

Full Title: Pied-Piping: Comparing Two Recent Approaches

Running Head: Pied-Piping, Part 2

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Pied-Piping: Comparing Two Recent Approaches

ABSTRACT:

The term ‘pied-piping’ is used by linguists to refer to structures where a movement operation applies to a constituent that is in some sense ‘larger than expected’. More precisely, pied-piping occurs when a movement operation that usually targets expressions of a particular type (*e.g.* *wh*-words) instead targets a phrase that *contains* an expression of that type. Pied-piping structures have long been a deep and difficult puzzle for formal syntactic theory. This is the second of two articles that present and compare two recent approaches to pied-piping, those of Heck (2008, 2009) and Cable (2010a,b). These works offer two very different perspectives on the nature of pied-piping, and thus yield rather different analyses of specific sub-phenomena. Nevertheless, there is much overlap in their general predictions and in several core assumptions. In this article, I compare the empirical predictions of Heck’s and Cable’s accounts, noting especially those areas where both approaches are challenged. The phenomena we will examine include (i) the locality constraints on pied-piping, (ii) Heck’s ‘Edge Generalization’, (iii) the apparent optionality of some pied-piping structures, and (iv) so-called ‘massive pied-piping’.

1. A Brief Review

This is the second of two papers that introduce and compare two recent approaches to pied-piping phenomena, the theories of Heck (2008, 2009) and Cable (2010a,b). In the preceding paper (“Pied-Piping: Introducing Two Recent Approaches”), I introduced the important distinction between ‘pied-piping’ and ‘pied-piping structure’, and provided summaries of Heck’s and Cable’s approaches to these phenomena. The present paper will presuppose knowledge of the preceding one. In the sections below, we will explore a variety of more specific issues concerning pied-piping structures, and we’ll critically examine the ways that Heck (2008, 2009) and Cable (2010a,b) approach these issues.

2. The Constrained Nature of Pied-Piping

One striking feature of pied-piping is how very limited the phenomenon is.¹ No language allows an operator to freely pied-pipe any and all phrases containing it. For example, as reported by Cable (2010a), even Tlingit – which permits pied-piping of relative clauses (1a) – does not allow *wh*-words to pied-pipe main predicates (1b).

- (1) a. [[**Wáa** kwligeyi CP] **xáat** NP] **sá** i tuwáa sigóo? ²
 how it.is.big.REL fish Q do.you.want
 How big a fish do you want?
 (Literally ‘A fish that is how big do you want?’) (Cable 2010b: 572)

¹ Throughout this paper, I will use the term ‘pied-piping’ in a purely descriptive sense, as an abbreviation of the longer term ‘pied-piping structure’, introduced in the preceding article. In a similar way, I will use the related terms ‘pied-pipe’, ‘pied-piper’ and ‘pied-piped phrase’ in a purely descriptive sense, as I do not wish the discussion here to necessarily presuppose the existence of (true) ‘pied-piping’, as defined in the preceding article.

² In this paper, I use the following abbreviations in glosses: ‘REL’ *relativization marker*, ‘Q’ *Q-particle*, ‘ERG’ *ergative case*, ‘ABS’ *absolutive case*, ‘GEN’ *genitive case*, ‘DAT’ *dative case*, ‘NOM’ *nominative case*, ‘3PL’ *third person plural agreement*.

- b. (i) [CP [Q] [_{DP} **Daa**] **sá**]_I [CP C_Q [TP ... [_{VP} *t*₁ iyatéén] ...]]]
 what Q you.can.see
What can you see?
- (ii) * [CP [Q] [_{VP} **Daa** iyatéén] **sá**]_I [CP C_Q [TP ... *t*₁ ...]]]
 what you.see Q (Cable 2010a: 162)

It is apparent, then, that any theory of pied-piping structures must impose some ‘brakes’ on the mechanism deriving them. This general issue is sometimes described in terms of ‘locality’: a pied-piping operator must in some sense be sufficiently ‘local’ to the phrase that it pied-pipes. For this reason, a theory of the constraints governing the internal form of pied-piped phrases is sometimes described as a theory of ‘the locality of pied-piping’.

In the work of Cable (2010a), the locality conditions on pied-piping arise from two, rather different sources. First, Cable introduces a constraint he calls ‘the QP-Intervention Condition’.

(2) **The QP Intervention Condition (Cable 2010a: 57)**

A QP cannot intervene between a functional head F and a phrase selected by F.

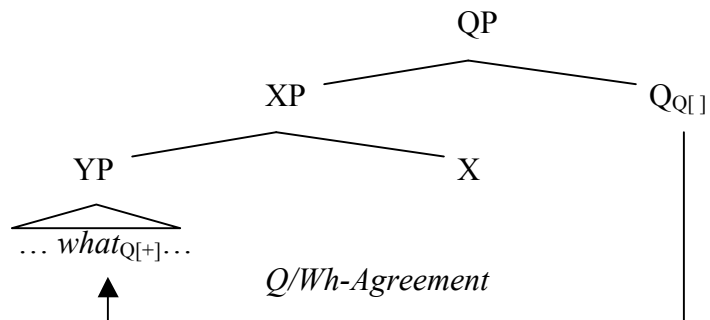
Cable (2010a: 43-62) provides much evidence that this condition holds for the overt QPs of Tlingit. For example, the constraint in (2) would seem to account for the contrast in (1b). Note that in the base-structure of the ill-formed (1bii), a QP would intervene between the functional T head and the VP it selects for, violating (2). In the well-formed (1bi), however, a QP intervenes between only the *lexical* head V and the DP it selects for, incurring no violation of (2).

Having concluded that (2) is true for the overt QPs of Tlingit, Cable (2010a) then proposes this constraint is universal across languages. Given Cable's view that all *wh*-fronting languages employ his 'Q-based' syntax for *wh*-questions, it follows that all *wh*-fronting languages will similarly disallow pied-piping of matrix predicates. Cable (2010a) states that this is an accurate prediction, as sentences parallel to (1bii) in English are similarly ill-formed.

- (3) a. What can you see?
b. * [See what] can you?

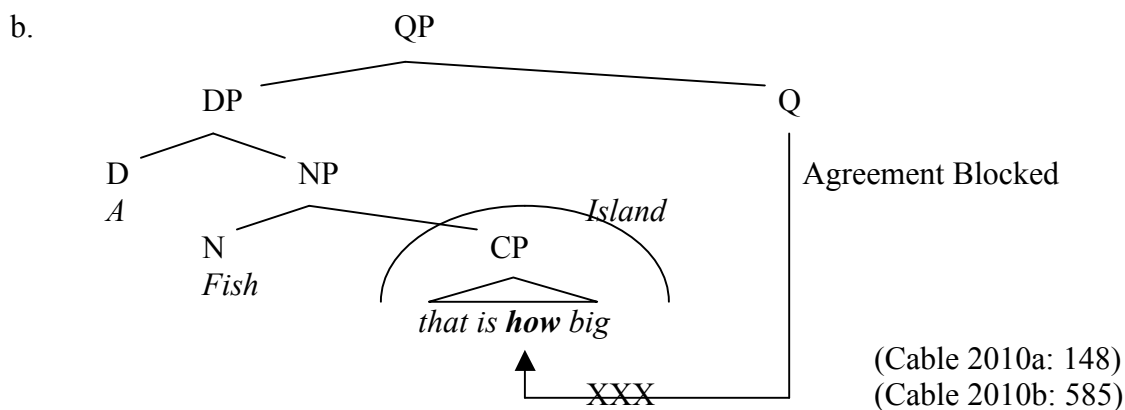
In addition to the universal in (2), Cable (2010a,b) proposes that in some languages, pied-piping is further constrained by the need for the *wh*-word and the Q-particle to Agree. That is, Cable (2010a,b) proposes that in some – but not all languages – the Q-particle bears an unvalued Q-feature, which must be valued through Agreement with a *wh*-word in its c-command domain. The structure below illustrates.

(4) **Q/Wh-Agreement in English (Cable 2010a: 146, Cable 2010b: 583)**



Although the concept of an unvalued ‘Q-feature’ on Q itself seems a bit suspect, Cable’s main contention is that some languages require an Agreement relation to be established between Q and a *wh*-word. This general view predicts that some languages will exhibit further constraints on the internal form of pied-piped phrases. For example, if some structure Y is a barrier to Agreement, then in a language where Q and the *wh*-word must Agree (*e.g.*, English), Y will not be able to dominate a *wh*-word within the pied-piped phrase. To illustrate, if relative clause islands are barriers to Agreement (as Cable assumes), then the hypothesis in (4) would correctly predict the ill-formedness of (5a) in English, as shown in (5b).

(5) a. * [A fish that is **how** big] did you buy?



Importantly, Cable (2010a,b) claims that this ‘Q/Wh-Agreement’ is *not* universal across languages; some languages do *not* require Q to Agree with the *wh*-word. Consequently, he is able to predict the contrast between English (5a) and Tlingit (1a). If Tlingit is assumed *not* to require Q and *wh* to Agree, then nothing would rule out the structure in (1a). In this way, Cable (2010a,b) proposes that all languages fall within two main types: the ‘limited pied-piping languages’ and the ‘non-limited pied-piping languages’.

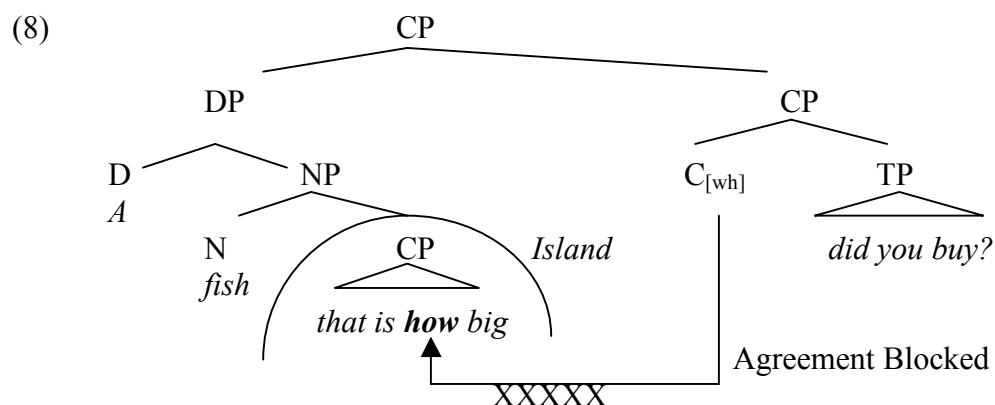
- (6) a. **Limited Pied-Piping Language (Cable 2010a: 144-145, Cable 2010b: 581)**
 A language where a *wh*-word cannot be dominated in a pied-piped phrase by either an island or lexical category.³
- b. **Non-Limited Pied-Piping Language**
 A language where a *wh*-word can be dominated in a pied-piped phrase by islands or lexical categories.

In the work of Heck (2008, 2009), the locality constraints on pied-piping receive a very different analysis, though one that shares some features with that of Cable. Like Cable, Heck identifies two main reasons why a pied-piper might not be able to pied-pipe some structure Y. First, in many cases, pied-piping of the structure Y might violate Heck's Repair Generalization. Recall that Heck's theory of pied-piping directly predicts the generalization below.

- (7) **The Repair Generalization (Heck 2008: 117, Heck 2009: 92)**
 Pied-piping of β by α is possible only if movement of α from β is blocked.

Note that (7) straightforwardly predicts the contrasts in (1b) and (3). Since the extraction of the *wh*-word from within the VP is possible in (1bi) and (3a), (7) entails that the pied-piping of the larger VP by that *wh*-word is impossible. Furthermore, Heck (2008: 117-160) shows that a myriad of observed generalizations concerning pied-piping structures across languages all follow from the simple generalization in (7).

What, though, of the impossibility of structures like (5a) in English? Since the *wh*-word is located within an island, it is not extractable, and so (7) would not be violated by such structures. For these cases, Heck (2008) shares with Cable (2010a,b) the view that the intervening island disrupts an obligatory Agreement relation. For Heck, however, this Agreement is between the *wh*-word and the interrogative $C_{[wh]}$, as illustrated below.



Thus, the pied-piping structure in (5a) would necessarily lead to a derivational crash, and so it is not a possible output of the underlying structure.

We find, then, that both Heck (2008) and Cable (2010a) view the locality conditions on pied-piping as a heterogeneous class. Certain observed constraints follow from independent

³ The restriction regarding lexical categories will be explained in the following section.

limits on syntactic Agreement, while others are due to a second general factor – for Cable, this is his ‘QP Intervention Condition’, while for Heck it is his ‘Repair Generalization’. Despite this conceptual similarity, the two accounts do make subtly different predictions. First, as noted earlier, Cable’s ‘QP Intervention Condition’ predicts that main predicates can never be pied-piped. However, as Heck (2008: 134) observes, Basque might provide a counter-example to this. In Basque, a *wh*-word can indeed pied-pipe a dominating participial phrase, as illustrated by (9a).

- (9) a. [[_{PartP} Nork idatzi]_{3-a} [da liburu hori t₃]]
 who.ERG written–ABS is book that
 By whom is that book written? (Literally ‘*Written by whom is that book?*’)
- b. * [Nork₃ [da liburu hori [_{PartP} t₃ idatzi]_{3-a}]]
 who.ERG is book that written–ABS

Importantly, Heck’s Repair Generalization predicts the contrast between (9) and (1b)/(3). Note that the ill-formedness of (9b) demonstrates that extraction of the *wh*-word from within a participial phrase is not possible in Basque. Thus, the Repair Generalization in (7) directly predicts that such *wh*-words will be able to pied-pipe the participial phrase, as in (9a).

It seems then that Heck (2008, 2009) might offer the more accurate account of the frequent inability for main predicates to be pied-piped.⁴ On the other hand, Heck’s account of the ill-formedness of (5) predicts that no language should ever allow a *wh*-word inside an island to pied-pipe that island. After all, under Heck’s account, pied-piping is driven by the need for Agreement between C and the *wh*-word to be as local as possible. However, if the *wh*-word is within a relative clause island, then no Agreement will be possible between it and C. Thus, pied-piping of an island is predicted never to ‘save’ a structure where the *wh*-word is island-internal. Consequently, it would appear that the well-formedness of sentences like (1a) in Tlingit would provide a counterexample to this prediction of Heck’s, and thereby support Cable’s theory of the facts in (1) and (5).⁵

3. Pied-Piping and the Left Edge of a Phrase

Syntacticians have long noted an interesting relationship between ‘pied-pipers’ and the left edge of a phrase (Horvath 2007a: 581-583). Generally speaking, a pied-piping operator is almost always located at the left edge of the pied-piped phrase. In the previous article, we saw that Heck (2008, 2009) dubs this pattern ‘the Edge Generalization’.

(10) The Edge Generalization (Heck 2008: 88, Heck 2009: 89)

If α pied-pipes β (and movement of α to the edge of β is grammatically possible), then α must be at the edge of β .

We also saw that (10) is a direct prediction of Heck’s theory of pied-piping. To briefly review, the logic of violable constraint interaction predicts that only (11a) below will be a well-formed

⁴ But see Cable (2010a: 228) for a reanalysis of the Basque facts, whereby the possibility of (9a) is rendered consistent with the QP Intervention Condition.

⁵ But see Heck (2008: 53-56) for a reanalysis of the Tlingit facts, whereby the possibility of (1) in Tlingit is rendered consistent with Heck’s overall theory of pied-piping.

question of German. Although German allows post-nominal possessors (11c), the structure in (11b) will incur one more violation of ‘Local Agree’ (LA) than (11a), and so will be suboptimal.

- (11) a. Ich weiss [CP [DP **wessen** [NP Bilder]] [CP C [du kaufen würdest]]]
 I know whose paintings you buy would
I know whose paintings you would buy.
- b. * Ich weiss [CP [DP [NP Bilder **wessen**]] [CP C [du kaufen würdest]]]
 I know paintings whose you buy would
- c. [DP Die [NP Bilder des Künstlers]]
 the paintings the.GEN artist.GEN
The artist’s paintings. (Heck 2008: 91)

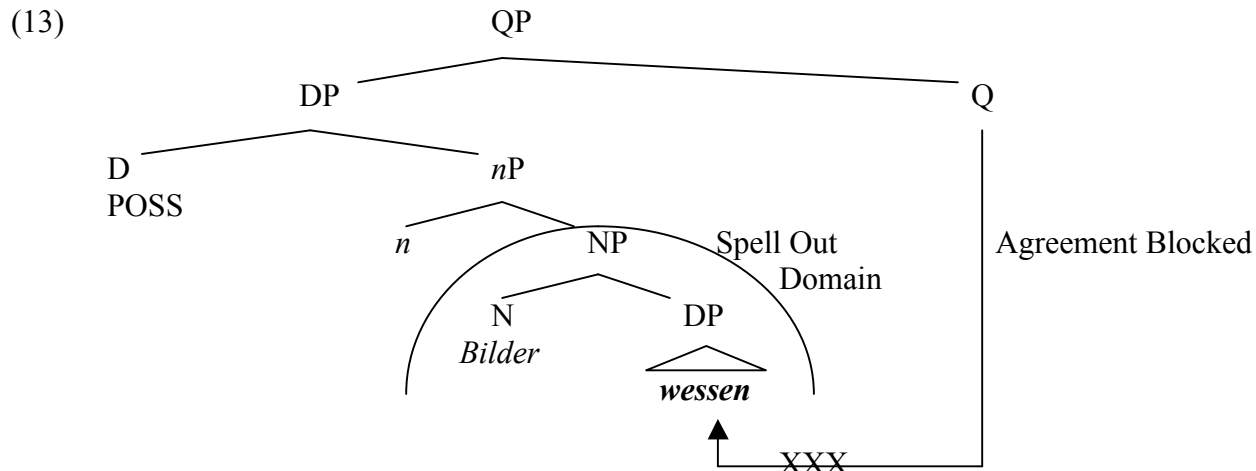
While syntacticians have long noted the tendency for pied-pipers to be left peripheral, they’ve also known obvious exception: pied-piping of PPs (Horvath 2007a: 584). As we saw in the last article, pied-piping of PPs in languages like English requires that the pied-piper remain in its base position. As shown below, movement of the pied-piper to the left-edge of P results in ill-formedness.

- (12) a. [In [**whose** honor]] was this made?
 b. * [[**Whose** honor] in] was this made?
 c. * This was made [[Dave’s honor] in]

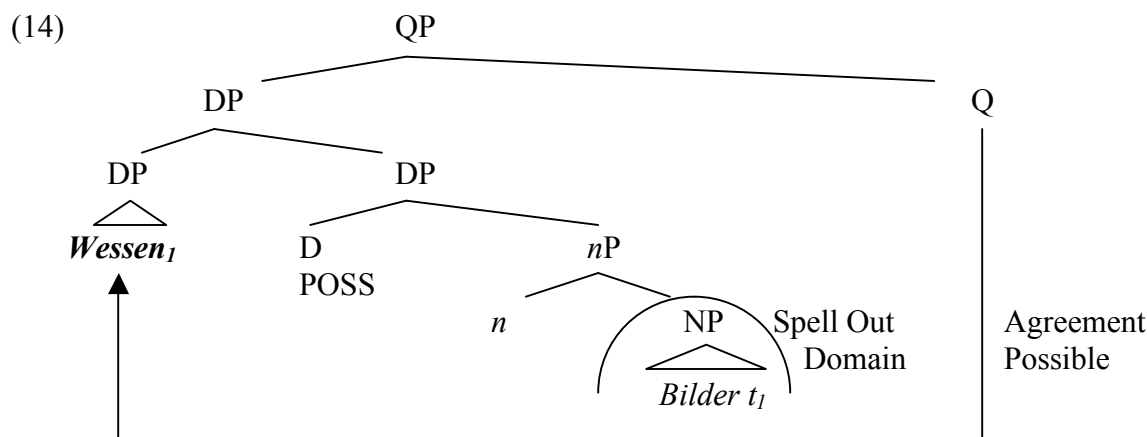
We’ve seen that Heck’s (2008, 2009) account easily explains this contrast. As shown in (12c), English and many other languages simply do not permit complements of P to move to SpecPP. The ill-formedness of such movements can be seen as due to an inviolable (undominated) constraint C of English syntax. Thus, the competition between (12a,b) will be decided by constraint C – not by LA – and so (12b) will be suboptimal.

We find, then, that Heck’s (2008, 2009) treatment of pied-piping easily predicts these long-observed patterns. But what of Cable’s (2010a,b) theory? First, Cable (2010a: 149, 2010b: 587) proposes that the ill-formedness of (11b) is akin to that of (5); in both structures, an obligatory Agree relation between the *wh*-word and the Q-particle cannot be established. In Cable’s view, the barrier to Agreement in (11b) is the lexical category NP containing the *wh*-word. Cable adopts the theory of lexical categories developed by Embick & Marantz (2008), whereby every lexical category is complement to a ‘phase head’.⁶ Under this view, the structure of the possessive DP in (11b) would be as in (13).

⁶ For reasons of space, I will not review here the theory of ‘phases’ assumed in current GB/Minimalism. For more information, the reader is referred to Chomsky (2000, 2001).



As shown above, under these syntactic assumptions, the Q-particle in (11b) would be in a separate Spell Out domain from the *wh*-word it must Agree with. Cable (2010a,b) assumes a strong version of the ‘Phase Impenetrability Condition’, under which no Agree relation can be established between heads in separate Spell Out domains. Consequently, the Q-particle cannot undergo the required Agreement with the *wh*-word in (11b), and so the structure is ruled out. However, in sentence (11a), the *wh*-word moves from the complement of N to SpecDP. As shown below in (14), this places the *wh*-word and Q in the same Spell Out domain. Thus, Q/Wh-Agreement in (11a) is predicted to be possible, and so (11a) is predicted to be well-formed.



In this way, Cable predicts that ‘pied-piping’ *wh*-words cannot (in languages like English) be dominated by lexical categories within the pied-piped phrase. Consequently, he predicts the *well*-formedness of structures like (12a), where a PP is pied-piped by the complement of P. Since prepositions are generally categorized as *functional* heads – not *lexical* heads – there need not be any phase head taking PP as complement in (12a). Moreover, since P itself is not necessarily a phase head, it follows that in a structure like (12a), the *wh*-word and the Q-particle are located within the same Spell Out domain. Thus, Q/Wh-Agreement is predicted to be possible in (12a), and so the pied-piping in (12a) is predicted to be well-formed.

But, what of the fact that, except for PP, a phrase XP can generally only be pied-piped by SpecXP? Here, Cable reasons as follows (Cable 2010a: 165-166, Cable 2010b: 591-592). First,

as we saw in (13), his account predicts that (in languages like English) a *wh*-word cannot pied-pipe a lexical category that dominates it. Therefore, a pied-piping *wh*-word must be dominated only by functional categories within the pied-piped phrase. Finally, note of the known functional categories – C, T, D, Deg, P – *only* prepositions (P) can take *wh*-words as complements. Thus, if ever a *wh*-word occupies CompXP, then unless X = P, it must be that X is a lexical category, and so the *wh*-word will be unable to pied-pipe XP. In this way, Cable (2010a,b) predicts that, except for PP, a phrase can only be pied-piped from its specifier.

It is clear, then, that both Heck (2008, 2009) and Cable (2010a,b) offer original explanations of the widely observed pattern in (10). Of course, neither account is without its problems. One noticeable problem for Cable's approach is the possibility of Agreement across lexical categories. After all, Cable's explanation of the ill-formedness of (11b) rests on the assumption that the lexical category NP blocks the Agree relation that must be established between the *wh*-word and Q. Cable thus assumes that Agreement should generally be impossible across lexical categories. However, as noted by Heck (2008: 44), this does not seem so. In Icelandic, for example, finite auxiliaries Agree with nominative complements inside VP.

- (15) Honum mundu sennilega hafa [vp líkað þeir]
 him.DAT would.3PL probably have liked they.NOM
He would have probably liked them. (Heck 2008: 44)

A related problem for Cable (2010a,b) concerns those languages where Q supposedly does *not* Agree with the *wh*-word. Recall that Tlingit is supposedly such a language, and that this accounts for the possibility of (1a). It would follow, then, that Tlingit should freely allow complements of phrases other than PP to be pied-pipers. However, Cable (2010b: 581) claims that the grammar of Tlingit independently conspires against such structures, and so the crucial prediction cannot be tested. Even more suspiciously, in every single example of Tlingit pied-piping provided by Cable (2010a,b), the *wh*-word is at the left-periphery of the pied-piped phrase. This suggests that the generalization observed in (10) does indeed hold for Tlingit, and so is independent of the putative need for Q/Wh-Agreement in the language.

On the other hand, a problem for Heck's approach concerns the ability in some languages for pied-pipers in CompPP to optionally move to SpecPP. For example, it is well-known that certain pronouns in German can undergo fronting to a position just above P, as shown in (16a).⁷

- (16) a. [pp **Wo**-mit] ist es gemacht?
 What-with is it made
 What is it done with? (Heck 2008: 254)
- b. [pp Mit **was**] ist es gemacht?
 with **what** is it made
 What is it done with? (Stefan Keine, p.c.)

Importantly, the 'inverted pronoun' structure in (16a) freely alternates with the structure in (16b), where the *wh*-word remains in CompPP. Recall, though, that Heck's theory crucially ties the possibility of structures like (16b) to the *impossibility* of fronting to SpecPP. After all, (16a) will

⁷ As can be seen by the contrast between (16a) and (16b), fronting to SpecPP causes the interrogative pronoun *was* 'what' to be pronounced as *wo* 'where'.

incur fewer violations of LA than (16b). Thus, Heck's account predicts that structures like (16b) will be sub-optimal, and so he incorrectly predicts that pied-piping of PP by CompPP is impossible in such cases.

4. Cases of Where Pied-Piping Seems to be Optional

It has often been observed that pied-piping structures are sometimes treated by languages as a kind of 'last resort' (Chomsky 1995, Roeper 2003, Heck 2008). That is, in some cases, pied-piping of a phrase XP appears to only be permitted if extraction of the 'pied-piper' from XP is not possible. For example, as illustrated in (17), pied-piping of PPs in English is felt to be degraded whenever P-stranding is possible.

- (17) a. **Who**₁ did she dance [PP with *t*₁]?
 b. ?? [PP With **whom**] did she dance?

Crucially, though, English speakers readily accept pied-piping of PPs in cases where the P-stranding competitor would not be allowable.

- (18) a. ?? [**What** way]₁ is he a natural choice [PP in *t*₁]?
 b. [PP In [**what** way]] is he a natural choice?

On the other hand, it has also often been observed that pied-piping structures sometimes appear to freely alternate with subextraction (Horvath 2007a, Cable 2010a). For example, as illustrated in (19), Russian and many other Slavic languages freely allow *wh*-possessors to either pied-pipe or extract from possessive DPs.

- (19) a. Ja sprosil [**kakuju** ty čital [*t*₁ knigu]]
 I asked whose you read book
I asked whose book you read.
 b. Ja sprosil [[**kakuju** knigu]₁ ty čital *t*₁]
 I asked whose book you read
I asked whose book you read.

Ideally, a theory of pied-piping structures would explain this seemingly paradoxical behavior, accounting for both those cases where pied-piping seems to be optional and those where it seems to only function as a last resort. Unfortunately, neither of the theories discussed here can easily account for the full range of attested cases. Indeed, neither offers a simple explanation for the contrast between English PP-pied-piping (17)/(18) and Slavic possessor pied-piping (19).

As we saw in the previous article, Heck (2008, 2009) predicts that all cases of pied-piping should exhibit the 'last resort' behavior seen for English PP-pied-piping in (17). This prediction is dubbed 'the Repair Generalization', and is stated in (7) above. As noted earlier, (7) is a direct, inescapable prediction of Heck's general approach to pied-piping. Consequently, Heck (2008: 273-294) reanalyzes alleged cases of 'optional pied-piping', so that the apparent optionality of these pied-piping structures is treated as an illusion of their surface appearance.

To illustrate, let us consider the case of Slavic possessor pied-piping (19). The possibility of both (19a) and (19b) seems to directly challenge Heck’s account. After all, structure (19a) would induce fewer violations of LA than (19b), and so (19b) should not emerge as an optimal output. Note, however, that this reasoning assumes both (i) that the only structural difference between (19a,b) is the pied-piping in (19b), and (ii) the *wh*-word *kakuju* ‘whose’ in (19a) has *extracted* from the possessive DP. Heck (2008, 2009) points out that neither of these are innocent assumptions.

First, Heck (2008: 293-294) notes (19a) and (19b) might have very different underlying structures. Following the work of Corver (1990) and Bošković (2005), it could be that (19a) has the structure in (20a), where the possessor is initially Merged as an adjunct to a bare NP.

- (20) a. Ja sprosil [**kakuju** ty čital [NP *t*₁ [NP knigu]]]
 I asked whose you read book
 I asked whose book you read.
- b. Ja sprosil [[DP **kakuju** [NP knigu]]₁ ty čital *t*₁]
 I asked whose book you read
 I asked whose book you read.

Note that (20a) indeed would fail to violate Heck’s ‘Left Branch Condition’, repeated below, and so would be predicted to be well-formed.

(21) **Left Branch Condition (Heck 2008, 2009)**

If α is the leftmost category within DP, then α can’t undergo movement from DP

Moreover, let us suppose that while Slavic languages allow bare NPs as in (20a), they can also make use of an English-like structure, where the possessor occupies SpecDP. Under this view, (19b) could have the structure in (20b), where the possessor occupies SpecDP. Note that for such a structure, extraction of the possessor would violate (21), and so Heck would predict pied-piping to be forced in such cases. Thus, we might understand the possibility of both (19a,b) as due – not to the optionality of the *pied-piping* per se – but to the option of either using a DP or a bare NP structure for possessive phrases.

Secondly, Heck (2009: 96-97) notes that (19a) needn’t be formed by *extraction* of the *wh*-word. Rather, as sketched in (22), it could be formed from extraction of the NP *knigu* ‘book’.

- (22) Ja sprosil [[DP **kakuju** *t*₂]₁ ty čital *t*₁ [NP knigu]₂]
 I asked whose you read book
 I asked whose book you read.

Furthermore, Heck notes that such ‘remnant movement’ analyses of Slavic possessor extraction have been independently defended by Abels (2003). If this is indeed the right analysis of (19a), then we find that possessor pied-piping is actually *obligatory* in Slavic languages; its obligatory status is simply obscured by independent processes of remnant movement.

In this and similar ways, Heck (2008: 273-294, 2009: 95-97) argues that truly optional pied-piping does not exist. While this may turn out to be the correct view, it should be noted that this is not a theory that seeks to predict when pied-piping will be (or appear to be) optional.

Rather, under Heck's view, truly optional pied-piping does not exist, and alleged instances of it must be explained away on a case-by-case basis.

In contrast, Cable (2010a,b) predicts that pied-piping can in principle be truly optional. Under Cable's 'Q-based' theory of pied-piping, nothing requires a Q-particle to appear as locally to a *wh*-word as possible. Consequently, it is in principle possible for both the structures in (23) to be licit.

- (23) a. [YP ... [XP ... X [QP *wh*-word Q] ...] ...]
 b. [YP ... [QP [XP ... X [DP *wh*-word] ...] Q] ...]

Given the assumption that '*wh*-fronting' actually targets the QP projected by Q, it follows that (23a) will lead to extraction of the *wh*-word alone, while (23b) will lead to a pied-piping structure where the *wh*-word is dominated by XP. In this way, Cable predicts that pied-piping of some categories can be optional, such as pied-piping of CPs in Tlingit, illustrated below.

- (24) a. [CP [QP **Goodéi** **sá**]₁ [has oowajée [CP *t*₁ wugootx] i shagóonich]]
 where.to Q they.think he.went your parents
 Where do you parents think that he went?
 b. [CP [QP [CP **Goodéi** wugootx] **sá**]₁ [has oowajée *t*₁ i shagóonich]]
 where.to he.went Q they.think your parents
 Where do you parents think that he went? (Cable 2010b: 573)

On the other hand, additional assumptions made by Cable (2010a,b) often conspire together to rule out optional pied-piping. While this might at first seem positive – after all, some languages do treat pied-piping as a 'last resort' – in actual practice this often leads to problematic predictions.

The main force militating against optional pied-piping in Cable's system is his 'QP Intervention Condition' in (2). From this condition, it follows that if a QP is ever able to extract from some phrase XP (23a), it must be that X is a *lexical* head, and not a functional one. Consequently, if Q is Merged at a position *higher* than XP (23b), there will be a lexical category intervening between Q and the *wh*-word. Therefore, if the language requires Q/Wh-Agreement, then Merger of Q above XP will be ill-formed, and so pied-piping of XP will not be possible. We find, then, that for those languages where Q must Agree with the *wh*-word (e.g. English), Cable (2010a,b) will generally share with Heck (2008, 2009) the prediction that pied-piping of XP will not be possible if extraction from XP is. Nevertheless, despite this prediction, Cable (2010a,b) still has great difficulty accounting for the exact pattern in (17) and (18). For example, Cable (2010a: 171-173) proposes that (17) might follow from the assumption that in English, P is a lexical head and not a functional one. This, however, would incorrectly predict that (18a) should also be preferred to (18b).

Thus, Cable (2010a,b) does offer a theory that (i) accepts the existence of optional pied-piping, and (ii) makes clear predictions regarding when pied-piping will *fail* to be optional. However, it seems that those predictions are often problematic. In fact, Cable (2010a: 172-173) has some difficulty predicting the apparent optionality of Slavic possessor pied-piping (19). For various reasons, Cable (2010a) must assume that Slavic languages require Q/Wh-Agreement.

Consequently, following the reasoning laid out above, the well-formedness of (19a) leads Cable to incorrectly predict that (19b) should be ill-formed. To avoid this prediction, Cable (2010a: 173) adopts the ‘structural ambiguity’ proposal sketched in (20).

In summary, cases where pied-piping freely alternates with subextraction pose major challenges to current theories of pied-piping. Heck (2008, 2009) predicts that such cases should never exist, and so must explain away alleged examples on a case-by-case basis. Although Cable (2010a,b) does predict that such cases should exist, he is unable to account for the attested examples in a completely natural way.

5. Massive Pied-Piping

We saw in Sections 2 and 3 that pied-piping structures are often subject to some rather stringent constraints. Curiously, though, there do seem to be environments where these constraints on pied-piping structures are relaxed to an extent. For example, although pied-piping of an NP by its complement is completely disallowed in embedded questions (25a), it is often reported as (marginally) acceptable in matrix questions (25b).

- (25) a. * I wonder [[pictures of **whom**] you bought on the internet].
b. ?? [Pictures of **whom**] did you buy on the internet?

Similarly, pied-piping of NP by its complement is completely disallowed in restrictive relative clauses (26a), but is rather more acceptable in appositive relatives (26b).

- (26) a. * I don’t want to see any boy [[pictures of **whom**] you bought on the internet].
b. ? I don’t want to see Dave, [[pictures of **whom**] you bought on the internet

Following Safir (1986), both Heck (2008, 2009) and Cable (2010a,b) refer to the phenomenon in (25b)/(26b) as ‘massive pied-piping’. Put more precisely, ‘massive pied-piping’ refers to cases where constraints that generally govern pied-piping structure can be marginally violated.

Ideally, a general theory of pied-piping will answer the following core questions regarding this ‘massive pied-piping’.

- (27) a. What exactly are the environments where massive pied-piping can occur?
b. Why those environments?
- (28) a. Which constraints exactly are obviated in cases of massive pied-piping?
b. Why those constraints?

Heck (2008) develops a theory of massive pied-piping that addresses each of these questions. Cable (2010a) does not offer an extensive theory of massive pied-piping, but does offer some speculations that bear on these questions. We will look at each of these approaches in turn.

Heck (2008) puts forth the following original generalization concerning massive pied-piping.⁸

⁸ Heck also puts forth a second generalization regarding massive pied-piping, his ‘Intervention Generalization’ (Heck 2008: 173). For reasons of space, I will need to put aside this generalization and its empirical import.

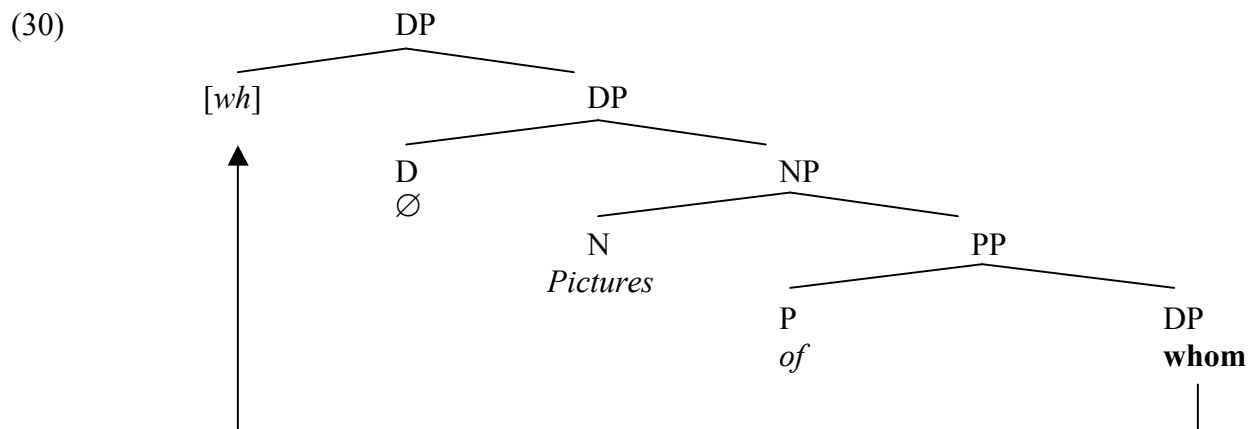
(29) **Generalization on Massive Pied-Piping (Heck 2008: 160)**

Massive pied-piping is only possible if (a) and (b) hold.

- a. The CP whose specifier is the target of *wh*-movement is not subordinated
- b. In relative clauses, the pied-piper is selected by a D-element.

Generalization (29a) states that massive pied-piping can only occur in non-subordinated CPs.⁹ Clearly, this would cover the contrast between (25a,b). Moreover, if we assume that appositive relative clauses are not truly subordinated (Fabb 1990), then (29a) would also cover the contrast between (26a,b). Thus, (29) offers a novel answer to question (27a). But, what of question (27b)? Why can massive pied-piping only occur only in unembedded clauses?

To answer this question, we must unpack Heck's (2008) theory of how massive pied-piping structures are derived. In Heck's view, massive pied-piping – unlike 'normal' pied-piping – is derived by feature movement. To illustrate, the massively pied-piped phrase in (25b)/(26b) would have the structure below.



In this structure, the *wh*-feature of the embedded *wh*-word undergoes pure feature movement, and adjoins to the dominating DP node. Interestingly, if this kind of feature-movement is allowed to occur prior to Merger of the interrogative C, then Heck's account predicts that pied-piping of the entire complex DP must occur. This is illustrated in the tableau below.

Nevertheless, explaining this 'Intervention Generalization' remains an important puzzle for future work on pied-piping. I refer the reader to Heck (2008: 173-179, 346-371) and Cable (2010a: 194-198) for more information.

⁹ For reasons of space, I will put aside the generalization in (29b) regarding massive pied-piping in relative clauses.

(31) Heck's (2008) Analysis of Massive Pied-Piping

<u>Input:</u> [CP C _[wh] [TP you [vP v [VP buy [DP wh] [DP pictures of who]...]]	LBC	LA
a. [CP Who [CP C _[wh] [TP you [vP v [VP buy [DP wh] [DP pictures of <i>t</i>]...]]		!****
b. [CP [DP wh] [DP pictures of who]...] [CP C _[wh] [TP you [vP v [VP buy <i>t</i>]...]]		**
c. [CP wh] [CP C _[wh] [TP you [vP v [VP buy [DP <i>t</i>] [DP pictures of who]...]]	!*	*


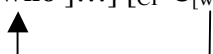
As shown above, if the feature movement in (30) occurs in the base structure, then only the massive pied-piping output in (31b) is optimal. Movement of the *wh*-feature alone (31c) would incur a violation of the highly ranked constraint LBC (21). Moreover, the standard algorithm for probing entails that the interrogative C must Agree with the *wh*-feature adjoined to the complex DP (Chomsky 2000, 2001). Consequently, movement of the *wh*-word alone (31a) would not reduce the violations of LA, and so such a candidate would incur more violations of LA than massive pied-piping of the complex DP.

In this way, Heck's (2008, 2009) theory of pied-piping can use feature-movement to derive massive pied-piping structures like (25b)/(26b). Under this analysis, it follows that massive pied-piping structures should appear to violate Heck's 'Repair Generalization' (7). If we assume that the feature movement in (30) is optional, then Heck's system will also be able to generate the structures in (32) below.¹⁰ The tableau in (33) illustrates.

- (32) a. [**Who**₁ [did you buy [pictures of *t*₁] on the internet]]?
b. I don't want to see Dave, [**who**₁ [you bought [pictures of *t*₁] on the internet]].

¹⁰ Heck (2008: 322-328) does not actually assume that the feature movement itself is optional. Rather, he assumes that the movement is obligatorily triggered by the presence of a (possibly null) D-head adjacent to the *wh*-word. However, the presence of that D-head is itself claimed to be optional, ultimately deriving the optionality of a structure containing the feature-movement in (30).

(33) Derivation of Non-Massive Pied-Piping

Input: [CP C _[wh] [TP you [vP v [VP buy [DP [NP pictures of who]...]]	LBC	LA
a. [CP Who [CP C _[wh] [TP you [vP v [VP buy [DP [NP pictures of <i>t</i>]...]] 		**
b. [CP [DP [NP pictures of who]...] [CP C _[wh] [TP you [vP v [VP buy <i>t</i>]...]] 		!***

As shown above, if the feature movement in (30) *does not* occur in the base structure, then only the *wh*-extraction output in (33a) is optimal. Since no feature movement has taken place, the interrogative C Agrees with the *wh*-word itself. Thus, the massive pied-piping output (33b) will incur more violations of LA than simple *wh*-extraction (33a).

Therefore, under Heck's account, the apparent ability for massive pied-piping to be optional – and thus to violate the 'Repair Generalization' (7) – is ultimately illusory, since massive and non-massive pied-piping are derived from different base structure inputs. Similarly, Heck's theory predicts that massive pied-piping should appear to violate his 'Edge Generalization' (10). Since the *wh*-word in (25b)/(26b) does not occupy a left-peripheral position, these structures seem to counter-exemplify (10). However, as shown in (31), Heck proposes that the pied-piper in these structures is actually the (unpronounced) *wh*-feature, which has undergone movement to the left-periphery of the complex DP. Thus, under Heck's analysis, massive pied-piping structures will actually be entirely consistent with (10).


Our preceding discussion reveals the way in which Heck's theory of massive pied-piping provides answers to questions (28a,b). The only remaining question to address is (27b): why is massive pied-piping disallowed in embedded clauses? Before we present Heck's explanation, let us first put aside an objection that some might consider raising. Recall that in the preceding article, we saw several arguments by Heck (2008, 2009) that feature-movement should *not* be used to analyze pied-piping. Is not Heck's own analysis of massive pied-piping subject to those same criticisms?

Interestingly, it is not. First, we should note that the aforementioned arguments were directed against analyzing *all* pied-piping as involving feature movement, even the non-massive pied-piping seen in embedded clauses. A key empirical argument against such an approach was the ability for specifiers to be pied-pipers. To recall, if all pied-piping were derived by feature-movement, then basic possessor pied-piping (11a) would require extraction of the *wh*-feature from SpecDP, in violation of the LBC (21). With this in mind, consider the fact that *massive* pied-piping by specifiers seems to be impossible (Heck 2008: 303-315).


- (34) a. The elegant parties, [[to be invited to one of **which**] was a privilege] ...
 b. * The men, [[for **whom** to be invited to one of the parties] was a privilege] ...

Thus, unlike normal, non-massive pied-piping, massive pied-piping exhibits exactly those properties that one would expect if it were formed via feature-movement. On these and similar grounds, Heck (2008: 303-315) claims that it is correct to employ feature movement in the derivation of massive pied-piping. Normal pied-piping, on the other hand, should be analyzed only in terms of the violable satisfaction of Local Agree.

But, why is massive pied-piping restricted to unembedded clauses? Unfortunately, the explanation developed by Heck (2008: 331-335) rests on some unusual assumptions and stipulations concerning selection. First, Heck assumes that in cases of non-massive pied-piping, a verb selecting for an interrogative complement selects not for the CP itself, but rather the *wh*-word buried within the specifier of the CP. This is illustrated below.

- (35) [Dave [asked [CP [PP in [DP [DP **whose**] honor]] [CP the festival was held]]]
- 
- Selection*

Secondly, Heck (2008: 332) stipulates that the selection relation indicated above cannot hold between a head and a feature that has undergone movement. Consequently, if a massively pied-piped phrase occupies the specifier of a complement clause, the selecting verb will not be able to satisfy its selection requirements. This is illustrated in (36).

- (36) [Dave [asked [CP [DP **wh**] [DP pictures of who]] [CP you bought]]]
- 
- Selection Prevented*

In this way, Heck accounts for the contrast between (25a,b). But what of the parallel data for relative clauses in (26a,b)? In order to extend the account in (36) to relative clauses, Heck (2008: 331-332) assumes that relative clauses are in some sense ‘selected’ by the noun they modify. It should be noted, though, that this unusual assumption follows from a system where all Merger is feature-driven (Collins 2002, Heck 2008: 331).

In summary, Heck (2008) develops a theory of massive pied-piping that supplies clear answers to all the questions in (27) and (28). Can the system of Cable (2010a,b) provide comparable results? Unfortunately, Cable (2010a) does not provide as comprehensive an account of massive pied-piping. However, he does offer some speculative proposals that address most of the questions in (27)-(28).

In order to allow for massive pied-piping structures, Cable (2010a: 191) introduces the following stipulation.

(37) **Optionality of Q/Wh-Agreement in Non-Subordinate CPs (Cable 2010: 191)**

In Q/Wh-Agreement languages, it is marginally possible in non-subordinated CPs to employ Q-particles that have valued Q-features. Thus, in the non-subordinated CPs of Q/Wh-Agreement languages, it is (marginally) possible for a Q-particle *not* to Agree with any *wh*-word.

Under the assumption that appositive relatives are not embedded, the stipulation in (37) will derive the marginal well-formedness of (25b) and (26b). After all, we saw in Section 3 that under Cable’s view, the ill-formedness of (25a)/(26a) results from the inability for Q/Wh-Agreement to

cross the lexical category (NP) dominating the *wh*-word. Consequently, if the need for such Agreement were (marginally) suspended in unembedded clauses, then those structures would be (marginally) well-formed.

In this way, Cable's stipulation in (37) provides an answer to question (27a); following Heck (2008, 2009), Cable proposes that massive pied-piping is limited to unembedded clauses. Of course, the stipulation in (37) remains mysterious, and so no answer is provided for question (27b). Cable explicitly makes no attempt to derive the stipulation in (37), and it is rather unclear why use of 'valued Q' would be limited to non-embedded clauses. On the other hand, we also saw that Heck's (2008) proposed answer to (27b) rests upon several mysterious stipulations. Arguably, then, neither account provides a wholly satisfying explanation for why massive pied-piping is disallowed in embedded clauses.

Although Cable's stipulation in (37) does not answer all of (27), it does offer clear answers to (28). Since massive pied-piping structures are derived by weakening the need for Q/Wh-Agreement, Cable predicts that massive pied-piping should obviate those constraints that are due to limits on Q/Wh-Agreement. Cable (2010a: 192-194) argues that this prediction is correct, as many of the constraints he attributes to the need for Q/Wh-Agreement indeed seem to be obviated in massive pied-piping. Furthermore, Cable (2010a: 193-194) predicts that *only* these constraints should be obviated in massive pied-piping. Thus, massive pied-piping should still be subject to the constraints that follow from Cable's QP Intervention Condition (2). Given that structures like (38) seem to be just as ill-formed as ones like (39), Cable concludes that this prediction is also accurate.

- (38) a. * [See **what**] can you? (viz. (3))
 b. * I just met Rachael Maddow, [[see **which**] you can on TV every night].
- (39) a. * I wonder [[see **what**] you can].
 b. * I don't want to meet anyone [[see **which**] you can on TV every night].

In addition to the facts discussed above, both Heck (2008: 346-371) and Cable (2010a: 194-198) examine a variety of further 'intervention' conditions on massive pied-piping, first observed by Nanni & Stillings (1978). Although space precludes even a summary discussion of these other, intricate patterns, they remain an important area for future research. It should also be noted that while Heck (2008) offers well-developed analyses of these 'intervention conditions', Cable (2010a) does not, and only provisionally restates the basic generalizations in terms of his Q-based theory. The reader is referred to these works for more details.

6. Summary

In these two articles, we have introduced and then compared two recent, book-length treatments of pied-piping phenomena, Heck (2008, 2009) and Cable (2010a,b). We've seen that Heck and Cable offer two very different perspectives on pied-piping. Heck argues that pied-piping results from the interplay between violable constraints on syntactic form. Cable argues that pied-piping as such does not exist; rather, putative cases of pied-piping involve normal phrasal movement of a phonologically null QP.

Despite these very different general perspectives, we've seen that there are many analytic and empirical similarities between these works. Both works eschew mechanisms of 'feature

percolation'. Both view the locality constraints on pied-piping as a heterogeneous class; some of these constraints derive from more general constraints on Agree, while others derive from a second mechanism. Finally, both these accounts are challenged by (alleged) cases of optional pied-piping, and both have difficulty explaining why massive pied-piping is restricted to non-embedded clauses. We might hope that the areas of consensus between Heck (2008) and Cable (2010a) mark real regions of progress in our understanding of pied-piping phenomena, while areas of disagreement and shared difficulty indicate paths for future work on the subject.

Finally, it is worth noting that these works together make clear that pied-piping is a thoroughly syntactic phenomenon. That is, contrary to the hope expressed in early Minimalist literature (Chomsky 1995), pied-piping cannot be understood as a 'PF-driven' phenomenon. Rather, in-depth study of the constraints governing pied-piping reveals them to be thoroughly syntactic in nature. Although GB/Minimalism has long given up the hope of deriving phrasal movement from PF-interface conditions (Chomsky 2000, 2001), we might nevertheless pause for a moment to appreciate that pied-piping *is* a syntactic problem, and a rather deep one at that.¹¹

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¹¹ For more arguments against the notion that pied-piping is driven by concerns of PF-well-formedness, see Horvath (2007a: 623-628).

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