That-trace effects are yet to be explained away: challenges for prosody-based accounts*

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Abstract *That-trace* effects in English have been treated as violations of prosodic well-formedness conditions, i.e. Kandybowicz (2006a) and Sato & Dobashi (2016): the C head and the trace cannot be parsed in the same prosodic phrase. Satisfying this condition allows for amelioration effects induced by sentential adverbs and narrow focus on the embedded verb. However, I argue that a [C *t*] prosodic parse cannot be the reason for *that-trace* effects since such a prosodic phrase should never be posited by the postsyntactic system in the first place. I discuss empirical and conceptual arguments that support such a conclusion. As a result, although promising, the accounts that aim to explain *that-trace* effects in terms of the prosodic ill-formedness of a C-t adjacency, cannot be correct. An explanation for the that-trace effects and their amelioration is still outstanding.

Keywords: that-trace effects; syntax-prosody; function words; relative clauses; narrow focus

1 Introduction

That-trace effects refer to the unacceptability of a configuration where a complementizer "immediately precedes" the trace or copy of a moved subject, as in (1)

(1)   * Who did you say that *t* wrote *Good Omens*?

Despite there being a whole body of literature addressing the phenomenon since Perlmutter (1968), it remains a problem to this day what is the best analysis to derive the effects. Some proposals argue for syntactic ill-formedness, i.e. a constraint making reference to the hierarchical structure of the clause (see Pesetsky (2017) for a detailed overview on the phenomenon and a proposal in terms of the probe-goal theory of movement by Pesetsky & Torrego (2001)). On top of the early ECP accounts based on government (Pesetsky 1982; 1995; Rizzi 1982; Culicover 1993a;b), some have recently argued that the effects can be explained if there is an antilocality constraint (Erlewine 2016; 2020; Brillman & Hirsch 2016; Toquero-Pérez 2020) according to which movement from Spec,TP to Spec,CP is too short (i.e. it does not cross enough projections).

There are also amelioration effects that improve the acceptability of sentences with an overt complementizer and a subject trace. The most common one is the "adverb effect" originally spotted by Bresnan (1977: 194, fn.6) and rediscovered by (Culicover 1993a). This consists of inserting an adverbial that breaks the linear adjacency between the C head and the trace, as in (2).These amelioration effects seemingly present a challenge to a purely syntactic explanation and bolster the appeal of accounts in terms of prosodic constraints

(2)   ? Who did you say that for **all intents and purposes** *t* wrote *Good Omens*?

While a prosodic account has a natural way to explain the amelioration effects, the antilocality syntactic accounts can also deal with them: assuming that the adverbial is adjoined to a functional projection above the TP (Browning 1996), *wh*-movement is "long enough" bypassing antilocality.
    In addition to this ameliorating effect, Kandybowicz (2006a: 221-222) claims that there are other mitigating effects that are due to prosody. Among these, narrow focus on the embedded verb (3) and C-auxiliary contraction (4) are supposed to improve the acceptability of a sentence with *that-trace* effects:

(3)   ? I know you dont't know who filmed it, but who did you say that *t* WROTE *Good Omens*?

(4)   ? Who did you say that'll *t* write *Good Omens*?

Data like (3) and (4), assuming they are acceptable,[1] present serious challenges for purely syntactic accounts: no obvious change in the syntactic structure seems to have occurred that would explain the amelioration. Thus, (3) and (4) make prosody-based accounts especially appealing.
    Nevertheless, despite the fact that prosodic approaches apparently derive the facts in an elegant fashion, I would like to point out there are some overlooked challenges that are worth calling attention to. In this squib, I will review two recent prosody-based accounts, i.e. Kandybowicz (2006a) and Sato & Dobashi (2016), and I will raise two sets of concerns: one of them is empirical and is related to the mappings created by the syntax-prosody algorithm if constraints like the Lexical Category Condition (Truckenbrodt 1999) or Prosodic Vacuity (Kandybowicz 2015) are operative in the grammar, as is assumed at least by Sato & Dobashi (2016); the other is conceptual and focuses on the accessibility that the prosodic phrasing algorithm has to traces.
    The squib is organized as follows. Section 2 overviews the two mentioned proposals. Section 3 discusses the first set of observations: (i) a conceptual argument discussing the status of functional categories for syntax-prosody, (ii) evidence for that conceptual argument based on two phonological rules of English, and (iii) the application of (i) and (ii) to relative clauses. Section 4 briefly presents a conceptual argument against the two mentioned approaches and suggests a potential alternative. Section 5 concludes the squib.

2   Prosody-based accounts

2.1   Kandybowicz's *<C^0, t>* filter

Kandybowicz (2006a) proposes that there is a *<C^0, t> filter at PF (5) that disallows certain prosodic mappings.

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[1] Ritchart, Goodall & Garellek (2016) tested Kandybowiczs (2006) hypothesis by looking at focused data. They found no significant interaction between *that* and *focus*: while the *that-trace* sentence improves in the two contrastive focus case, a very similar amelioration is found in the subject gap cases without *that*. "The ameliorating effect that contrastive focus has been claimed to have on the that-trace phenomenon is thus real, but misleading: it is not specific to the that-trace sentence, and is part of a general amelioration that occurs in all the subject gap cases" (Ritchart, Goodall & Garellek 2016: 324). They also looked at and C^0-aux cliticization (*that will → that'll*). In the case of C^0-aux cliticization, they found that it does not have amelioration effects on the acceptability of the sentence: no *that* is signigicantly better than overt *that* and *that*-AUX; overt *that* and *that*-AUX are equally bad.

(5) *<C^0, t> iff:

    a. C^0 and t are adjacent within a prosodic phrase; and

    b. C^0 is aligned with a prosodic phrase boundary   (Kandybowicz 2006a: 223)

A note on the terminology is in order. Given the broadness of the term "prosodic phrase" in (5), it could make reference to any prosodic constituent: from a Prosodic Word (which roughly corresponds with lexical items that might host function words) to Intonational Phrases (which correspond to clauses or full utterances typically marked by obligatory pauses). The ones that will be relevant here are Intonational Phrases (IPs), Intermediate Phrases (intPs) and Phonological Phrases (PhPs). A PhP consists of at least a Prosodic Word, and roughly corresponds to XPs in the syntax, while an intP typically describes topics and adverbial clauses, i.e. they are bigger than PhPs but smaller than IPs (Hsu 2016: 3).

That said, according to (5) a sentence like (1), repeated as (6), is ruled out because it violates both conditions of the filter. (5a) because "when C is pronounced in full, an Intermediate Phrase divides the embedded clause from the matrix clause" (Kandybowicz 2006a: 222). Thus, C and the trace are contained within the same prosodic phrase, i.e. the intP that introduces the embedded clause. (5b) is violated given that the C head is aligned with the left edge of the intP.

(6) * ($_{IP}$ Who did you say ($_{intP}$ that *t* wrote *Good Omens*?))

The filter in (5) also provides an explanation for the adverb the adverb amelioration effect in (7): sentential adverbials can be parsed as IPs creating a prosodic boundary to the right of the complementizer. Thus, even though C is aligned with a prosodic phrase boundary, C and the trace are in separate phrases. Kandybowicz (2006a: 223, fn.2) assumes that the trace is not contained within any prosodic phrase, but rather is a float that the prosodic phrasing algorithm ignores when doing the syntax-prosody mapping. If this is the case, however, the trace in (6) should also be outside of the relevant prosodic phrase, contrary to what is expected by Kandybowicz (2006a). This raises one of the questions that will be dealt with in section 4: prosody and its accessibility to traces.

(7)   ($_{intP}$ Who did you say that) ($_{IP}$ for all intents and purposes) *t* ($_{intP}$ wrote *Good Omens*?)

Kandybowicz (2006a) also observes that the effects are ameliorated if the embedded verb is focused as in (8a). The reason for the amelioration is the assumption that the focused constituent will create a separation into two different intPs: one containing the matrix clause and crucially the complementizer, and another that contains the embedded clause whose prosodic edge is marked by the focused constituent (8b). The trace is not part of either (Kandybowicz 2006a: 223,ex. 13a). Crucially, focusing any other element does not seem to give rise to this amelioration (8c) since the trace belongs to the same prosodic phrase as the complementizer and the complementizer marks the left edge of the phrase. As above, though, it remains unexplained why the trace and the complementizer do not belong to the same prosodic phrase in (8b) but they do in (8c) if traces "cannot be grouped into any prosodic phrase (i.e. [I]P/intP)" (Kandybowicz 2006a: 223, fn.2).

(8)   a. ? Who did you say that *t* WROTE *Good Omens*?

    b.   ($_{intP}$ Who did you say that) *t* ($_{intP}$ WROTE *Good Omens*?)

    c. * ($_{IP}$ Who did you say ($_{intP}$ that *t* wrote) ($_{intP}$ *GOOD OMENS*?))

Although the proposal is attractive and seems to make the right predictions, I will mention some problems. But before I do that, I will overview the proposal by Sato & Dobashi (2016).

2.2 Sato & Dobashi's alternative

A more recent proposal has been made by Sato & Dobashi (2016). Building on Kandybowicz (2006a), they propose an alternative PF condition (9):

(9) Function words cannot form a prosodic phrase on their own.   (Sato & Dobashi 2016: 333)

According to (9) any prosodic phrase (e.g. PhP, intP, IP) that is made of only function words will be ruled out at PF. For them traces do count at the time of parsing and these are considered empty categories whose status is identical to that of functional categories, i.e. they cannot form a prosodic phrase on their own. That is, a prosodic phrase composed of only C and/or a trace should be ruled out. For them adjacency between C and the trace does not play a role as long as there is a lexical item in the prosodic phrase containing C and t. This is a well established assumption in the prosodic literature: constraints relating syntactic and prosodic categories only apply to lexical elements and their projections. Some examples of this include the Principle of the Categorial Invisibility of Function Words (Selkirk 1986), the Lexical Category Condition (Truckenbrodt 1999) or Prosodic Vacuity (Kandybowicz 2015).

In addition to this they adopt a theory of phases according to which the spell-out domain of a phase head is mapped onto a PhP at PF (Dobashi 2003). They also assume that in order to avoid an "assembly problem" during linearization, there must be a shared element that connects the two spell-out domains: the initial (or left most element in the structure) is left behind and remains accessible to the next application of spell-out. This allows for the subject to be parsed with the complementizer, for example (10a):

(10) a. $[_{CP}$ C $[_{TP}$ Subj $[_{T'}$ T $[_{vP}$ v Obj]]]]
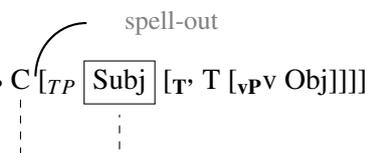
  b.   ($_{PhP}$ C Subj) ($_{PhP}$ T v V) ($_{PhP}$ Obj)   (Sato & Dobashi 2016: 334)

The proposal makes similar predictions with respect to (1) and the adverb facts (7). It is worth mentioning, though, that their parse of (1) is different from Kandybowicz's (2006) given in (6). In fact, if their parse were as (6) the sentence would be ruled in since it does not violate their PF condition in (9): both function and lexical words form the intP. What would rule out (1) is that C and t will be in a "minimal" (i.e smaller) prosodic phrase. Namely the parse would be identical to the one in (10b), with t instead of subject. Thus, this will cause a *that-trace* effect.

A more salient difference is concerned with the focused data. In fact, they assume that there is a Left Focus Restructuring Rule (LFR) for English (11), originally proposed by Kenesei & Vogel (1995), that applies at the level of PhPs and that alters the original prosodic mapping so that (9) is satisfied. An example is in (12):

(11) Left Focus Restructuring: English
     If some word in a sentence bears focus, place a phonological phrase boundary at its right edge,and join the word to the phonological phrase on its left.
                                        (Sato & Dobashi 2016: 339) *apud* (Kenesei & Vogel 1995: 19)

(12) a.   Who did you say ($_{PhP}$ that t) ($_{PhP}$ WROTE *Good Omens*)?   Prior LFR
      b.   Who did you say ($_{PhP}$ that t WROTE) ($_{PhP}$ *Good Omens*)?   After LFR

After LFR has applied in (12b), the PF condition is satisfied and the amelioration effect is achieved. This is in direct contrast with Kandybowicz (2006a), for whom focus starts a prosodic phrase (8b).

Now that the two prosody-based accounts have been reviewed, I will move on to delve into the issues and questions raised by them, which to my knowledge remain unaddressed in the literature.

3   Functional categories and their own phonological phrases

In this section I concentrate on three major arguments: first, I discuss a conceptual argument taken from the previous literature on functional items and traces; then I provide empirical support for the conceptual argument based on evidence from the tap and palatalization rules, which to my knowledge has not been applied to this domain before; finally, I apply the two arguments to the domain of subject relative clauses introduced with *that*.

Most of the syntax-prosody literature makes a distinction between lexical and functional categories. For example, lexical words in English require that one of their syllables is stressed, while function words do not; their vowels are typically unstressed and reduced to schwa (i.e.*that* = [ðət]). In fact, as argued by Selkirk (2011: 453), function words, especially monosyllabic ones, tend to not be standardly parsed as prosodic words. That said, and no matter what is the algorithm to match a syntactic structure into the corresponding prosodic one, function words should always be contained within a larger prosodic unit composed of at least one lexical element. In other words, there is no place for (unstressed) function words to project their own phonological phrase; instead they must clitizice either right or left onto something that can (see Tyler (2019) for further details on this).

This invisibility of function words is ensured by conditions like the Lexical Category Condition (Truckenbrodt 1999) and Prosodic Vacuity (Kandybowicz 2015) given in (13) and (14) respectively:[2]

(13)   The Lexical Category Condition
       Constraints relating syntactic and prosodic categories apply to lexical syntactic elements and their projections, but not to functional elements and their projections, or to empty syntactic elements and their projections.   (Truckenbrodt 1999)

(14)   Prosodic Vacuity
       Phonetically empty (i.e. null elements and functional heads) prosodic phrases are ruled out at PF.   (Kandybowicz 2015)

Based on these conditions, the mapping from syntax to prosody in a sentence like (1) repeated below should not be as (15a) or (15b), but it should be as (15c). The point here is not that (13) and (14) are being violated; rather, the mapping should never arise to begin with because unstressed function words need a prosodic host. And that assumption is built in the system.[3]

(15)   * Who did you say that *t* wrote *Good Omens*?

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[2] The argument is also valid if we used other versions of these principles under Match Theory (Selkirk 2011). See Weir (2012), Elfner (2012), Bennett, Elfner & Mccloskey (2016) for details. I am making specific reference to these two because they are the ones that at least one of the works I am reviewing here follows.

[3] One could think of this in terms of Optimality Theory (Prince & Smolensky 1993) where The Lexical Cateogry Condition or Prosodic Vacuity are very high ranked markedness constraints that must be satisified for the optimal output to win. If any candidate violates the constraint, such violation would be fatal. The simple tableau in (i) shows precisely that.

(i)

that t wrote Good Omens		Lexical Category Condition	*<C^0, t>
a.	(that) t (wrote) (Good Omens)	∗!	
b.	(that t) (wrote Good Omens)	∗!	∗
c. ☞	(that t wrote) (Good Omens)		∗

a. $(_{intP}(_{PhP}$ that$)$ t $(_{PhP}$ wrote$)$ $(_{PhP}$ *Good Omens*$))$ à la Kandybowicz (2006a)

b. $(_{PhP}$ that $t)$ $(_{PhP}$ wrote$)$ $(_{PhP}$ *Good Omens*$)$ à la Sato & Dobashi (2016)

c. $(_{PhP}$ that t wrote$)$ $(_{PhP}$ *Good Omens*$)$ as predicted by (13) & (14)

The parse in (15a) is what Kandybowicz (2006a) would predict: *that* and the *t* are contained within the same intP, but at a deeper level they are not part of the same phrase, i.e. the PhP, given that traces do not count for the parse. The *<C^0, t> filter, as argued by him, is not the problem here. In addition, Sato & Dobashi's (2016) prosodic condition in (9) does not hold either: there is a lexical element contained within the PhP that also contains the complementizier and the trace. If (15c) is the correct mapping, then it poses a serious challenge to both theories reviewed here. On the other hand, (15c) by itslef is not an argument against Kandybowicz (2006a): (15c) violates the *<C^0, t> filter.

Evidence for the fact that (15c) is the correct mapping comes from sentences that contain pronouns and subject relative clauses with an overt complementizer, as I will show in the next sections.

3.1 Phonological Phrasing of subject pronouns

It has become standard in the literature, since (Abney 1987), to treat pronouns and determiners as belonging to the functional category of D heading a DP. If we transformed (15) into a declarative clause and replaced the embedded subject with a pronoun like *I/you*, Sato & Dobashi (2016) would predict that the sentence is equally ungrammatical because the complementizer and a function word of type D form a PhP. However, this prediciton is not borne out as shown in (16). Instead of the predicted (16a), the parse is as in (16b), obeying (13) and (14).

(16)   You said that I wrote *Good Omens*

a.   * you said $(_{PhP}$ that I$)$ $(_{PhP}$ wrote$)$ $(_{PhP}$ *Good Omens*$)$ à la Sato & Dobashi (2016)

b.   you said $(_{PhP}$ that I wrote$)$ $(_{PhP}$ *Good Omens*$)$ as predicted by (13) and (14)

It is difficult to predict what the parsing would be under Kandybowicz (2006a) as he is not very explicit when it comes to the status of functional categories in general, but assuming that he allows for *that* to project its own phrase, the pronoun should too.

If phonological phrases are a domain within which segmental phonological processes apply, we can test the well-formedness of (16b) by using a phonological rule like the tap insertion rule or palatalization rule. If one of the environments that conditions the application of the tap or palatalization rule of coronal stops in English is that the target segment and the trigger segment belong to words in the same prosodic domain (i.e. a PhP), then we expect these rules to apply to sentences like (16).[4]

(17)   /t/$\rightarrow$ [ɾ] / $(_{PhP}$ [V]__[V]$)$
you said tha[ɾɑɪ] wrote *Good Omens*

(18)   /t/$\rightarrow$ [tʃ] / $(_{PhP}$ [V]__[jV]$)$
I said tha[tʃu] wrote *Good Omens*

We cannot conclude what the correct parse is just by looking at (17) and (18). However, we can use this set up to test what happens when we *wh*-move the embedded subject. If the embedded verb forms a phonological phrase with the complemenizer and the *t*, as indicated by the suggested parse in (16b), these rules are expected to apply in a context where the complementizer is followed by a verb that starts with /ɪ/ or /ju/, even though the sentences are ungrammatical. [5] This prediction

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[4] The rules used here are very simplified versions of these rules. I am using them to support the main argument.

[5] 10 native speakers of English were informally asked to read a set of grammatical and ungrammatical *that-trace* sentences. In 9/10 cases, the two rules applied.

is borne out as the data in (19) and (20) show. The presence of the (*wh-*)trace does not block the application of phonological rules, as argued by Nespor & Vogel (1986: ch.2, 53-57) for a series of processes cross-linguistically. This supports the fact that the complementizer and the main verb belong to the same PhP:

(19)   /t/→ [ɾ] / ($_{PhP}$ [V]__[V])
       *who did you say ($_{PhP}$ tha[ɾɪ]nterpreted) ($_{PhP}$ Demon Crowley)

(20)   /t/→ [tʃ] / ($_{PhP}$ [V]__[jV])
       *Who did you say ($_{PhP}$ tha[tʃu]sed) ($_{PhP}$ Demon Crowley)

3.2   Subject relative clauses

In addition to this, both theories face some challenge with subject relatives like the one in (21). Under the head raising analysis, (Vergnaud 1974; Kayne 1994; Bhatt 2002) the head NP originates inside the CP relative and then moves out projecting a NP. Under the head external analysis (Chomsky 1977; Heim & Kratzer 1998) there is movement of the *wh*-operator to the specifier of the CP relative clause. Crucially for our purposes, any of this movement operations leaves a trace (or unpronounced copy) following the complementizer (21a-21b):[6]

(21)   The demon that saved the world from Armageddon
       a.   the [demon]$_2$ [$_{CP}$ [OP t_2]$_1$ that t_1 saved the world from Armageddon]
       b.   the demon [$_{CP}$ OP_1 that t_1 saved the world from Armageddon]

The structure of this sentence is identical to that in (15) where the complementizer is followed by a trace left by a *wh*-operator. Data like this also present a challenge for antilocality approaches (but see fn.6 for details). Following the same logic as with (15), we should expect a mapping according to which (i) the Complementizer aligned with the left boundary is adjacent to the trace within a prosodic phrase and thus violates the *<C^0, t> filter, or (ii) the complementizer should project its own PhP and thus violates the prosodic condition in (9). This is illustrated in (22a) and (22b) respectively (the * indicates that the prosodic phrasing is ungrammatical).

(22)   The demon that *t* saved the world from Armageddon
       a.   * The demon ($_{intP}$($_{PhP}$ that) *t* ($_{PhP}$ saved the world) ($_{PhP}$ from Armageddon))
       b.   * The demon ($_{PhP}$ that *t*) ($_{PhP}$ saved the world) ($_{PhP}$ from Armageddon)
       c.   The demon ($_{PhP}$ that *t* saved the world) ($_{PhP}$ from Armageddon)

Even though (22c) is the correct prosodic mapping, it violates the *<C^0, t> filter: the C is adjacent to the trace in the same prosodic phrase and C is aligned with a PhP boundary. Kandybowicz (2006a: 223) claims that the correct mapping of relative clauses is as in (23a) on the assumption that there is no pause between the N antecendent and the C head: while C and *t* are adjacent within the same IP, C is not aligned with a boundary.

(23)   adapted from (Kandybowicz 2006a)
       a.   ($_{IP}$ The demon that *t* saved the world from Armageddon)

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[6]   One might argue that in subject relative clauses there is no *wh*-movement to the specifier of the CP because they show weaker island effects as observed by Chung & McCloskey (1983) and would violate some sort of antilocality (Brillman & Hirsch 2016; Toquero-Pérez 2020). In this case, instead of a trace, the *wh*-operator itself would be left in the specifier of TP immediately adjacent to the complementizer *that*. Even if we follow this approach, the predictions with respect to the prosodic mapping should be no different: there still is a null element following the complementizer which the PF interface should treat as any other unpronounced material.

b.   * ($_{IP}$ The demon ($_{intP}$ that *t* saved the world from Armageddon))

However, such a claim is not as robust as one might think. Relative clause data discussed in Fodor (2002) indicates that a prosodic boundary before a relative clause is actually common, especially if the relative clause is longer than 2 items. What is more, the presence of a boundary before the clause is usually indicative of a higher attachment when there are two potential antecedents. If Kandywbowicz was correct, he would predict that a high attachment interpretation should not be possible due to the presence of a boundary before C. This prediction is not borne out as shown by the example in (24). Thus, the mapping should be as in (22c) which violates the *$<C^0$, t> filter.

(24)   Someone shot the servant of the demon that cried all through the night
        high attachment: the servant cried all through the night.

We can test whether the mapping in (22c) is correct by applying the tap and palatalization rules in (17-18). If *that* and the verb form a PhP we should be able to apply the rule. This is what we see in (25) where the verb *saved* has been replaced with *incinerated* and *united*:
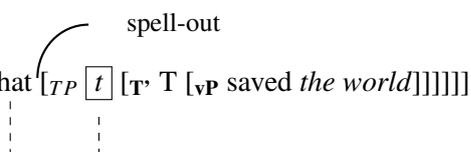
(25)   a.   the demon tha[ɾɪ]ncinerated the whole world
        b.   the demon tha[tʃu]nited the whole world.

In conclusion, these theories predict that subject relatives like (21) are ungrammatical, and yet they are not which suggests that the correct prosodic phrasing is not as these theories argue for, but should be as in (22c)

There is one more area of concern that has remained unnoticed so far. For Sato & Dobashi (2016: 343), relative clauses do not seem to be a problem because their phasal spell-out forces the complementizer and the trace to belong to two different spell-out domanins: C transfers the TP complement with the trace left by the subject when the D head is merged. However, there is a loophole in their theory. According to their model of spell-out, based on Dobashi (2003), the initial (or left most) element in the structure is left behind and remains accessible to the next application of spell-out. This was shown in (10a) and repeated in (26a). For example, if the TP is spelled-out when C is merged, the subject (in Spec,TP) escapes the mapping and is able to form a phonological phrase with the preceding C head (Sato & Dobashi 2016: 334) (26b).

(26)   a.   [$_{CP}$ C [$_{TP}$ Subj [$_{T'}$ T [$_{vP}$ v Obj]]]]
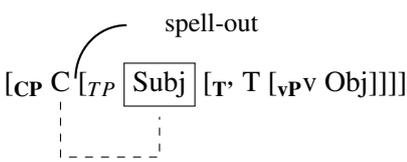
                           spell-out

        b.   ($_{PhP}$ C Subj) ($_{PhP}$ T v V) ($_{PhP}$ Obj)   (Sato & Dobashi 2016: 334)

This has an important, though unnoticed, implication for subject relatives: when D is merged into the structure, the phase head C must spell-out its TP complement which includes the trace of the moved *wh*-subject. However, since they assume that the subject, i.e. the leftmost element in the spell-out domain, is still accessible to the next spell-out operation, there is nothing that prevents C and the trace from forming a PhP as (26b). And as a result, the structure should be incorrectly ruled out.

(27)   [$_{DP}$ the [$_{NP}$ demon [$_{CP}$ that [$_{TP}$ *t* [$_{T'}$ T [$_{vP}$ saved *the world*]]]]]]

                           spell-out

Up until this point I have presented some empirical arguments for why *that-trace* effects of the type seen in English cannot be reduced to prosodic conditions proposed by Kandybowicz

(2006a) and Sato & Dobashi (2016). Before moving on to the next section, I want to note two more concerns: one is related to cliticization of the complementizer, and the other is especifically concerned with the focus restructuring rules.

3.3   A note on Complementizer cliticization and focus restructuing rules

Both Kandybowicz (2006a) and Sato & Dobashi (2016) assume that the complementizer cannot cliticize to the left, outside the CP: *that* can reduce to schwa and generally fails to display pitch accent. As such, it is a weak function word, and it is notoriously difficult to say which direction such words cliticize onto in the prosody. One might think that *that* would need to phrase with something following it because it is at the left edge of a CP, but virtually all theories of syntax-prosody mapping in English treat right edges as being relevant to prosodic boundaries, with left edges much less so or not at all (Selkirk 1995; 1996; 2005; Truckenbrodt 1999). Besides, recent work by Tyler (2019) (building on prevous work by Zec (2005)) has convincingly shown that function words can have different subcategorization frames: they can either be left-clitizicing as Tyler argues for weak object pronouns, contracted negation *n't*, and the very reduced auxiliaries; or right-clitizicing as Tyler shows it is the case for most prepositions in Englsih, auxiliaries and determiners. To my knowledge there is no research that has probed what frame complementizers belong to. Thus, in principle, nothing should rule out a phrasing like the one in (28) where the complementizer has left-cliticized onto the preceding material.[7]

(28)   * [who did you ($_{PhP}$ say that)] [*t* ($_{PhP}$ wrote) ($_{PhP}$ *Good Omens*)]

Regarding LFR (11), it remains unaddressed what would happen if the focused element inside the embedded clause is an auxiliary verb as in (29a). Auxiliary verbs are function words and as such should not be phrased in their own PhP, regardless of whether they bear focus. If the LFR rule applies to (29a) we should get the phrasing in (29b):

(29)   a. I know you don't know who should play demon Crowley, but who do you think that *t*
           COULD play demon Crowley?

       b. ($_{PhP}$ that *t* COULD) ($_{PhP}$ play) ($_{PhP}$ *demon Crowley*)?

(9)   Function words cannot form a prosodic phrase on their own.   (Sato & Dobashi 2016: 333)

The focused auxiliary has created a boundary at its right edge and has joined to the phonological phrase on its left. Nevertheless, this should not be enough by itself to satisfy Sato and Dobashi's (2016) condition in (9), repeated above. The informants that I have consulted and that accept these sort of sentences with focus do not report a difference in acceptability between a focused auxiliary and a focused lexical verb, which goes against what one would expect under (9).[8]

Last but not least, (Kandybowicz 2006a) claims, contrary to Sato & Dobashi (2016), that the focused element marks the left edge of a prosodic boundary. There is no phonetic or phonological evidence that supports this claim. In fact, this goes against Selkirk (2000: 247-251) who argues that it is the right edge of a focused constituent that has to be aligned with the right edge of a prosodic phrase:

(30)   She loaned her rollerblades to Robin   adapted fromSelkirk (2000: 247 ex.27)

       a.   ($_{PhP}$ she loaned her rollerblades) ($_{PhP}$ to Robin)

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[7] I am very grateful to Jonah Katz for this suggestion.

[8] 10 native speakers of American English were consulted for judgments. Of those 10, only 2/10 accepted the structures with narrow focus on either lexical or auxiliary verbs. The other 8/10 did not report a significant amelioration aligning with the results found by Ritchart, Goodall & Garellek (2016) mentioned in fn.2.

b. $(_{PhP}$ she LOANED$)$ $(_{PhP}$ her rollerblades$)$ $(_{PhP}$ to Robin$)$

c. * $(_{PhP}$ she LOANED her rollerblades$)$ $(_{PhP}$ to Robin$)$

d. * $(_{PhP}$ she$)$ $(_{PhP}$ LOANED her rollerblades$)$ $(_{PhP}$ to Robin$)$

As a result, there are strong empirical arguments to be skeptical that these prosodic accounts can successfully provide a principled explanantion to *that-trace* effects in English. In the next section, I outline one conceptual argument that any syntax-prosody analysis would have to address.

4   Why should prosody care about traces?

It is typically assumed that null material in general does not count for prosodic phrasing, which puts into question why traces should be visible to prosody. More specifically, why should the trace following but not the one preceding the complementizer be responsible for the violations? If CP is a phase, and there is successive cyclic movement through its edge there should be another trace preceding the complementizer. Why isn't the latter trace the problematic one? If traces are so important to prosody, all the traces left by the moved subject should count.

The same reasoning that has been applied to traces can also be applied to other null elements more generally, e.g. null operators, PRO, *pro*, which just like traces do not block phonological rules from applying within a particular domain (Nespor & Vogel 1986). What is more, if we extend these prosodic filters to other languages such as null subject languages, we should predict that any sentence that contains an overt complementizer and is followed by a null subject in Spec,TP should be prosodically ill-formed. This is not a desirable prediction if one looks at Romance for example.

In fact, prosodic filters like *$<C^0$, t$>$ filter (i.e. do not have a C next to a *t*) do not seem completely coherent within current models of the grammar. Within a broadly Chomskyan modular view of language there is no reason why the system of prosodic phrasing should regard traces or even have access to them.[9] This is especially problematic if prosodic phrasing happens quite late at PF after Vocabulary Insertion, and thus chain reduction, have applied (Kandybowicz 2006b: Ch.3 & 5). That said, the system of prosodic phrasing should apply to whatever terminal nodes have been spelled-out after Vocabulary Insertion and should have access to nothing else.

On the other hand, as a potential alterative, one could reverse the perspective of the generalization and say something along the lines of (31):[10]

(31)   The Two-Trace Condition
Do not have two traces/copies of the same moved constituent within the same phonological phrase.

(32)   * who did you say $(_{Php}$ t that t wrote$)$ $(_{Php}$ *Good Omens*$)$?

An example like (32) respects Prosodic Vacuity (Kandybowicz 2015) and the Lexical Category Condition (Truckenbrodt 1999) but violates the condition in (31). We can think of this as a linearization problem, rather than as a prosodic one. Linearization would apply earlier at PF, before any insertion of lexical material. We know that structure needs to be turned into word order, and as the first part of this process, we have a simple linearization that scans the tree and creates an ordering statement; and traces should matter at this point to determine what precedes what and avoid contradictions. Moreover, as an interface rule (31) distinguishes between relative clauses and questions. In fact one can think of this interface condition as the penalty one has to pay for violating antilocality in the syntax: you can execute the syntactic movement but then the structure cannot be linearized. Nevertheless, if the offending contradictory statement is deleted as a result of ellipsis (Merchant 2001), the antilocality violation in the syntax is then repaired:

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[9] Jonah Katz raised this concern and pointed it out to me. I would like to thank him for it.

[10] Many thanks to Roumyana Pancheva for suggesting this alternative.

(33) Aziraphale said that some demon would save the world but I can't remember who ~~Aziraphale said *t* that *t* would save the world.~~

5 Conclusion

This squib has reviewed some PF proposals to *that-trace* effects based on prosodic ill-formedness made by Kandybowicz (2006a) and Sato & Dobashi (2016). These PF proposals are interesting alternatives to structurally based accounts because they deal with a set of data that pose great challenges to most (if not all) purely syntactic accounts. Nevertheless, I have raised some concerns that these two proposals have to face in order to be compelling alternatives. First of all, phonological phrases composed of only a complementizer or a complementizer and a trace should never be a potential output of prosodic phrasing to begin with; and there is empirical evidence from relative clauses and phonological processes like the tap insertion rule that supports this argument. Second, given that prosodic phrasing occurs late at PF, once vocabulary items have been inserted and chains reduced, it remains a mystery how the system of prosodic prhasing has access to traces and why traces should be relevant. The conclusion arrived at here does not entail that a prosodic account is in principle inadequate or impossible to articulate, for it is yet to be understood what the best and more principled theory can provide an explanation to these phenomena. Instead, I outlined a series of challenges that a any proponent of a prosody-based theory should consider and I suggested an alternative line of reasoning based on the Two-Trace Condition as an interface condition that operates on contradictory linear statements at PF.

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