On parasitic gaps in relative clauses and extraction from NP *

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1.   Introduction

This paper contributes to a body of research using parasitic gaps (PGs; Engdahl 1983, Culicover and Postal 2001, a.o.) to explore the nature of movement (Nissenbaum 2000, Legate 2003, Overfelt 2015b, Bondarenko and Davis 2019, Davis 2020, a.o.). In particular, this paper examines the implications of a particular variety of PG for the hypothesis that movement paths often involve several successive-cyclic steps:

(1)   *A schema for a successive-cyclic movement path*
$[_{XP}$ α X ... $[_{YP}$ t Y ... $[_{ZP}$ t Z ... t]

For extensive recent discussion about this influential hypothesis, see Abels (2012), Citko (2014), Davis (2020), and references therein. Many works in this vein argue that movement is successive-cyclic when exiting *phases* (Chomsky 2000, 2001, a.o.), which are the cycle-demarcating domains that bound the formation of syntactic dependencies. The set of phases is generally taken to be vP, CP, and sometimes DP. Importantly for this paper, a growing body of research in both syntax and morpho-phonology argues that there is also a phase below D—in essence, the NP (Marvin 2003, Newell 2008, Embick and Marantz 2008, Embick 2010, Newell and Piggott 2014, Simpson and Syed 2016, Syed and Simpson 2017, Bayırlı 2017, Simpson and Park 2019, a.o.). If NP is a phase, then we make the general prediction that movement from it must pass successive-cyclically through its edge:

(2)   *Prediction: Successive-cyclic movement via edge of NP (as well as CP, vP, etc.)*
Who did you take $[_{DP}$ a $[_{NP}$ $\boxed{t}$ $[_{N'}$ picture of t]]]?

In this paper, I argue that the possibility of such movement is revealed by PGs in relative clauses licensed by extraction from NP—a phenomenon that has received little attention:[1]

(3) *PG in relative clause licensed by phrase A′-extracted from the same NP*

     a. Who$_1$ did Mary take [[pictures of t_1]$_2$ [that __$_2$ weren't that flattering to **PG**$_1$]]? (Citko 2014, ex. 105)

     b. That's the teacher who$_1$ I know [[a student of t_1]$_2$ [who's __$_2$ had a very intense grudge against **PG**$_1$ since last year]].

     c. Mary is very picky about art. [This kind of person]$_1$, I could never paint [[an image of t_1]$_2$ [that __$_2$ would be able to satisfy **PG**$_1$ even a little]].

     d. Mary is the one who$_1$ I painted [a silly portrait of t_1]$_2$ [that John likes to give copies of __$_2$ to friends of **PG**$_1$ at every chance he gets].

     e. Let me tell you [which cafe]$_1$ I learned [[something about t_1]$_2$ [that __$_2$ really makes me want to avoid **PG**$_1$]] [as I was watching the news today].

     f. I just got a kitten $\varnothing_1$ that I'm gonna go buy [[a toy for t_1]$_2$ [that __$_2$ I think will be likely to entertain **PG**$_1$]].

The main point of this paper is is as follows: If (restrictive) relative clauses are adjoined to NP, below determiners/quantifiers (Quine 1960, Stockwell et al. 1973, Partee 1975, Heim and Kratzer 1998, a.o.) and if PGs depend on successive-cyclic movement of their licensing phrase through the edge of the phrase to which the PG-container adjoins (Nissenbaum 2000, Legate 2003, Davis 2020), then PGs in relative clauses of the sort shown above reveal the availability of an intermediate landing site in the NP edge. I argue that this result has interesting implications for a number of other topics in syntactic theory.

2. Background: PGs and intermediate landing sites

It is well-known that a PG and its antecedent (=“licenser") can be separated by an island. Use of an island also makes it clear that a given gap is indeed “parasitic". I assume following previous research that this is so because PGs do not involve movement from an island, but rather, island-bounded movement of a separate operator (Contreras 1984, Chomsky 1986, Browning 1987, Nissenbaum 2000, a.o.). This is illustrated with an adjunct island in (4):

(4) *Island-bounded operator movement forming a PG*
     Who$_1$ did you forget about t_1 [[$_{AdjunctP}$ **OP** after talking to t_{OP}(=**PG**)]]?

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[1]Aside from Citko (2014), which I discuss in section 3, the only other work I know to have mentioned such examples is Matushansky (2005), who reports that they are ungrammatical. However, 12/16 individuals who have provided me with their judgments (plus several anonymous conference reviewers) accept this PG configuration. As Engdahl (1983) notes, there is considerable inter-speaker variation in the acceptability of PGs, so I will not dwell on the fact that not all speakers accept these relative clause examples. Rather, I will focus on the general implications of the fact that many speakers do accept them.

Nissenbaum (2000) argues that many PGs are formed by the operator-hosting phrase adjoining to an intermediate landing site of successive-cyclic movement. His account of PGs in sentential adjuncts like that in (4), which I extend to PGs in relative clauses, is as follows.

The PG-forming operator moves to the edge of the island, triggering Predicate Abstraction (Heim and Kratzer 1998). If the island is a sentential adjunct as in (4), its original type t is thus raised to <e,t> (assuming semantic vacuity of the operator). Also, the licensing phrase that ultimately binds the PG successive-cyclically A′-moves through vP. This triggers an application of Predicate Abstraction in vP as well, creating an <e,t> position in it (which is immediately saturated by the trace of that successive-cyclic movement). The type <e,t> adjunct can adjoin to the <e,t> node in vP, and combine with it by Predicate Modification (Heim and Kratzer 1998). This conjoins their denotations, creating another type <e,t> node in vP. This third <e,t> node is saturated by the intermediate trace of successive-cyclic A′-movement from vP. Consequently, the A′-moved phrase which left that trace binds its original trace, and the trace of the moved operator in the adjunct, which is the PG.[2] [3] [4]

(5)   *The derivation of a PG in an adjunct of vP*

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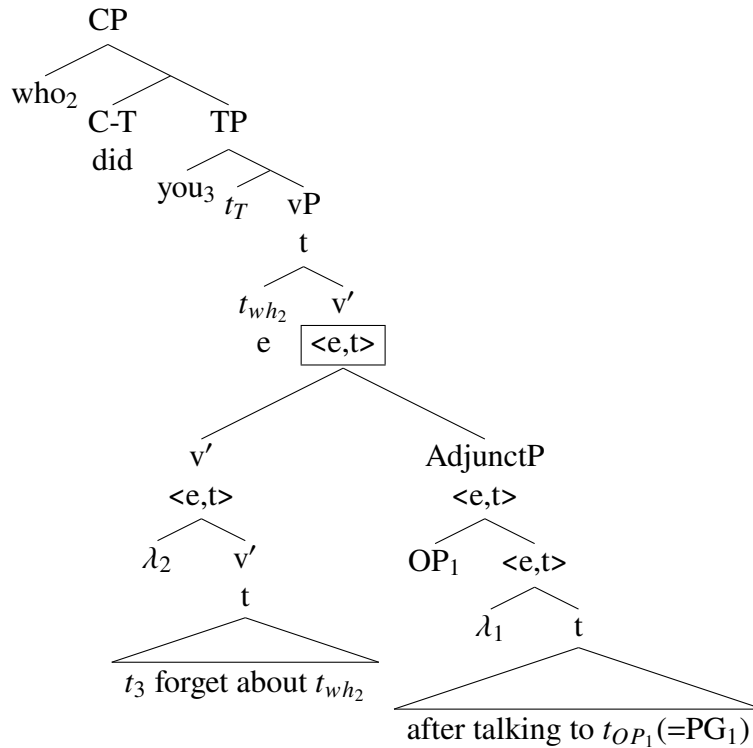
[2]Here I adopt from Nissenbaum the simplifying assumption that vPs and vP modifiers (like sentential adjuncts) are type t, modulo A′-movement within them triggering Predicate Abstraction.

[3]Heim & Kratzer implement Predicate Abstraction by inserting a node bearing an index co-referent with the variable that corresponds to the traces(s) of movement, and converting this into a λ-term at LF. For simplicity, I diagram the nodes inserted by Predicate Abstraction as bearing a λ with the relevant index.

[4]Unlike Nissenbaum, I assume that successive-cyclic movement in vP precedes merger of the adjunct, following works arguing that adjuncts merge late (Lebeaux 1988, Stepanov 2001, Zyman To appear, a.o.). Late adjunction renders the intermediate trace of the licenser (t_{wh_2}) and its corresponding λ_2 non-local in (5). These elements were local before adjunction, however, and after adjunction the structure remains interpretable.

Under this account, movement of a semantically vacuous operator within the island is necessary to make it a predicate, whose saturation results in "parasitic" binding of the gap in the island. Importantly, that island must combine with a position created by successive-cyclic movement of the PG-licensing phrase, since due to Predicate Abstraction such a position is a predicate that will be saturated by a trace of that licensing phrase. Significantly, this syntax/semantics for PGs makes a more general prediction:

(6)   *Prediction about PGs and (intermediate) landing sites*
        If a PG-containing phrase can be interpreted when adjoined to a given position, that position must be a possible (intermediate) landing site for movement.

Legate (2003) uses this reasoning to argue for successive-cyclic movement in various verbal constituents. I will use this reasoning to show how PGs in relative clauses indicate the possibility of movement via the edge of NP.

3.   The position of relative clauses and its significance

Citko (2014) notes the existence of PGs in relative clauses, which she suggests may constitute evidence for successive-cyclic movement from DP, given a general prediction about PGs like that stated in (6) above. As Citko discusses, this proposal requires the assumption that relative clauses can be merged in the projection of D. Many recent works do take DP to be a phase, and thus a domain which movement from must be successive-cyclic (Heck and Zimmermann 2004, Bošković 2005, 2016, Newell 2008, Newell and Piggott 2014, Syed and Simpson 2017, Simpson and Park 2019, a.o.). If relative clauses could be merged to DP, the possibility of PGs in relative clauses could thus be taken as evidence for successive-cyclic movement from DP. There is a problem with this proposal, however.

Much work has argued that (restrictive) relative clauses are adjective-like predicates that attach to NP, below any determiners or quantifiers (Quine 1960, Stockwell et al. 1973, Partee 1975, a.o.). Thus following Heim and Kratzer (1998), I assume that both NPs and relative clauses are predicates of individuals <e,t>, which merge together and are interpreted via Predicate Modification (7):

(7)   *Relative clauses merge in NP*
        $\{x \mid x \text{ is cat}\}_{[[N']]} \cap \{x \mid x \text{ has a long tail}\}_{[[CP]]}$
        $= \{x \mid x \text{ is cat and x has a long tail}\}_{[[NP]]}$ ('cat that has a long tail')

Several pieces of syntactic evidence support this proposal. For instance, ellipsis within NP can include relative clauses, but leave the rest of the DP behind:

(8)   *Relative clause and NP ellipsis*
        I brought four different kinds of cakes to the party. Mary liked [two [*N'* cakes [that I brought]]], but Bill liked [all four ~~[*N'* cakes [that I brought]]~~]!

Relative clauses can also be included in a segment of NP subjected to *one*-replacement:

(9)   *Relative clauses and "one"-replacement* (Bhatt 2015, 32a)
        Bill admires the very tall [**student who came to Tom's lecture today**]. Antony admires the very short **one**.
        (*one* substitutes for '[$_{N'}$ [student] [who came to Tom's lecture today]]')

Additionally, the quantificational determiner *every* c-commands and thus can license NPIs like *ever* and *any* in a relative clause of the same nominal, but not within the containing clause, which it does not c-command (Ladusaw 1979, Overfelt 2015a, a.o.):

(10)   *NPI licensing by "every"* (Overfelt 2015a, ex. 10)

        a.   [$_{DP}$ **Every** [$_{NP}$ guest [who ate **any** of the potato salad]] became ill.
        b.   * [$_{DP}$ **Every** [$_{NP}$ guest [who became ill]] ate **any** of the potato salad.

These facts are all consistent with the proposal that relative clauses are adjoined below D, in NP. See Donati and Cecchetto (2011) and Bhatt (2015) for further evidence.

Importantly, if (restrictive) relative clauses are merged in NP, then PG-licensing in a relative clause by extraction from NP indicates the possibility of successive cyclic A′-movement through the NP edge. This is illustrated in detail in the next section.

4.   The derivation of PGs in relative clauses

In the basic case NPs denote predicates from individuals to truth values <e,t>, as mentioned above, and as shown in (11a). When successive-cyclic movement through the NP edge occurs, such movement will apply Predicate Abstraction in the NP, adding a λe to its denotation. This creates a two place predicate <e,<e,t>> in the NP, as in (11b):

(11)   a.   *Before movement from NP*   b.   *After movement from NP*

The first λe of the two place predicate in (11b) is saturated by the type e trace that successive-cyclic movement from NP formed. This yields a typical type <e,t> NP, ready to combine with a determiner or quantifier. Importantly, this intermediate <e,<e,t>> position in the NP

facilitates the interpretation of a PG-bearing relative clause. Before showing why this is the case, however, let's examine the construction of a PG-containing relative clause.

I assume that the gap of relativization, and the PG in the relative clause, are each formed by movement of an operator. The correct interpretation emerges from these two operators forming crossing paths, with the higher one moving first, and the lower one "tucking-in" (Richards 1997, a.o.) below it in the relative clause's edge. Both of these operator movements trigger Predicate Abstraction, ultimately making the relative clause type $<e,<e,t>>$, as illustrated by (12) below. Following Heim and Kratzer (1998), I assume that Predicate Abstraction inserts a λe on top of the sister of the landing site of the moved phrase. Assuming that this process occurs in a maximally local way, when a PG-forming operator tucks-in below a relativizing one as in (12), the former will insert its corresponding λe above that previously formed by movement of the latter. The result is two stacked semantic argument positions, in reverse order relative to the phrases whose movement formed them:[5]

(12)   *Derivation of a PG-containing relative clause*

$$
\begin{array}{c}
\text{CP} \\
<e,<e,t>> \\
(\lambda y.\lambda x.x \text{ weren't that flattering to } y)
\end{array}
$$

OP$_{REL_1}$ OP$_{PG_2}$ C′
$<e,<e,t>>$
λ_2 C′
$<e,t>$
λ_1

that t_{REL_1} weren't that flattering to t_{PG_2}

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[5]To explain certain facts about multi-PG contexts, Nissenbaum (2000) proposes that overlapping operators move with crossing paths, as I have assumed above. If the operators in structures like (12) really behave in this way, then we make an additional prediction, given the following consequence of Nissenbaum (2000):

(i)   When multiple phrases form specifiers of vP upon successive cyclically A′-moving from it, a single PG in a sentential adjunct of that vP can only be licensed by the structurally highest moved phrase. (See Fox and Nissenbaum (2018) and Davis (2020) for discussion of why this consequence holds.)

In isolation, movement of relativizing and PG-forming operators can both license (additional) PGs. Given (i), if in structures like (12) the movement of the PG-operator tucks-in beneath that of the relativizing operator (presumably in the vP phase and also in their final landing sites), then we expect a second PG in an additional island to only be successfully licensed by the relativizing movement. This is true, as we see in (ii):

(ii)   Guess who$_1$ I painted [a silly portrait of t_1]$_2$ [that John likes to give copies of ___$_2$ to friends of PG$_1$...
      ...[**in order to make them want to buy PG$_2$**]] / *...[**in order to introduce them to PG$_1$**]]

We have just seen that a PG-containing relative clause is type <e,<e,t>>. We saw in (11b) above that the N′ sister of an intermediate trace formed by successive-cyclic movement from NP is also type <e,<e,t>>. Assuming a more general version of Predicate Modification that can semantically combine the denotations of any two nodes of the same semantic type (Partee and Rooth 1983, Nissenbaum 2000, Nissenbaum and Schwarz 2011), the PG-containing relative clause and this N′ can thus be merged together and interpreted.[6] In the structure in (13) below, we see a boxed type <e,<e,t>> N″ that illustrates the result of such merger. Here the first semantic argument λe of the boxed function is saturated by the trace of successive cyclic movement through NP. This yields a type <e,t> NP, denoting a set of entities that are pictures of, but not flattering to, the referent of the extracted phrase *who*. This NP is fit to undergo Functional Application with D/Q as usual, and the derivation will successfully achieve an interpretable result.

(13)   Who$_1$ did Mary take **[pictures of t_1 [that weren't that flattering to PG$_1$]]**?
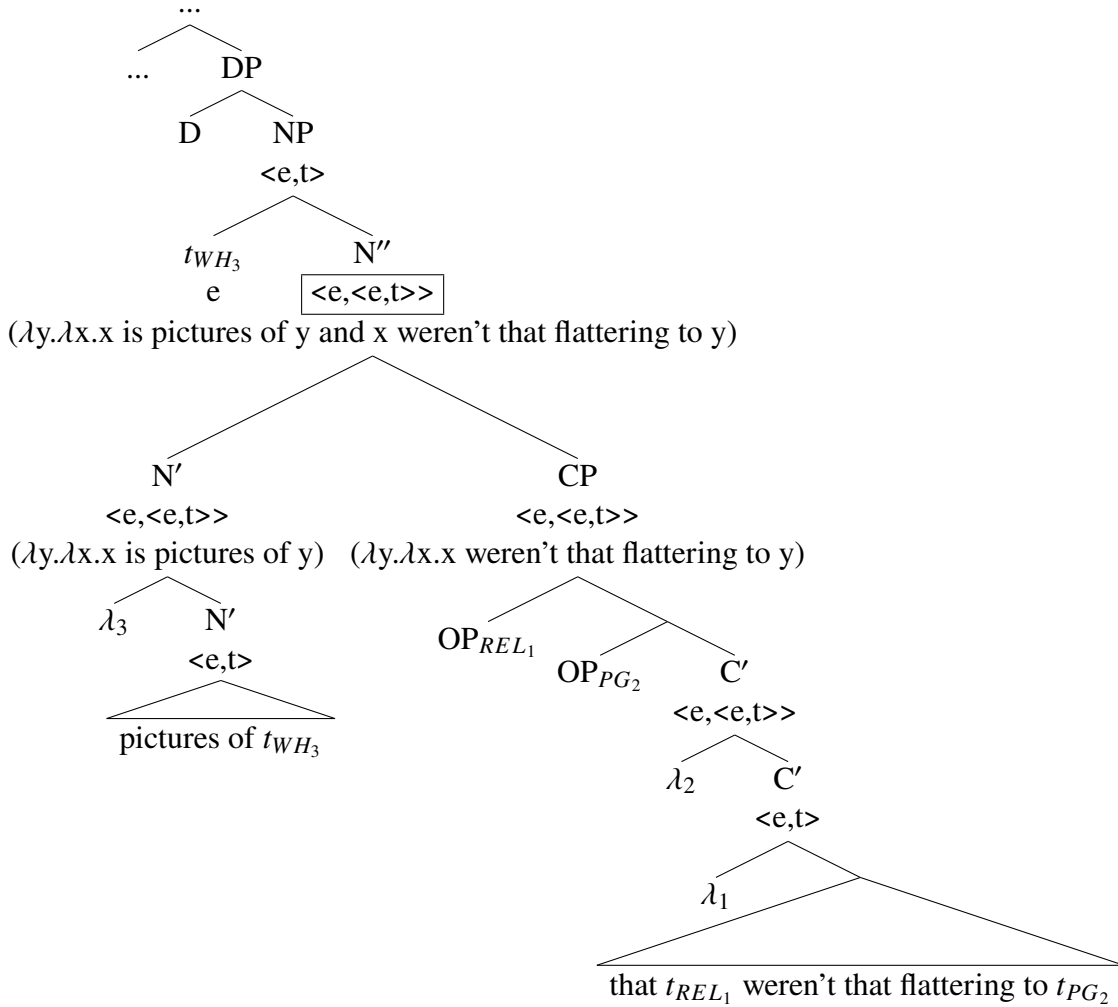
In summary, a PG-bearing relative clause is a two-place predicate, whose interpretation depends on it merging to another two-place predicate. Since relative clauses adjoin to NPs, which are usually type <e,t>, successive-cyclic movement from NP must occur to create a two-place predicate N′ that the PG-bearing relative clause can merge to.[7]

4.1 On the order of the gaps

In all PG-containing relative clauses shown so far, the gap of relativization precedes the PG. Interestingly, reversing these gaps is not acceptable, as (14) shows:

(14)   *Reltivization gap must precede PG*

   a.   Who$_1$ did you paint [a silly portrait of t_1]$_2$ [that John likes to give copies of __$_2$ to friends of PG$_1$]?

   b.   *?? Who$_1$ did you paint [a silly portrait of t_1]$_2$ [that John likes to send friends of PG$_1$ copies of __$_2$]?

   c.   Let me tell you [which animal]$_1$ I made [a statue of t_1]$_2$ [that I intend to send __$_2$ to a fan of PG$_1$].

   d.   *?? Let me tell you [which animal]$_1$ I made [a statue of t_1]$_2$ [that I intend to send a fan of PG$_1$ an exact copy of __$_2$].

Descriptively speaking, the relativized NP always co-refers with the first gap, and the phrase extracted from NP with the second gap. I argue that this is what we expect: First, assume that Predicate Abstraction in NP triggered by successive cyclic extraction always forms the outer λe of the resulting type <e,<e,t>> N′, as in (11b) above. Second, assume

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[7]Aside from the operator movement analysis, there are at least two other analyses of relativization. (See Bhatt (2015) for a recent overview.) One is the *matching* analysis, in which what moves is an NP identical to the "head" of the relative clause (though partially deleted at PF). This analysis is compatible with this paper's proposals, since it only differs from the operator analysis in positing that the constituent that moves to form the relative clause has some notable internal structure. There is also the *raising* analysis, for which the NP that heads the relative clause originates within that clause. The influential version of the raising analysis in Kayne (1994) involves this NP moving to the edge of the relative CP, and that CP then being selected by D (i). Here the NP that "heads" the relative clause is not modified by CP, but rather a C′, since C is assumed to project:

(i)   This is [$_{DP}$ the [$_{CP}$ [$_{NP}$ **book**]$_1$ [$_{C'}$ that I read t_1]]].

As (13) above shows, I have argued that when extraction from NP licenses a PG in a relative clause, such extraction saturates the <e,<e,t>> segment of NP to which the PG-containing relative clause adjoined. This saturation yields a type <e,t> NP that can semantically compose with D/Q as usual. In contrast, for the raising analysis the sister of D/Q in this case would not be NP, but CP. This assumption is awkward, however, since this CP would need to have the semantics of an NP in order for semantic composition with D/Q to succeed. However, Cecchetto and Donati (2015) argue for a general theory of labeling for which in a raising relative, movement of the "head" noun re-labels the relative CP as NP. Given this modification, there is no need to assume that D/Q can select CP rather than NP, or that a CP can have the semantics of an NP. This account also makes a raising analysis of relative clauses straightforwardly compatible with this paper's arguments.

that in the PG-hosting relative clause, the higher of the two operators moves first, and the second tucks-in below it, as in (12-13). As described above, if Predicate Abstraction applies in a cyclic and local way, the operator that moves second and tucks-in will trigger insertion of a corresponding λe above the λe formed by the prior movement of the first operator. The result is two stacked semantic argument positions, in reverse order relative to the operators whose movement formed them, as we saw in (12-13). Importantly, notice that given these considerations, the outer λe of the type <e,<e,t>> PG-containing relative clause will always correspond to the inner of the two moved operators, which in turn always corresponds to the second gap in the relative clause. Predicate Modification unites the outer λe of the <e,<e,t>> PG-containing relative clause with the outer λe of the <e,<e,t>> N′ that the relative clause merges to, as we saw in (13) above, yielding yet another <e,<e,t>> constituent. The first λe of that resulting function will be saturated by the trace of the phrase that A′-moves from NP. Consequently, the extracted phrase will always bind both its actual trace in NP, as well as whatever the second gap in the relative clause happens to be. This is the correct result.

5.   An asymmetry with stacked relative clauses

Nissenbaum (2000) observed that when one CP hosts two sentential adjuncts, both can have a PG, but when only one of the adjuncts has a PG, it must be the inner of the two (15):

(15)   *Multiple sentential adjuncts*

    a.   Guess [which computer]$_1$ we'll try to buy t_1 [without even reading reviews about **PG**$_1$] [after getting funding from the department for **PG**$_1$].

    b.   Guess [which computer]$_1$ I'll try to buy t_1 [without even reading reviews about **PG**$_1$] [after I get my next paycheck].

    c.   *?? Guess [which computer]$_1$ I'll try to buy t_1 [after I get my next paycheck] [without even reading reviews about **PG**$_1$].

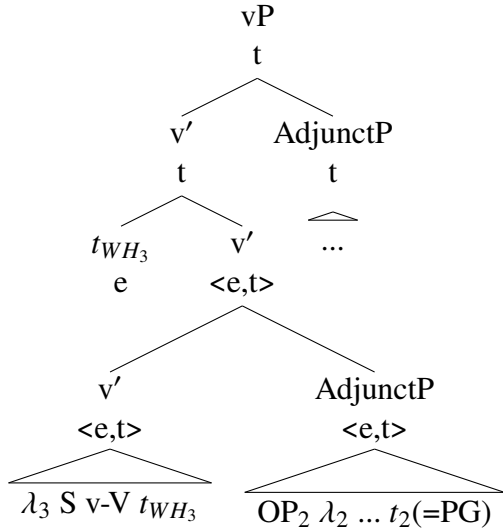I report that the same asymmetry holds for an NP with stacked relative clauses (16):

(16)   *PGs in stacked relative clauses*

    a.   Guess [which actor]$_8$ I took pictures of t_8 [that weren't very flattering to **PG**$_8$] [that unfortunately really embarrassed **PG**$_8$].

    b.   Guess [which actor]$_8$ I took pictures of t_8 [that weren't very flattering to **PG**$_8$] [that unfortunately turned out blurry].

    c.   *?? Guess [which actor]$_8$ I took pictures of t_8 [that unfortunately turned out blurry] [that weren't very flattering to **PG**$_8$].

Nissenbaum's account of (15) extends to (16) with minimal modification. I argue that this is because both of these patterns emerge from the general principles about how the semantics of successive-cyclic movement interacts with adjunction.

Nissenbaum points out that nothing prevents multiple PG-containing adjuncts from being sequentially merged in vP and interpreted by Predicate Modification. While a sentential adjunct with a PG is type <e,t>, a sentential adjunct that lacks a PG will be type t. Since such an adjunct cannot combine with the <e,t> segment of vP formed by successive cyclic movement from vP, it must adjoin above the landing site of that movement, not below, as we see in (15b-c) above and the diagrams in (17):

(17)   a.   *PG-less adjunct above*   b.   *No PG-less adjunct below*
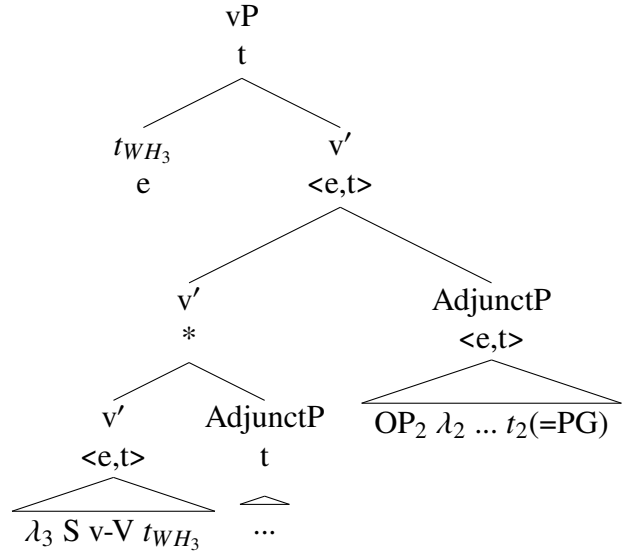
The same form of argumentation, using higher semantic types, captures the relative clause facts in (16) above. Recall that when successive-cyclic movement from NP occurs, it creates an intermediate <e,<e,t>> position in NP. This is immediately saturated by the trace of that movement, yielding a usual type <e,t> NP. Any number of PG-containing relative clauses can be merged to the intermediate <e,<e,t>> position in that NP (16a). It is also possible to merge a PG-bearing relative clause to that intermediate position, and a usual type <e,t> PG-less relative clause higher up in the NP (16b). But it is impossible to merge a PG-less relative clause below a PG-containing one (16c), since this would have to involve a type <e,t> relative clause merging into the segment of the NP that is type <e,<e,t>> due to the influence of Predicate Abstraction. This would yield a type mismatch.[8]

6.   Implications for the analysis of left branch extraction from NP/DP

This paper's arguments are relevant to a proposal of Bošković (2005, 2016) about left branch extraction (LBE; Ross 1967, a.o.) of elements like adjectives. While such LBE is banned in many languages like English (19), many other such as Serbo-Croatian permit it (18):

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[8]It is worth asking why it is not possible to generate the sentences in (15c) and (16c) by merging the PG-less constituent to a lower segment of vP/NP that is below the trace of successive-cyclic movement, and thus below the area to which Predicate Abstraction has applied. Several works have argued that adjuncts generally merge late (Lebeaux 1988, Stepanov 2001), and that late merge cannot apply too deeply in the structure built so far (see Stanton (2016), Davis (2020), and references therein). Such a constraint on adjunction will prevent forming the relevant configurations via deeper merger.

(18)   *LBE allowed in Serbo-Croatian* (Bošković 2016, ex. 17)
Skupa₁   on voli   [$_{NP}$ t_1 kola].
expensive he loves   cars

Bošković argues that in languages that allow LBE, nominal phrases are bare NPs that lack D. In contrast, he argues that the phasehood of DP blocks LBE in languages where D is present. Specifically, he argues that since DP is a phase extraction from DP must pass through spec-DP, but extraction of an adjective from the NP edge to the DP edge is banned by *anti-locality* (Grohmann 2003, Abels 2003, 2012, a.o.). Consequently, such LBE is banned in a language like English where, by assumption, D is always present (19):

(19)   *Anti-local extraction from adjunct/specifier of NP through spec-DP*
         * Expensive he loves [$_{DP}$ t D [$_{NP}$ t cars]]

I have argued that PGs in relative clauses reveal that movement through the NP edge is possible. This entails that, contra Bošković, either DP is not a phase (Sabbagh 2007, Davis 2021, Zyman To appear) and thus movement from the NP edge need not be followed by movement through the DP edge, or anti-locality does not actually ban such movement.[9] [10]

Bošković (2005) suggests another analysis that avoids this conflict, inspired by Abney (1987). Bošković suggests that in languages without D, when an adjective merges to NP, NP projects so that the nominal constituent can be selected as an argument (20a). In contrast, he argues that in languages with D the adjective projects when it merges to NP, and that later merger of D ensures that this constituent can be selected as an argument (20b).

(20)   *Labeling difference with and without D* (Adapted from Bošković 2005, ex. 58-59)

         a.   [$_{NP}$ AdjP N]
         b.   [$_{DP}$ D [$_{AdjP}$ Adj [$_{NP}$ N]]]

Bošković argues that when D is present (20b), adjective LBE is impossible because the AdjP does not form a constituent that excludes the NP.[11] In contrast, AdjP is an exclusive constituent in the D-less configuration (20a), which thus permits AdjP LBE. This alternative analysis has no conflict with the findings of this paper. However, this cannot be the full story, since the literature on LBE has shown that many other elements can participate in

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[9]There is further evidence that the latter of these two consequences, at least, is correct. As observed by Bresnan (1973), English displays what might be characterized as DP-internal adjective fronting, which Adger (2003) suggests involves movement to spec-DP. This would be movement from the NP edge to the DP edge:

(i)   a.   He's [$_{DP}$ [**that reliable**]₁ a [$_{NP}$ t_1 man]].   b.   [$_{DP}$ [**how fierce**]₁ a [$_{NP}$ t_1 battle]]
               (Adapted from Bresnan 1973, ex. 111a)   (Adapted from Adger 2003, ex. 87)

[10]Also note that if LBE is not sub-extraction, but rather a product of something like *distributed deletion* (Faneslow and Ćavar 2002, Bondarenko and Davis 2019), it will not be constrained by anti-locality anyway.
[11]While the adjectival head in (20b) is an exclusive constituent, this element cannot be extracted, since heads are generally capable of only maximally local movement (Travis 1984).

such extraction (possessors, quantifiers, demonstratives, numerals, and so on). A broader discussion of the typology of LBE is beyond the scope of this paper.

7. Conclusion

I have argued that PGs in relative clauses reveal the possibility of successive-cyclic movement from NP, which is predicted by many works arguing that NP is a phase. Demonstrating the phasehood of NP would require showing that such movement is obligatory rather than merely available, however, which I leave for future work. This investigation of PGs in relative clauses has also revealed evidence for tucking-in effects in multiple movement, dealt with the semantics of successive-cyclic movement more generally, and identified implications for theories of extraction from NP/DP. See Davis (2020) for further discussion.[12]

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[12]PG-containing relative clauses can extrapose (i). If such a clause must adjoin to an NP passed through by A′-movement, then this fact is consistent with the proposal that adjunct extraposition involves late merge after covert movement of the "source" DP (Fox and Nissenbaum 1999, a.o.). For such an account, in (i) the DP exited by extraction covertly moves, and then late external merge of the relative clause applies to it:

(i)   Who$_1$ did Mary take [pictures of t_1 t_2] yesterday [that weren't that flattering to PG$_1$]$_2$?

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