1982; Chao and Sells 1983)) must arise not from the pronouns themselves, but from the conditions that trigger the appearance of resumptive pronouns. Some cases are problematic, e.g. the incompatibility of resumptive pronouns with multiple interrogation in English:

- (i) ?Which student would you get mad if I spoke to about what?
 (ii) *Which student would you get mad if I spoke to him about what?

²⁷Fox (1994) argues that direct object resumptive pronouns like those in (55)-(57) result from the stranding of the preposition (or particle) that introduces specific direct objects (?oto 'him' consisting of the accusative particle ?et plus hu 'he'). Consequently, these pronouns also are responding to island violations.

- (59) a. *There is one worker *who* the company fired the employee [that had treated __ badly].
b. There is one worker *who* the company fired the employee [that treated *him* badly].
- (60) a. *This is the guy *who* I like *him*.
b. This is the guy *who* I like ____.

In Hebrew, for example, a resumptive pronoun in local subject position is impossible unless that subject position is separated from the target of movement by an island, like the island created by topicalization in (57b) (Fox 1994, citing Doron 1982):

- (61) a. Ha-yeled še (*hu) ohev rak ?et dalit
The-boy that he loves only Dalit
b. Ha-yeled še rak ?et dalit hu ohev
The-boy that only Dalit he loves

Likewise, a resumptive pronoun in object position of a PP is possible only when the preposition has been stranded (Fox 1994, after Doron 1982):

- (62) a. ?eyze gever Ruti xoševet alav?
which man Ruti thinks about-him?
b. *Al eyze gever, Ruti xoševet alav?
about which man, Ruti thinks about him?
c. Al eyze gever, Ruti xoševet?
about which man, Ruti thinks

Extraction from *wh* islands and other subjacency violations also license resumptive pronouns in Hebrew (example from Fox 1994):

- (63) ha-?iš še dalit ša?ala ?im *(hu) ohev balšanut.
the-man that Dalit asked if *(he) likes linguistics.

Thus, resumptive pronouns seem to be a “repair strategy” applied only when a trace is separated from its antecedent by an island boundary. Consequently, they have often been taken to diagnose the absence of movement (Borer 1984, 220-228).

A proposal by Perlmutter (1972) might reconcile this restriction with the evidence for movement. Perlmutter suggested that movement leaves a trace whose form is pronominal -- a so-called “shadow pronoun”. Movement itself,

Perlmutter suggested, is not constrained by islands. What is constrained by islands is an otherwise obligatory rule that deletes shadow pronouns. The “only if needed” character of resumptive pronouns follows from the structural description and obligatoriness of the pronoun deletion rule. One might adopt Perlmutter’s proposal into the present system essentially unchanged. We would need to posit a family of island constraints that prohibit an unpronounced trace separated from its antecedent by an island boundary. Such constraints have the general form:

(64) **Island Constraints:** * α ...[*island* ... β ...], where β is the trace of α and unpronounced.

If an island constraint is ranked higher than SILENT-*t*, extraction from that island will produce a trace that wants to be pronounced. If we adopt Perlmutter’s idea that traces *are* pronouns, the pronounced trace will be a pronoun:²⁸

(65) Island Constraints (various) >> SILENT-*t*

Perlmutter’s Shadow Pronoun Hypothesis, however, leaves us with no account of the evidence (e.g. (52)) that a trace of A-bar movement is a full copy of its antecedent.

²⁸The discussion in the text simplifies facts of greater complexity. Although English resumptive pronouns respond to islands, the response is not uniform. In the case of subject extraction from a *wh* island, for example, an unpronounced trace (gap) is far worse than a resumptive pronoun. In the case of object extraction from a *wh* island, however, the pronoun and gap seem to have roughly equal status (cf. the unification of island-violating gaps with resumptive pronouns in Cinque 1990).

- (i)a. ?Which book were you asking whether it had appeared yet?
- b. *Which book were you asking whether __ had appeared yet?
- (ii)a. ?Which book were you asking whether we were going to review it?
- b. ?Which book were you asking whether we were going to review __?

Our analysis can capture these differences if the constraint that yields the *wh*-trace effect in (i) is ranked higher than SILENT-*t* but the constraint active in (ii) is tied with SILENT-*t*. (Likewise, extraction of a conjunct would violate a constraint ranked higher than SILENT-*t*: *Which wine would you never serve it/*gap and sushi together.*) The mild deviance of both examples in (ii) is left open by this account, as is the question of whether the contrast between (i) and (ii) is an accidental fact about English (so that another language might show the opposite pattern) or rests on some principled basis.

This is where the optimality-theoretic character of the phenomenon becomes rather clear. At the heart of OT are the twin ideas that (A) constraints are violable, but (B) violation is minimal. Why should the solution to island violations be a pronoun? I suggest the answer lies in the fact that island constraints require certain traces to be pronounced, but do not care about the nature of the pronunciation. SILENT-*t*, in turn, wants traces to be completely unpronounced; but if a more highly ranked constraint eliminates the possibility of total non-pronunciation for a trace, SILENT-*t* will want that trace to be *as close to unpronounced as possible*. A pronoun is a pronunciation of ϕ -features like number, person and gender, but is not a pronunciation of notional features like those that distinguish *picture* from *table*. A pronoun like *it* as a pronunciation of *which picture of John* can therefore be seen as a pronunciation of some, but not all the features of *which picture of John*. Since it is the ϕ -features of phrases that percolate to the maximal projections of those phrases, resumptive pronouns can alternatively be seen as pronunciations of some, but not all the *nodes* of the trace.

The relevance of this is as follows: pronouncing a pronoun instead of *which picture of John* or *who* in trace position can serve as a way of satisfying island constraints while minimizing the violation of SILENT-*t*. That is, pronouncing the features of DP, rather than the richer features of other nodes in *which picture of John* amounts to a partial pronunciation of the phrase, and therefore a lesser violation of SILENT-*t* than full pronunciation of the trace. Silence is golden, but pronouns are silver.

(66)

Which picture of John were you wondering [<i>island</i> whether <i>which picture of John</i> was going to win a prize...]?	Island Cond	SILENT- <i>t</i>
*...[<i>island</i> whether <i>which picture of John</i> was going to...]		* ϕ - features *others!
*...[<i>island</i> whether <i>which picture of John</i> was going to...]	*!	
...[<i>island</i> whether it _{<i>which picture of John</i>} was going to.		* ϕ - features

7. Interactions of SILENT-*t* with other Constraints: Broihier (1995)

The punch line for the previous section is provided by important work by Broihier (1995) on relativization in Polish and Russian. In this section of the paper, I offer a summary of Broihier's work, with an emphasis on its role in the context of our discussion so far.

I have touched on the hypothesis that resumptive pronouns are partial pronunciations of traces. These partial pronunciations are winning candidates in the pronunciation sweepstakes because they represent minimal violations of SILENT-*t* in environments where higher ranking constraints require *some* violation of SILENT-*t*. It is natural to wonder whether constraints like SILENT-*t* also interact in an interesting way with the system developed in the first sections of the paper -- in particular, with REC, LE(CP) and TEL. The question is important because it may help us discern whether principles of pronunciation form the tightly interacting, unified system posited here. Broihier's work supports our assumptions.

The key to Broihier's discussion is a proposal about the distinction between oblique and non-oblique case. Broihier suggests that these cases differ with respect to recoverability. In particular, purely structural cases like Slavic nominative and accusative (just like semantically contentless elements) bear no special burden of recoverability under deletion, while oblique cases like dative or genitive do (just like semantically contentful elements).

It is a fact about relative clauses in languages like Latin, Greek, Russian or Polish that while number and gender is shared by relative *wh* and the head of the relative clause, there is no special link linking the case of *wh* and head. There is, for example, no requirement that the case of the relative *wh* and the case of the head of the relative be the same, as the following examples from Russian make clear:

(67)a. Ira govorila s *mal'čikom*, *kotoryj* govorit po-ispanski.
Ira spoke with boy-INSTR who-NOM speaks Spanish

b. *Staryj professor*, *kotoromu* ty pomog, ljubit pel'meni.
old professor-NOM whom-DAT you helped loves dumplings

Broihier suggests that this fact has an implication for recoverability. The head of a relative cannot help with the recoverability of case on a deleted *wh*. Consequently, the case features of relative *wh* must either be recoverably deletable on their own, or else some member of the *wh* chain must express that case marking overtly.

If non-oblique cases are recoverably deletable, deletion of non-oblique *wh* in a relative clause poses no problem for REC. If, on the other hand, oblique cases are not recoverably deletable, deletion of a non-oblique *wh* will be possible only if that non-oblique case is phonologically expressed on another position in the chain created by *wh* movement. In other words, an oblique *wh* may be deleted only if case is pronounced on some trace of *wh*. Crucially, if other aspects of constraint ranking preclude pronunciation of the trace, then deletion of (non-

recoverable) oblique *wh* will be impossible, even if deletion of (recoverable) non-oblique *wh* is allowed. Broihier suggests that this is precisely the situation in certain registers of Russian.²⁹

For our purposes, the structures and movement patterns in the Russian CP system can be viewed as identical with English and French. The pronunciation patterns, however, are interestingly different. Literary Russian generally prefers relative clauses that are introduced by the *wh* phrase, with the complementizer *čto* obligatorily deleted (as seen in (67)).³⁰ But a certain style of literary Russian (Borras and Christian 1971: 301), as well as colloquial registers, also allow relative clauses introduced by *čto* ‘that’ (with *wh* deleted). This second type of relative, however, is restricted to instances in which the deleted *wh* bears nominative or accusative case.³¹ Thus, for example, the nominative *wh* in (67a) can be deleted, as can an accusative *wh*, as shown in (68). On the other hand the dative *wh* in (67b) cannot be deleted, nor can an instrumental *wh*, as shown in (69). This looks like exactly the situation we are looking for:³²

(68)a. Ira govorila s mal’čikom, ~~kotoryj~~ čto govorit po-ispanski.
Ira spoke with boy-INSTR ~~who-NOM~~ that speaks Spanish
‘Ira spoke with the boy that speaks Spanish’

b. My ne znali o knige, ~~kotoruju~~ čto opublikovala
We didn’t know about the book-PREP ~~which-ACC~~ that published
naša firma.
our company-NOM
‘We didn’t know about the book that our company published.’

²⁹Broihier’s data come from Comrie (1989) and Gołąb and Friedman (1972), and are generally confirmed by native speakers (Sergey Avrutin and Maria Babyonyshev, personal communication).

³⁰This might follow if the “DCP” is split into separate constraints for C and for SPEC,CP, and if in the preferred style DCP(C)>>DCP(SPEC,CP).

³¹The 1980 Academy Grammar of Russian (vol. 2, p. 524) notes further that “colloquial, unforced speech does not know such a restriction: the word *čto* is used here also in a position reserved for oblique case” [translation mine]. In colloquial speech at this level, however, deletion of a pied-piped PP is also found (Masha Babyonyshev, personal communication), suggesting that we may be dealing with LE(CP) ranked higher than REC.

³²The genitive that replaces accusative for masculine animate nouns counts as oblique for these purposes and consequently may not be deleted.

- (69)a. *Staryj professor, ~~kotoromu~~ čto ty pomog, ljubit pel'meni.
old professor-NOM ~~whom-DAT~~ that you helped loves dumplings
'The old professor that you helped loves dumplings.'
- b. *Zavod, ~~kotorym~~ čto on sejčas vladejet, ran'se nazvalsja
Factory, ~~which-INSTR~~ that he now runs, formerly was called
Krasnyj Oktjabr'
Red October.
'The factory that he now runs was formerly called *Red October.*'

Broihier analyzes the phenomena as follows:

- The existence of an alternation between pronounced *wh* and pronounced complementizer is evidence for a tie between LE(CP) and TEL, as in English.
- The absence of relative clauses with both *wh* and the complementizer deleted suggests that Russian lacks the English possibility of treating relative clauses as complements. If both elements are deleted, the DCP is violated more severely than if just one element is deleted.
- The impossibility of the pronunciations in (69) follows if REC allows deletion of an oblique *wh* phrase only if the trace of *wh* is pronounced; SILENT-*t* prefers gaps over pronounced traces.

Assume that SILENT-*t* does belong in the system we have been discussing. The data do not permit us to discern where SILENT-*t* is ranked with respect to LE(CP) and TEL, so long as it is not tied with those constraints. A tie would cause it to lose its ability to filter out deletion of oblique *wh*, as we shall see when we turn to Polish. Both (70a) and (70b) are thus compatible with the facts:

(70) **Possibilities for Russian:**

- a. REC >> SILENT-*t* >> LE(CP) = TEL
- b. REC >> LE(CP) = TEL >> SILENT-*t*

The tableaux in (71) show the pronunciations of relative clauses with oblique *wh* that are allowed by the two rankings. The tableaux in (72) show the

pronunciations of relative clauses with *non-oblique wh*. Once again, the position of SILENT-*t* does not make a difference.³³

(71) **Oblique *wh* in Russian**

a. SILENT-*t* ranked high

Candidates	REC	SILENT- <i>t</i>	LE(CP)	TEL
a. *[CP wh-OBL čto...pron-OBL...]		*!	*	*
b. *[CP wh-OBL čto ...gap...]			*	*
c. *[CP wh-OBL ěto...pron-OBL...]		*!	*	
d. [CP wh-OBL ěto ...gap...]			*	
e. *[CP wh-OBL čto...pron-OBL...]		*!		*
f. *[CP wh-OBL čto...gap...]	*!			*
g. *[CP wh-OBL ěto...pron-OBL...]		*!	*	
h. *[CP wh-OBL ěto...gap...]	*!		*	

b. SILENT-*t* ranked low

Candidates	REC	LE(CP)	TEL	SILENT- <i>t</i>
a. *[CP wh-OBL čto ...pron-OBL...]		*	*!	*
b. *[CP wh-OBL čto ...gap...]		*	*!	
c. *[CP wh-OBL ěto ...pron-OBL...]		*		*!
d. [CP wh-OBL ěto ...gap...]		*		
e. *[CP wh-OBL čto ...pron-OBL...]			*	*!
f. *[CP wh-OBL čto ...gap...]	*!		*	
g. *[CP wh-OBL ěto ...pron-OBL...]		*		*!
h. *[CP wh-OBL ěto ...gap...]	*!	*		

³³There is also no evidence concerning the ranking of SILENT-*t* and DCP if SILENT-*t* is ranked lower than LE(CP) and TEL. With SILENT-*t* ranked higher than LE(CP) and TEL, it obviously must also rank higher than DCP, but there is no actual interaction between the two constraints.

(72) **Non-Oblique *wh* in Russian**

a. SILENT-*t* ranked high

<i>Candidates</i>	REC	SILENT- <i>t</i>	LE(CP)	TEL	DCP
a. *[CP <i>wh</i> čto ...pron...]		*!	*	*	
b. *[CP <i>wh</i> čto ...gap...]			*	*!	
c. *[CP <i>wh</i> čto ...pron...]		*!	*		* _C
d. [CP <i>wh</i> čto ...gap...] ¹³⁸			*		* _C
e. *[CP <i>wh</i> čto ...pron...]		*!		*	* _{SPEC,CP}
f. *[CP <i>wh</i> čto ...gap...] ¹³⁸				*	* _{SPEC,CP}
g. *[CP <i>wh</i> čto ...pron...]		*!	*		* _C * _{SPEC,CP!}
h. *[CP <i>wh</i> čto ...gap...]			*		* _C * _{SPEC,CP!}

b. SILENT-*t* ranked low

<i>Candidates</i>	REC	LE(CP)	TEL	SILENT- <i>t</i>	DCP
a. *[CP <i>wh</i> čto ...pron...]		*	*!	*	
b. *[CP <i>wh</i> čto ...gap...]		*	*!		
c. *[CP <i>wh</i> čto ...pron...]		*		*!	* _C
d. [CP <i>wh</i> čto ...gap...] ¹³⁸		*			* _C
e. *[CP <i>wh</i> čto ...pron...]			*	*!	* _{SPEC,CP}
f. *[CP ^{wh} čto ...gap...] ¹³⁸			*		* _{SPEC,CP}
g. *[CP <i>wh</i> čto ...pron...]		*		*!	* _C * _{SPEC,CP!}
h. *[CP <i>wh</i> čto ...gap...]		*			* _C * _{SPEC,CP!}

There is another possible interaction between SILENT-*t* and a LE(CP)-TEL tie that one might expect to find in a language. SILENT-*t* might be tied with these two constraints. In such a case, the interpretation of the notion “tie” that we adopted in (24) becomes important:

(73) **Constraint Tie:** The output of a set of *tied* constraints is the union of the outputs of every possible ranking of those constraints.

The output of a three-way tie among LE(CP), TEL and SILENT-*t* is thus be the union of the outputs of the following rankings:

- (74) **The output of LE(CP) = TEL = SILENT-*t* is the union of:**
- | | | | | |
|---------------------|----|------------------|----|------------------|
| a. SILENT- <i>t</i> | >> | LE(CP) | >> | TEL |
| b. SILENT- <i>t</i> | >> | TEL | >> | LE(CP) |
| c. TEL | >> | LE(CP) | >> | SILENT- <i>t</i> |
| d. TEL | >> | SILENT- <i>t</i> | >> | LE(CP) |
| e. LE(CP) | >> | TEL | >> | SILENT- <i>t</i> |
| f. LE(CP) | >> | SILENT- <i>t</i> | >> | TEL |

Let us consider how such a tie would evaluate the candidates considered in (71)-(72) (assuming that the tie is ranked lower than REC and higher than DCP). To begin with, the winning candidates of the two-way tie will also be winners of the three-way tie. For example, the rankings in (74a-b) yield candidates with gaps rather than resumptive pronouns. Non-oblique *wh* will be deleted in favor of the pronounced complementizer in (74a), but the complementizer will be deleted in favor of *wh* in (74b). Deletion of oblique *wh* will be impossible on these rankings, since REC has eliminated candidates with deleted oblique *wh* and no resumptive pronoun, and high-ranked SILENT-*t* within the tie favors candidates without resumptive pronouns over those with resumptive pronouns. Consequently, these two rankings contribute the same winners to the pooled output as those contributed by the two-way tie of Russian.

Likewise, the rankings with TEL high seen in (74c-d) contribute no novel winners. High ranking for TEL within the tie favors candidates in which the complementizer has been deleted -- i.e. relative clauses introduced by pronounced *wh*. In a finite relative clause (as we saw earlier in this paper), LE(CP) can never be satisfied by candidates that satisfy TEL. Consequently LE(CP), whether ranked higher or lower than SILENT-*t*, has no effect on output. SILENT-*t* excludes all candidates with resumptive pronouns. Consequently, these rankings also contribute nothing novel -- merely relative clauses introduced by *wh*, without resumptive pronouns (except those that might be independently required by island violations).

The rankings in (74e-f) are another story, however. These rankings say, in effect, that it is more important to start CP with a pronounced complementizer than it is either to delete the complementizer (TEL) or to avoid resumptive pronouns (SILENT-*t*). In cases where a *non-oblique wh* has been moved to SPEC,CP, it is possible (given REC) to start CP with a pronounced complementizer and simultaneously avoid resumptive pronouns. Consequently, with non-oblique relativization, we once again have a result familiar from our earlier discussion: relative clauses introduced by the complementizer, with a gap rather than a pronoun in the position of the trace. On the other hand, when an *oblique wh* is moved to SPEC,CP, the winner is a new candidate: a pronunciation in which *wh* is deleted (so as to start CP with a pronounced

complementizer) and in which REC is satisfied by pronouncing the trace as a resumptive pronoun.

To summarize: a three-way tie among LE(CP), TEL and SILENT-*t* permits any relative clause to display the pronunciation pattern *wh complementizer* or *wh complementizer*. When a non-oblique position is relativized and the second pattern is chosen, trace is pronounced as a resumptive pronoun. In all other cases (except island violations), the trace is not pronounced. In fact, as Broihier notes, this pattern is found in Standard Polish (as well as very colloquial registers of Russian). In Polish (Fisiak et al. 1978; Giejgo 1981), pronunciation patterns in which *wh* is pronounced and the complementizer is unpronounced are always acceptable. A resumptive pronoun is not allowed in this type of relative clause.

(75)a. On podniósł książkę która eø ~~trace~~ leżała na podłodze.
He picked up book *wh*-NOM that lay on floor

b. *On podniósł książkę która eø **ona** leżała na podłodze.
He picked up book *wh*-NOM that it lay on floor
(Giejgo 1981, 49-50)

(76)a. On spotkał studenta któremu on dał ~~trace~~ piątkę.
He met student *wh*-DAT he gave good mark

b. *On spotkał studenta któremu eø on **mu** dał piątkę.
He met student *wh*-DAT that he him-DAT gave good mark

When a local nominative or accusative position is relativized, the pattern in which *wh* is deleted (and the complementizer pronounced) is acceptable for most speakers (though Fisiak et al. note that the accusative is a bit worse). Crucially, a resumptive pronoun is impossible (examples from Fisiak et al. 1978):³⁴

³⁴For some speakers of Polish, all relative clauses introduced by *co* are marginal (Fisiak et al. 1978: 173, fn.16). These speakers may impose more stringent recoverability conditions on deletion of *wh*, imposing a recoverability requirement on deletion of any case-marked element. I do not know whether *co* relatives are more acceptable (or less) to such speakers when the trace is pronounced as a resumptive pronoun. If resumptive pronouns do not improve *co* relatives, an additional factor (e.g. high ranking for SILENT-*t*) must be sought.

- (77) a. Widziałem chłopca, **który** co *trace* złapał zająca.
I-saw boy *wh-NOM* that caught hare
“I saw a/the boy that caught a/the hare”
- b. *Widziałem chłopca, **który** co *on* złapał zająca.
I-saw boy *wh-NOM* that he caught hare
- (78) a. ?Ten samochód, **który** co Janek widział *trace* wczoraj, zniknął.
The car *wh-NOM* that Janek saw yesterday disappeared
- b. *Ten samochód, **który** co Janek *go* widział wczoraj, zniknął.
The car *wh-NOM* that Janek it-ACC saw yesterday disappeared.

When an oblique positionis relativized, however, the pattern in which *wh* is deleted is acceptable only with a resumptive pronoun (a preverbal clitic in Polish; cf. Giejgo 1981, 53).³⁵

- (79) a. *ten chłopiec, **którego** co widziałeś *trace* wczoraj
the boy *wh-GEN* that you saw yesterday
- b. ten chłopiec, **którego** co *go* widziałeś wczoraj
the boy *wh-GEN* that him-GEN you saw yesterday
- (80) a. *On spotkał studenta **któremu** co on dał *trace* piątkę.
He met student *wh-DAT* that he gave good mark
- b. On spotkał studenta **któremu** co *mu* on dał piątkę.
He met student *wh-DAT* that him-DAT he gave good mark

This is precisely the situation we have been discussing:

³⁵As in Russian, the genitive used instead of accusative (for human direct objects) counts as oblique, as noted by Fisiak et al.

- (i) *ten mężczyzna, **którego** co Janek widział *trace*-wczoraj
the man *wh-GEN* that John saw yesterday
‘the man John saw yesterday’
- (ii) ten mężczyzna, **którego** co Janek widział *go* wczoraj
the man *wh-GEN* that John saw him yesterday
“the man John saw yesterday”

(81) Non-Oblique *wh* in Polish

<i>Candidates</i>	REC	SILENT- <i>t</i>	LE(CP)	TEL	DCP
a. *[CP wh co ...pron...]		*	*	*	
b. *[CP wh co ...gap...]			*	*!	
c. *[CP wh eø ...pron...]		*	*		* _C
d. [CP wh eø ...gap...] <i>[TEL highest]</i> ☞			*		* _C
e. *[CP wħ co ...pron...]		*		*	* _{SPEC,CP}
f. *[CPwħ co ...gap...] <i>[LE(CP) highest]</i> ☞				*	* _{SPEC,CP}
g. *[CP wħ eø ...pron...]		*	*		* _C * _{SPEC,CP!}
h. *[CP wħ eø ...gap...] <i>[gets as far as DCP with TEL highest]</i>			*		* _C * _{SPEC,CP!}

(82) Oblique *wh* in Polish

<i>Candidates</i>	REC	SILENT- <i>t</i>	LE(CP)	TEL	DCP
a. *[CP wh co ...pron...]		*	*	*	
b. *[CP wh co ...gap...]			*	*	
c. *[CP wh eø ...pron...]		*	*		* _C
d. [CP wh eø ...gap...] <i>[SILENT-<i>t</i> or TEL >> LE(CP)]</i> ☞			*		* _C
e. *[CP wħ co ...pron...] <i>[LE(CP) highest in tie]</i> ☞		*		*	* _{SPEC,CP}
f. *[CPwħ co ...gap...]	*!			*	* _{SPEC,CP}
g. *[CP wħ eø ...pron...]		*	*		* _C * _{SPEC,CP!}
h. *[CP wħ eø ...gap...]	*!		*		* _C * _{SPEC,CP!}

The existence of the patterns detected in Polish and in Russian constitutes an argument in favor of the pronunciation system presented here. Broihier's results follow from a mechanism of variation -- reranking -- built into the concept of ranked, violable constraints. Furthermore, insofar as one relevant reranking involves a tie, this section supports our appeal to this notion in earlier discussion.

8. How much grammar is Optimality-Theoretic?

If the results reported here are correctly interpreted, pronunciation of certain elements is determined by a set of constraints. These constraints cannot always be simultaneously satisfied. When the desires of the various constraints conflict, the best candidate is good enough to be acceptable -- where the notion of “best” is determined by a ranking of the constraints and an overarching requirement that constraint violation be minimal.

Does this sort of interaction among constraints characterize aspects of sentence grammar besides pronunciation? For example, do the principles governing movement and structure building interact in an OT fashion (e.g. Chomsky’s 1995, chapter 4, “Move and Merge”)? The answer is not clear. Some problems for our proposal as developed above might be solved if some aspects of structure building have an OT character, perhaps along the lines suggested by Grimshaw (1996).

One argument might be found in non-literary registers of French that permit apparent violations of the “Doubly Filled Comp Filter”:

- (83)a. Je me demande *quand que* Pierre arrivera
I wonder when that Pierre will arrive
- b. l’homme *avec qui que* j’ai dansé
the man with whom that I danced

The structures and pronunciation patterns discussed so far leave this phenomenon unexpected. We can accommodate this pattern if the pronounced *wh* phrase and the pronounced complementizer in such constructions belong to distinct CPs. This could be viewed as “CP recursion” (CP immediately dominating CP) or as a relic of the cleft-like structure familiar from matrix questions (Obenauer 1976):

- (84) Quand est-ce que Pierre arrivera?
when is-it that Pierre will arrive
‘When will Pierre arrive?’

The structure of (83) might then be (85) (or one of a number of possible variations of these structures). Each CP now receives its optimal pronunciation under the system already developed for Standard French:

- (85)a. Je me demande [_{CP} *quand que* [_{CP} *que* Pierre arrivera]]
I wonder when ~~that~~ that Pierre will arrive
- b. l’homme [_{CP} *avec qui que* [_{CP} *que* j’ai dansé]]
the man with whom that that I danced

If this proposal is correct, we must somehow exclude this sort of structure -- not only in simple declarative clauses:

(86) *Je pense [CP *que* [CP *que* Pierre arrivera.]]

-- but also when the direct object is relativized and Standard French requires *wh* to delete (Kayne 1976, 275):

(87) *l'homme [CP *qui* *que* [CP *que* je connais]]
the man ~~wh~~ that that I know

The argument for an OT role in structure building arises at this point. Crucially, the double CP structure is allowed only when it is the unique parse that permits the CP closest to IP to satisfy LE(CP). It is as if there were a constraint of the form *Minimal Projection* (Grimshaw 1994) ranked just below LE(CP) in non-literary French, but above LE(CP) in Standard French -- in a framework in which the constraints are evaluated cyclically from bottom to top. I lack space to develop this observation here, but will return to these issues in future work.

Nonetheless, not all aspects of structure building have an obvious OT character. Some interactions may, in fact, have a patently *non-OT* character. Consider, for example, English infinitival relative clauses whose subject is a phonologically realized phrase (i.e. not PRO). When no pied piping has occurred, these clauses resemble infinitival relatives with PRO subjects in requiring deletion of *wh*. They differ from such relatives, however, in prohibiting deletion of complementizer *for*:

- (88) a. *a book which for Mary to read *t*
 b. *a book which ~~for~~ Mary to read *t*
 c. a book ~~which~~ for Mary to read *t*
 d. *a book ~~which~~ ~~for~~ Mary to read *t*

We may follow Chomsky (1980) in attributing part of this pattern to Case Theory. We can assume that unpronounced *for* is incapable of assigning Case (or checking Case; Chomsky 1993), thereby ruling out the patterns in (88b) and (88d). If (88a) is ruled out as usual by the interaction of LE(CP) and TEL, the winning candidate is (88c).

Could this Case requirement belong to the pronunciation system outlined in this paper? At first glance, the answer appears to be "yes". For example, if there were no Case Filter, these infinitival relatives would display the pattern familiar from English finite relatives. The three pronunciations in (88b-d) should all be acceptable. Adding the Case Filter to the pronunciation system

(whether ranked above or below the tie between LE(CP) and TEL) will exclude (88b) and (88d) -- leaving (88c) as the sole winner, as desired.

(89) a. **CASE ranked low**

Candidates	REC	LE(CP)	TEL	CASE
a. *a book which for Mary to read t		*	*for *to!	
b. *a book which for Mary to read t		*	*to	*!
c. a book which for Mary to read t			*for *to	
d. *a book which for Mary to read t		*	*to	*!

b. **CASE ranked high**

Candidates	REC	CASE	LE(CP)	TEL
a. *a book which for Mary to read t			*	*for *to!
b. *a book which for Mary to read t		*!	*	*to
c. a book which for Mary to read t				*for *to
d. *a book which for Mary to read t		*!	*	*to

This sort of analysis runs into serious problems, however, when one examines infinitival relatives with a pronounced subject that also involve pied piping of a PP. The problem arises because REC will not permit deletion of the PP. This prevents LE(CP) from being met by any candidate that has passed REC. In the examples seen earlier, TEL rules the day, and chooses the candidate in which the complementizer has been deleted. This yields the “Doubly Filled Comp Effect”. Now suppose CASE is part of the same system. If CASE is ranked higher than the tie between TEL and LE(CP), CASE will rule the day, picking the option that violates the Doubly Filled Comp Filter. If CASE is ranked lower than the tie, it will be violated by the winning candidate chosen by higher-ranked TEL. If CASE is tied with LE(CP) and TEL, outputs that violate the Double Filled Comp Filter (*for* pronounced) and outputs that violate TEL (*for* deleted) will be equally acceptable.

Putting things more simply, if CASE is ranked high, it is more important to satisfy the Case Filter than to avoid the sequence *wh for*. If CASE is ranked low, it is more important to avoid the sequence *wh for* than to satisfy the Case

filter. Now what are the facts? Does the Doubly Filled Comp Effect give way to Case, or does Case give way to the Doubly Filled Comp Effect, or are both patterns found? In fact, no pattern is found. There is no acceptable pronunciation of an infinitival relative structure with pied piping and an overt subject. The structure is *ineffable*:

- (90) a. *a topic on which for Mary to work *t*
b. *a topic on which ~~for~~ Mary to work *t*
c. *a topic ~~on which~~ for Mary to work *t*
d. *a topic ~~on which for~~ Mary to work *t*

If the situation is as it appears, we have an argument that CASE is *not* a ranked, violable constraint inside the system of pronunciation principles. Instead, given the ineffability of the structure considered in (90), CASE seems to be a *filter on the output* of the pronunciation system. One might propose, in the spirit of the early Minimalist Program (Chomsky 1993) that structures with unchecked Case are phonetically uninterpretable. Further arguments for this position could be found if CASE turns out to be completely surface-true, as is likely (though not inevitable; cf. Grimshaw 1996). On this view, the pronunciation principles would produce (90b) as the winning candidate (cf. the comparable finite relative in (27)). This winner, however, would be unpronounceable, yielding ineffability as the final, sorry result of the computations that might have accorded a pronunciation to *a topic on which for Mary to work*. The reader may verify that an alternative proposal that views the Case Filter as an *input* constraint would not achieve the right results.

Obviously, one also wants to consider OT-internal alternatives. I cannot explore a broad spectrum of possibilities here. I can note that certain obvious solutions within OT do not work. For example, one might imagine that the actual winner is unfaithful in some respect to the input structure. If one allows structures with stranding to compete with pied piping, then the winner might be (91):

- (91) a topic for Mary to work on *t*

This result could be achieved, however, only if the system said that it is more important to satisfy *both* CASE and the tie between LE(CP) and TEL than it is to remain faithful to the input structure. This would involve ranking all three constraints above a Faithfulness condition that regulates pied piping and stranding. Such a move, however, would eliminate the possibility of pied piping in infinitival relative clauses altogether. Structures like *a topic to work on* satisfy LE(CP) and maximally satisfy TEL, while structures like *a topic on which to work* maximally satisfy TEL but do not satisfy LE(CP). If CASE, LE(CP) and TEL were all ranked higher than Faithfulness with respect to

stranding and pied piping, the candidate with stranding would win over the candidate with pied piping:³⁶

(92)

<i>input</i> : a topic on which for Pro to work	REC	LE(CP)	TEL	FAITH (PP)
a. a topic on which for Pro to work t		*	* <i>to!</i>	
b. a topic which for Pro to work on t			* <i>to</i>	*

Similar problems arise with any solution that ranks LE(CP) and TEL above Faithfulness, e.g. if one attempts to argue that the winner maintains pied piping, but replaces *Mary* with Pro. In that case, *a book for Mary to read* would lose to *a book PRO to read*.

Obviously, there may be alternatives that involve constraints and grammatical architectures quite different from those developed here. I make no attempt to anticipate these possibilities in the present paper. For now, I am content to note the apparent, quite interesting argument that a pronunciation system whose internal organization is optimality-theoretic interacts with Case Theory in a strikingly non-OT fashion. Many other phenomena appear to have this character, for example, the marginal acceptability of resumptive pronouns in languages like English. For now, it looks as though the output of the pronunciation system passes through a profoundly non-OT censorship apparatus that can discard or downgrade the acceptability of the forms that it receives.

³⁶For very similar reasons, it is also necessary to bar pronunciation patterns that could mimic stranding while actually interpreting a structure with pied piping: *a topic ~~on~~-which ~~for~~ Pro to work on ~~which~~*. This structure would arise if deletion of *on* inside SPEC,CP is possible under identity with part (but not all) of the trace. It looks as though we must block deletion of subparts of chain members under identity with other subparts of chain members -- i.e. requiring deletion to be an “all or nothing” phenomenon.

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