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On the syntax and semantics of parasitic gaps in relative clauses formed by extraction from noun phrases: An argument for successive-cyclicity in the NP

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This paper examines a particular variety of parasitic gap (PG) in English that appears in relative clauses, licensed by extraction from the relativized NP. I argue that this little-studied construction has several potential implications for linguistic theory, particularly regarding the syntax of nominal phrases. Many works argue that movement is successive-cyclic when exiting phases, which constrain the length of syntactic dependencies. Generally, vP, CP, and occasionally DP are taken to be phases. Some research in both syntax and morpho-phonology argues that there is also a phase below D, which essentially corresponds to NP. If NP is a phase, we predict that movement from it must pass successive-cyclically through its edge. I argue that the possibility of such movement is revealed by PGs in relative clauses licensed by extraction from NP. This conclusion follows from two independently-supported hypotheses: 1. relative clauses are adjoined to NP, below determiners/quantifiers, and 2. PG interpretation requires successive-cyclic movement of the licensing phrase through the edge of the phrase to which the PG-container adjoins. While this result does not prove that NPs are phases for which successive-cyclic movement is required, it does demonstrate that such movement is at least possible. I go on to argue that such PGs in relative clauses are compatible with relativization via operator movement or matching derivations, but not head-raising ones. I conclude by exploring consequences for theories about movement and locality in the nominal domain.

1 Introduction

I examine parasitic gaps (PGs: Engdahl 1983; Nissenbaum 2000; Culicover & Postal 2001, a.o.) in English that appear in relative clauses, licensed by extraction from the relativized NP. This little-studied construction is complex and deserves further investigation, but is clearly attested, and has several potential consequences for linguistic theory.

Many works argue that movement is successive-cyclic when exiting *phases* (Chomsky 2000; 2001, a.o.), which constrain the length of syntactic dependencies. Generally, vP, CP, and occasionally DP are taken to be phases. Research in both syntax and morpho-phonology argues that there is also a phase below D—in essence, NP (Marvin 2003; Newell 2008; Embick & Marantz 2008; Embick 2010; Newell & Piggott 2014; Simpson & Syed 2016; Simpson & Park 2019, a.o.).[1] Importantly, if NP is a phase, we predict that movement from it must pass through its edge (1). Such movement would also pass through spec-DP if DP is a phase, though I set this possibility aside until later in the paper (see section 6).

(1) *Prediction: Movement via edge of (at least) NP*

Who did you take [$_{DP}$ a [$_{NP}$ $\boxed{t}$ [$_{N'}$ picture of t]]]?

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 (2):[2]

(2) *PGs in relative clauses licensed by extraction from NP*

a. Who$_1$ did Mary take [[pictures of $\boldsymbol{t}_1$]$_2$ [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 $\boldsymbol{t}_1$]$_2$ [who's $\_2$ had a very intense grudge against **PG**$_1$ since last year]].

c. Bill is very picky about art. [This kind of person]$_1$, I could never paint [[an image of $\boldsymbol{t}_1$]$_2$ [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 $\boldsymbol{t}_1$]$_2$ [that John likes to give copies of $\_2$ to friends of **PG**$_1$ at every chance he gets].

While these examples are complex, they clearly contrast with similar examples that contain a PG with no licensing movement, which are completely unacceptable:

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[1] These works vary in how exactly they label the relevant phrase (NP, nP, QP, etc.), but all converge on identifying a phase below DP.

[2] Most examples I report involve extraction from depictive nouns (*picture, portrait*, etc.) because these are natural when used with *of*-PPs, which I favored due to their low semantic load. However, further research should test such PGs with extraction from other types of NPs and PPs. I offer one example below, which in my judgment is on par with the examples in (2):

(i) Guess who$_1$ I heard a [rumor about t_1, [that might cause a big problem for PG$_1$]]?

(3) *Unlicensed PG in relative clause*[3]
* Mary took [[pictures of Sue_1] [that weren't that flattering to PG_1]]

This paper's main point is that if (restrictive) relative clauses are adjoined to NP (Quine 1960; Stockwell et al. 1973; Partee 1975; Heim & 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; Nissenbaum & Schwarz 2011, a.o.), then PGs in relative clauses reveal movement through the NP edge.

Aside from Citko (2014), which I discuss in section 2.1, the only work I know to have mentioned such examples is Matushansky (2005), who states that they are ungrammatical. However, I report that there are speakers that accept these examples. I conducted a simple survey in written format requesting judgments on a three-way scale (✓ - ? - *). This began with baseline PG examples like the one shown in (4) below, followed by the examples in (2) above, and concluding with the multiple relative clause configuration in (11) below, which I discuss in section 4. Of 12 participants, 8 judged the relative clause PG examples in (2) to be acceptable. The participants were all university students or employees, consisting of one native speaker of Australian English and two of British English, the rest being American English speakers. The Australian speaker rejected the examples, and only one of the British speakers accepted them. The rest of the speakers who accepted the examples were American speakers, 4 of which remarked that the examples are difficult, which I interpreted as an evaluation of "?".[4] Acceptance of the configuration is clearly not unanimous. As Engdahl (1983) notes, there is inter-speaker variation in the acceptability of PGs, which are often regarded as imperfect even in the basic case. Since PGs are sensitive, the complexity of the examples I focus on here makes this topic empirically challenging. This phenomenon deserves further investigation, whether through a more precise experimental study or simply a more comprehensive survey. Since some speakers clearly do accept the configuration, it is nevertheless worth discussing the implications of it for linguistic theory, to set the stage for future work.

If the analysis I provide is correct, these PGs indicate that successive-cyclic movement from NP is possible. This conclusion relies on the hypothesis that PG-licensing requires successive-cyclic movement. This proposal is defended in Nissenbaum (2000), but is not a universal aspect of PG theories (see for instance Kayne (1983)). Additionally, this analysis entails that successive-cyclic movement from NP is merely available, though the hypothesis that NPs are phases predicts that such movement should be obligatory. Thus this result does not directly support NP phasehood, though it converges well with the works cited above that propose this.

[3] I thank an anonymous reviewer for this point. The reviewer judges all examples in (2) to be ungrammatical, but interestingly, perceives that they are less degraded than examples like (3).

[4] Separately, 5/8 individuals who saw presentations on this research and offered their judgments commented that they accept these examples.

This paper's analysis also depends on the proposal that relative clauses adjoin to NP (at least when a PG is involved). While viewing relative clauses as NP adjuncts has received much support, there are analyses that do not assert this. As I discuss in section 5, adjunction to NP is a property of an operator-movement or *matching* theory of relative clauses, but not a *head raising* approach. However, I argue that this paper's analysis in fact predicts the latter theory to be inapplicable for relative clauses with PGs. This paper's results also have several consequences for syntactic theory in the nominal domain, which I address in section 6, along with discussion about the grammars of speakers who do not permit such PGs.

2 Background: PGs and intermediate landing sites

A PG and its antecedent (= "licenser") can be separated by an island. 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 to the edge of the island (Contreras 1984; Chomsky 1986; Browning 1987; Nissenbaum 2000, a.o.), as (4) shows in a sentential adjunct:

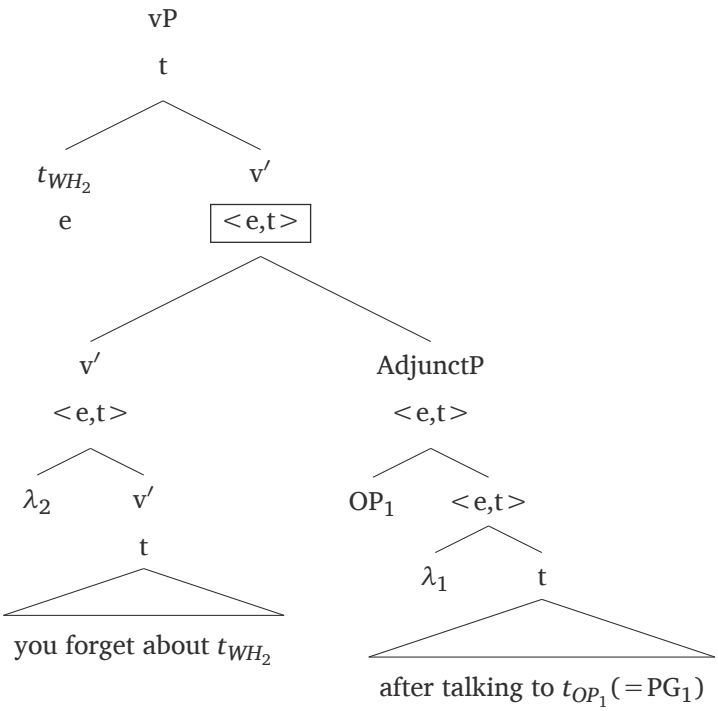
(4) *PG in adjunct island formed by operator movement*
Who$_1$ did you forget about $\boldsymbol{t}_1$ [*AdjunctP* **OP** after talking to $\boldsymbol{t}_{\mathbf{OP}}$(=**PG**$_1$)]?

Nissenbaum (2000) argues that such 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-operator moves to the edge of the island, triggering Predicate Abstraction (Heim & 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 Predicate Abstraction in the vP, creating an <e,t> position in it (which is immediately saturated by the trace of that successive-cyclic movement). The type <e,t> adjunct containing the PG can adjoin to the <e,t> node in vP, and combine with it by Predicate Modification (Heim & Kratzer 1998). This conjoins their denotations, creating another <e,t> node in vP, as diagrammed in (5) below. This third <e,t> node, boxed in (5), is saturated by the intermediate trace of successive-cyclic A′-movement from vP. Assume that successive-cyclic movement in vP precedes merger of the adjunct, following works arguing that adjuncts merge late (Lebeaux 1988; Stepanov 2001, a.o.). Late adjunction renders the intermediate trace of the licenser and its corresponding λ non-local, though the structure remains interpretable. Ultimately, the A-bar-moved phrase which created the intermediate trace binds its original trace in VP, and the operator's trace in the adjunct. The latter of these constitutes the PG, which is thus licensed:[5]

[5] I have adopted from Nissenbaum the simplification that vPs and vP modifiers (like sentential adjuncts) are type t, modulo Predicate Abstraction. Heim and 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.

(5) *A PG in an adjunct of vP* (partial structure for (4) above)



In summary, the PG-containing island combines with a position created by successive-cyclic movement of the licenser. Due to Predicate Abstraction, this position is a predicate that is saturated by a trace of that licensing phrase. Importantly, this theory makes a general prediction (6):

(6) *General prediction about PGs*
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.

Many works have defended this prediction (Nissenbaum 1998; Nissenbaum 2000; Nissenbaum & Schwarz 2011; Legate 2003; Abels & Bentzen 2009; Overfelt 2015). I use this reasoning to argue that PGs in relative clauses reveal the possibility of movement via the NP edge.

2.1 The position of relative clauses

Citko (2014) discusses PGs in relative clauses, which she suggests reveal successive-cyclic movement from DP. Many works do take DP to be a phase (Bošković 2005; Bošković 2016; Newell & Piggott 2014; Simpson & Park 2019, a.o.). As Citko notes, PGs in relative clauses only yield evidence for DP-phasehood if relative clauses are merged in DP. However, there is evidence that (restrictive) relative clauses attach to NP, below determiners or quantifiers (Quine 1960; Stockwell et al. 1973; Partee 1975; Heim & Kratzer 1998; Donati & Cecchetto

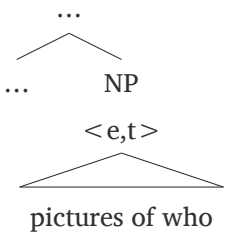
2011; Bhatt 2015, a.o.). Thus I adopt the view in Heim & Kratzer (1998) that NPs and (PG-less) relative clauses are both predicates of individuals <e,t>, which merge together and are interpreted via Predicate Modification, after which NP combines with D/Q (type <<e,t>,e> or <<e,t>,<<e,t>,t>>).

Importantly, if relative clauses are merged in NP, then PG-licensing in a relative clause by extraction from NP indicates successive cyclic movement from NP, as the next section demonstrates.

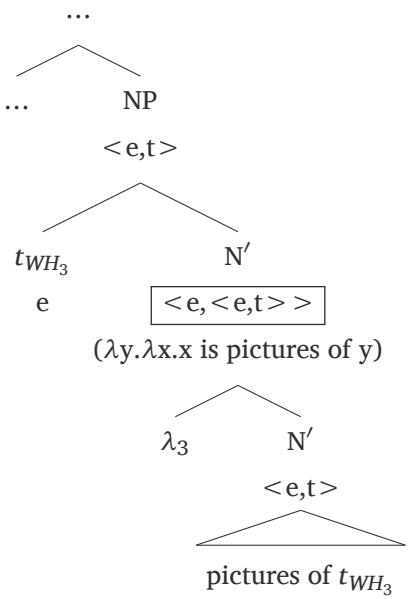
3 Deriving PGs in relative clauses

Since NPs are usually type <e,t> (7a), when movement through the NP edge occurs, such movement triggers Predicate Abstraction in the NP and creates a type <e,<e,t>> N′, as in (7b). The first λe of this two place predicate, which Predicate Abstraction created, is saturated by the type e trace left by successive-cyclic movement from NP. This saturation yields a typical type <e,t> NP, ready to combine with D/Q.

(7) a. *Before movement from NP*



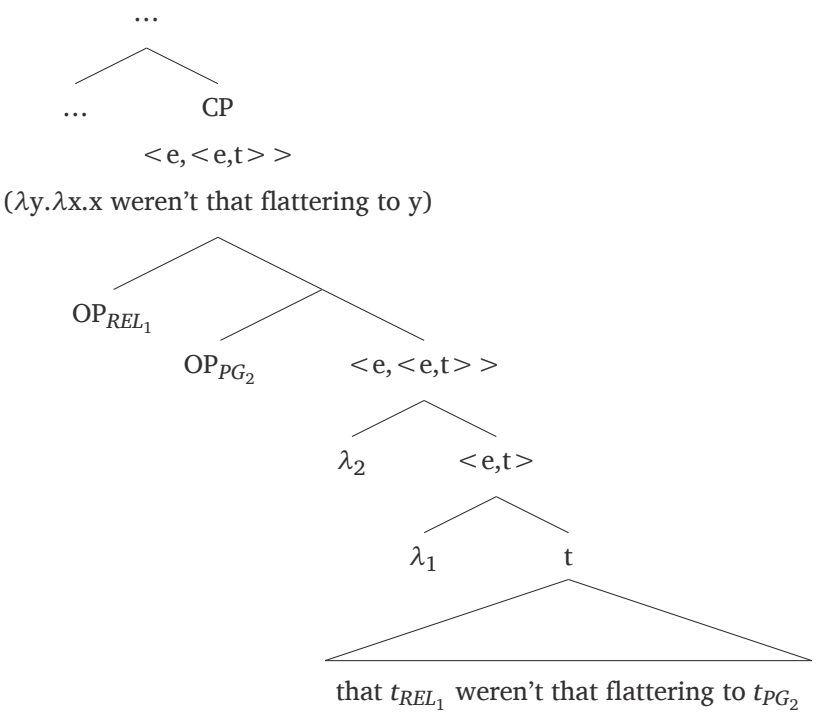
b. *After movement from NP*



Importantly, this intermediate $<e,<e,t>>$ position in NP facilitates the interpretation of a PG-bearing relative clause, as I demonstrate next.

For the moment, assume that the gap of relativization is formed by operator movement (Quine 1960; Chomsky 1977; Heim & Kratzer 1998). The PG in the relative clause is also formed by operator movement. 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 movements trigger Predicate Abstraction, making the relative clause type $<e,<e,t>>$, as illustrated in (8) below. (A PG-less relative clause is derived in the same way except that it has only the relativizing operator, and is thus type $<e,t>$.) Following Heim & Kratzer (1998), assume that Predicate Abstraction inserts a λe over the sister of the landing site of movement. Further, assume that this process occurs in a derivational and local way. Thus when a PG-forming operator tucks-in below a relativizing one as in (8), the former inserts its corresponding λe above the λe previously added by movement of the latter. The result is two stacked λe positions, in reverse order compared to the operators that formed them:[6]

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

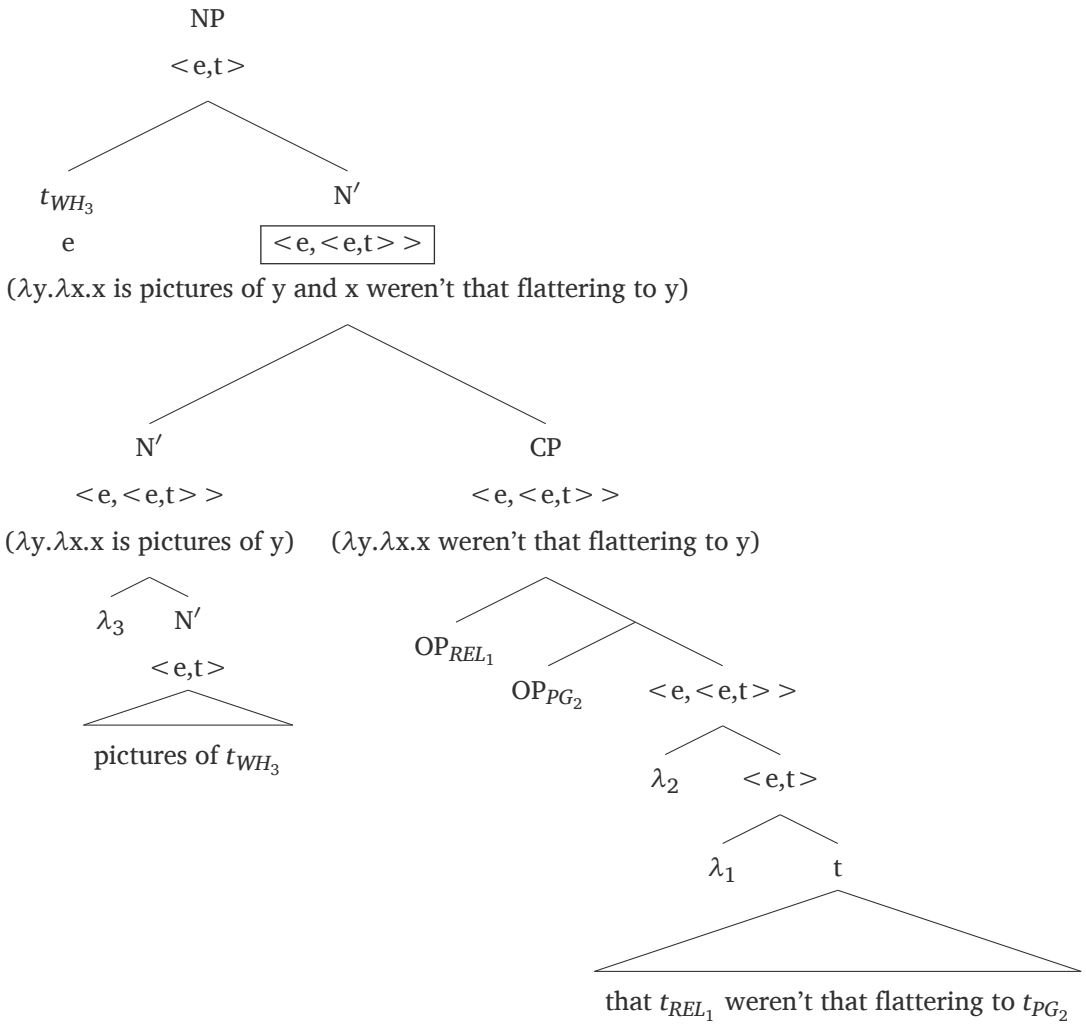


[6] This derivation requires tucking-in the PG operator below the relativizing one. However, if λe-insertion is not so strictly determined, we could place these operators in opposite order and arrange the instances of λe as needed.

Thus a PG-containing relative clause is type <e,<e,t>>. We saw in (7b) above that the N′ sister of an intermediate trace formed by successive-cyclic movement from NP is also <e,<e,t>>. Assuming generalized Predicate Modification that combines the denotations of any two nodes of the same semantic type (Partee & Rooth 1983; Nissenbaum 2000; Nissenbaum & Schwarz 2011), the PG-containing relative clause and this N′ can thus be merged and interpreted. Assume that the relative clause late-adjoins after successive-cyclic movement in NP. In (9) below, which represents (2a) above, we see a boxed type <e,<e,t>> N′ that is the result of such merger. Here the first λe of that boxed function is saturated by the trace of successive-cyclic movement through NP. This licenses the PG and yields a type <e,t> NP, fit to undergo Functional Application with D/Q as usual:

(9) *The licensing of a PG in a relative clause*

Who$_1$ did Mary take **[pictures of t_1 [that weren't that flattering to PG$_1$]]**?



In short, assuming that relative clauses adjoin in NP, successive-cyclic movement from NP (not DP) must occur to create a two-place predicate N′ that a PG-bearing relative clause can merge to.

4 A predicted asymmetry with multiple relative clauses

Nissenbaum (2000) observed that when one vP hosts two adjuncts, both can have a PG (10a), but when only one of them has a PG, it must be the innermost (10b versus 10c):

(10) *PG asymmetry with 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**$_1$].

The same asymmetry holds for an NP with multiple relative clauses, as (11) below shows. Of the 8 surveyed speakers who accept PGs in relative clauses, one rejected all examples with multiple relative clauses. The rest accepted these, with unanimous judgment that they are difficult to process, but that nevertheless the important contrast in (11b) versus (11c) is perceptible. I include (11d) as a baseline example that has the same order of constituents as (11c) but excludes the PG, to clarify that the PG is the problem in (11c).

(11) *PG asymmetry with multiple 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].

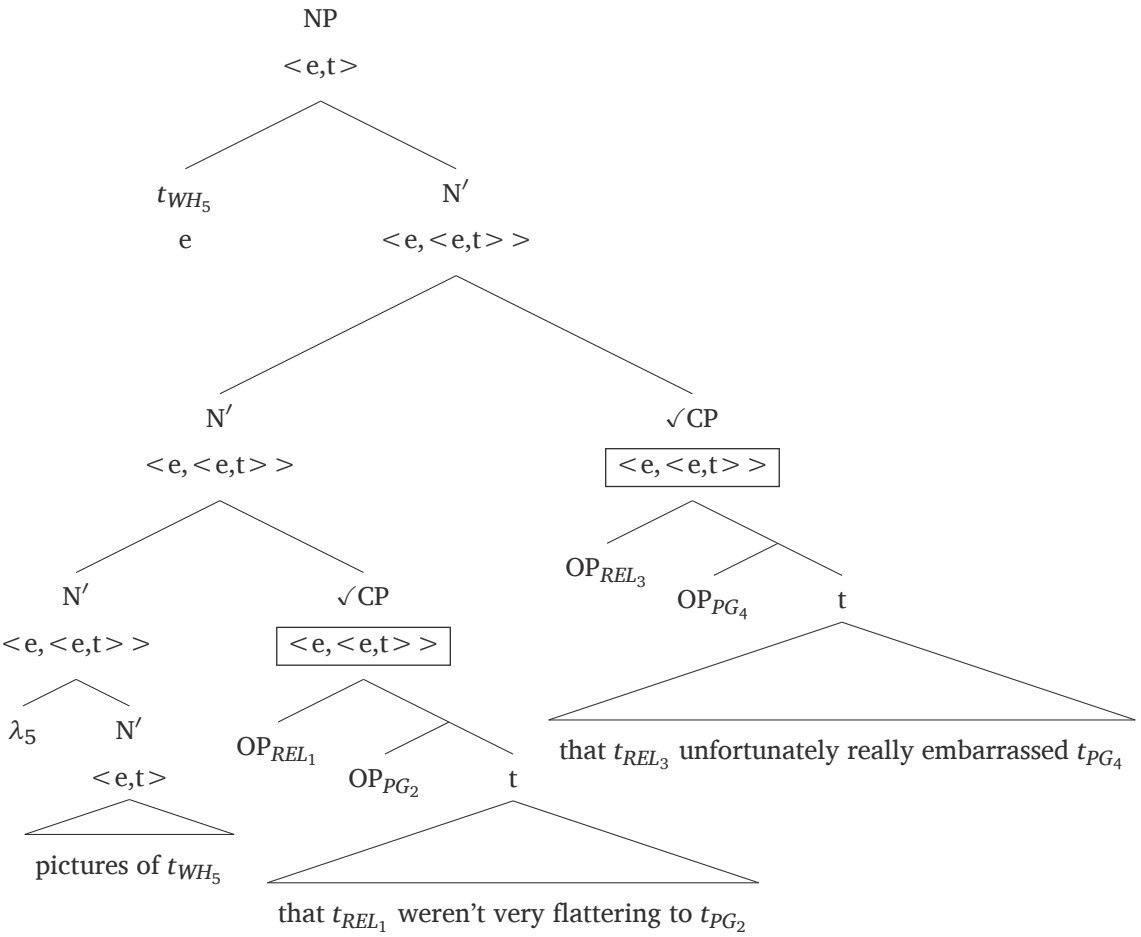
c. * Guess [which actor]$_8$ I took pictures of t_8 [that unfortunately turned out blurry] [that weren't very flattering to **PG**$_8$].

d. Guess [which actor]$_8$ I took pictures of t_8 [that unfortunately turned out blurry] [that weren't very flattering (to him)].

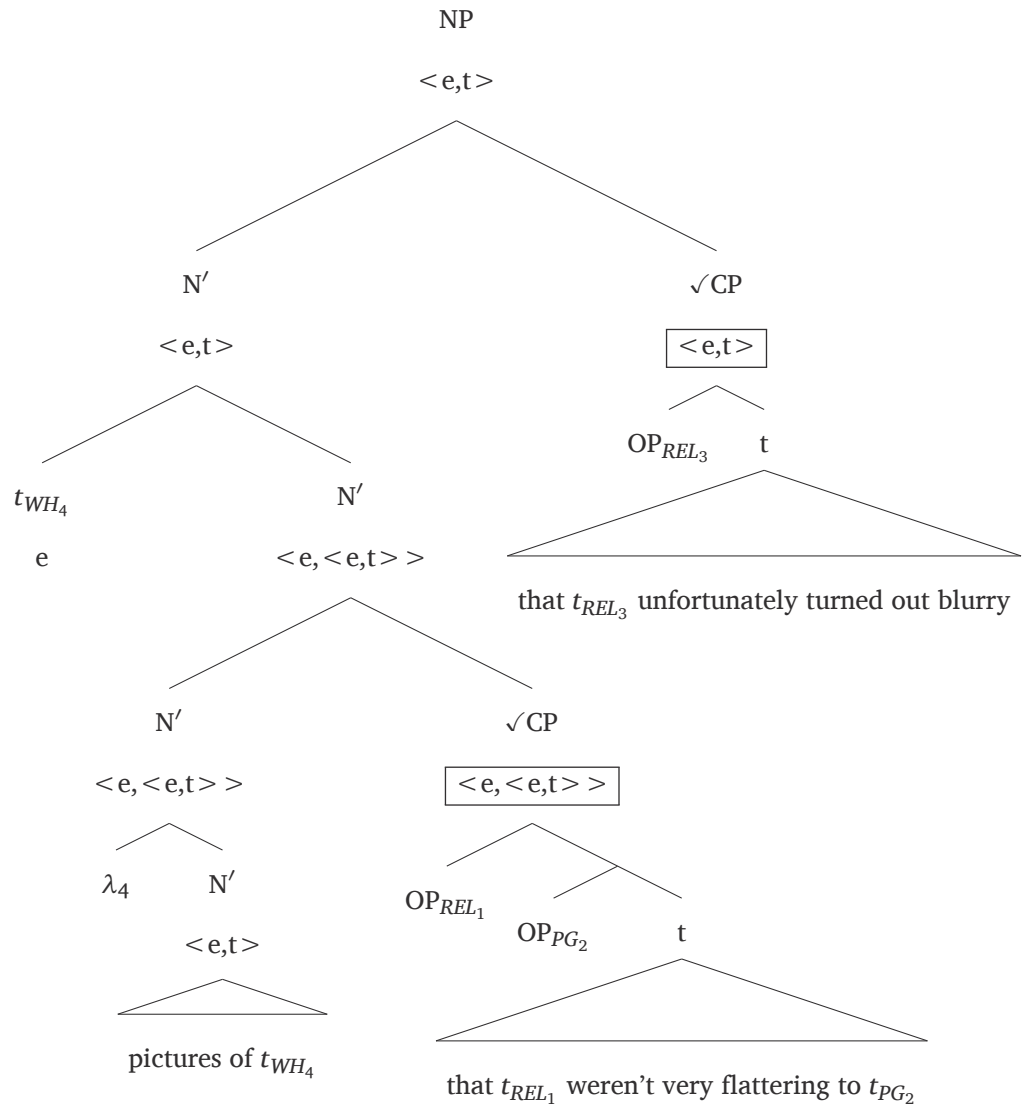
Nissenbaum's account of (10), which I extend to (11), is as follows. As (5) showed, successive-cyclic movement from vP creates an $<$e,t$>$ v′ via Predicate Abstraction, which a PG-containing adjunct (also $<$e,t$>$) can combine with by Predicate Modification. Predicate Modification can occur more than once and thus add multiple PG-containing adjuncts (10a). In contrast, an adjunct that lacks a PG is type t, and cannot combine with the $<$e,t$>$ v′. However, the $<$e,t$>$ v′ is

saturated by the trace of successive-cyclic movement and yields a vP node of type t, as (5) showed. A PG-less adjunct can adjoin to this node, since they are both type t. Thus if a PG-containing and PG-less adjunct are merged in one vP, the the PG-less one must be merged higher, above the trace of successive-cyclic movement, as (10b-c) shows. Similar reasoning captures the relative clause facts in (11). Successive-cyclic movement from NP creates an $<e,<e,t>>$ N′, which is saturated by the trace of that movement to yield a usual type $<e,t>$ NP, as (7b) showed. Multiple PG-containing relative clauses can be merged to that $<e,<e,t>>$ N′ (11a). However, a PG-less relative clause (type $<e,t>$) can only merge above the trace of successive-cyclic movement, and thus will always be attached structurally above (and thus rightward of) a PG-containing relative clause, as (11b-c) show. These three configurations are diagrammed in (12):

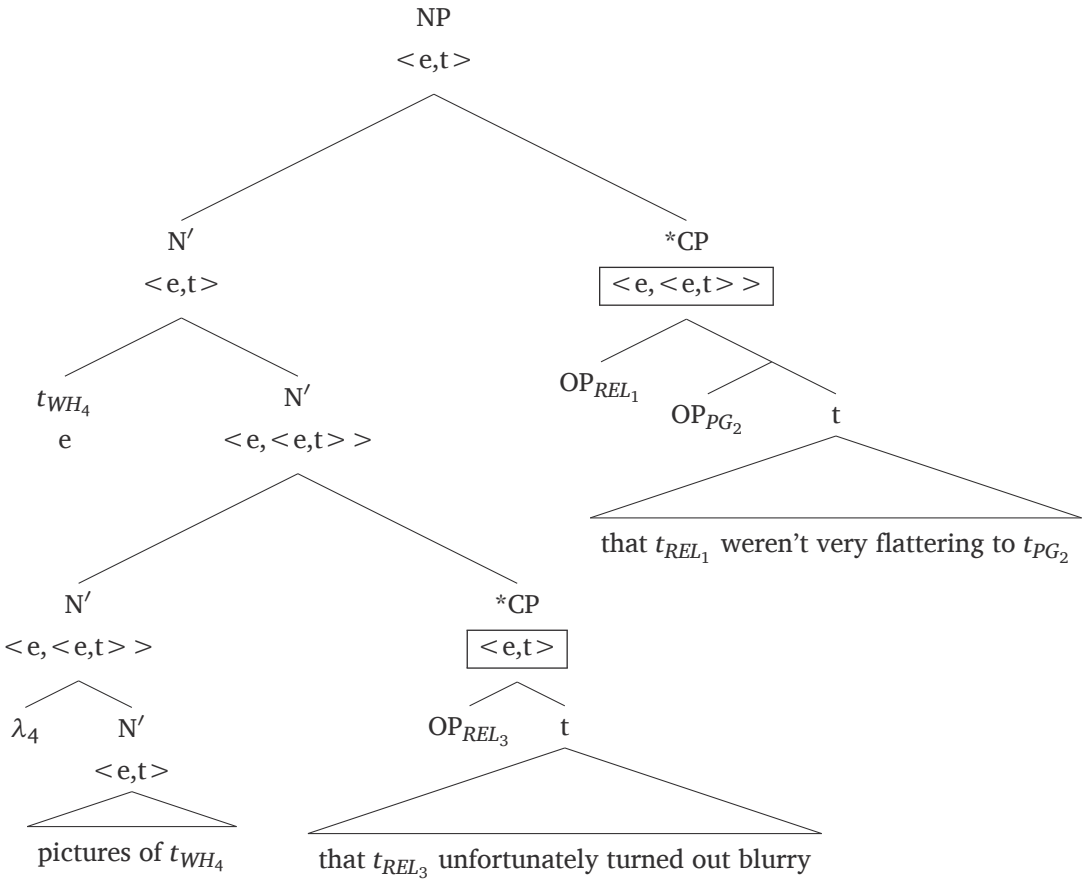
(12) a. *Two relative clauses with PGs are permitted* (=11a)



b. *Relative clause with PG must be below the one without* (=11b)



c. *The reverse is impossible due to semantic type mismatches* (=11c)



In summary, the same reasoning (though with different semantic types) explains the facts in (10) and (11). Both of these patterns arise automatically from independent principles about the semantics of successive-cyclicity and adjunction.

5 PG-licensing under matching and raising analyses of relative clauses

Above I have assumed that relative clauses involve operator movement. There are two other prominent analyses of relativization (see Bhatt (2015) for background). One is the *matching* analysis, under which what moves is not an operator, but an elided NP matching the "head" noun of the relative clause. This theory is compatible with the analysis of this paper:

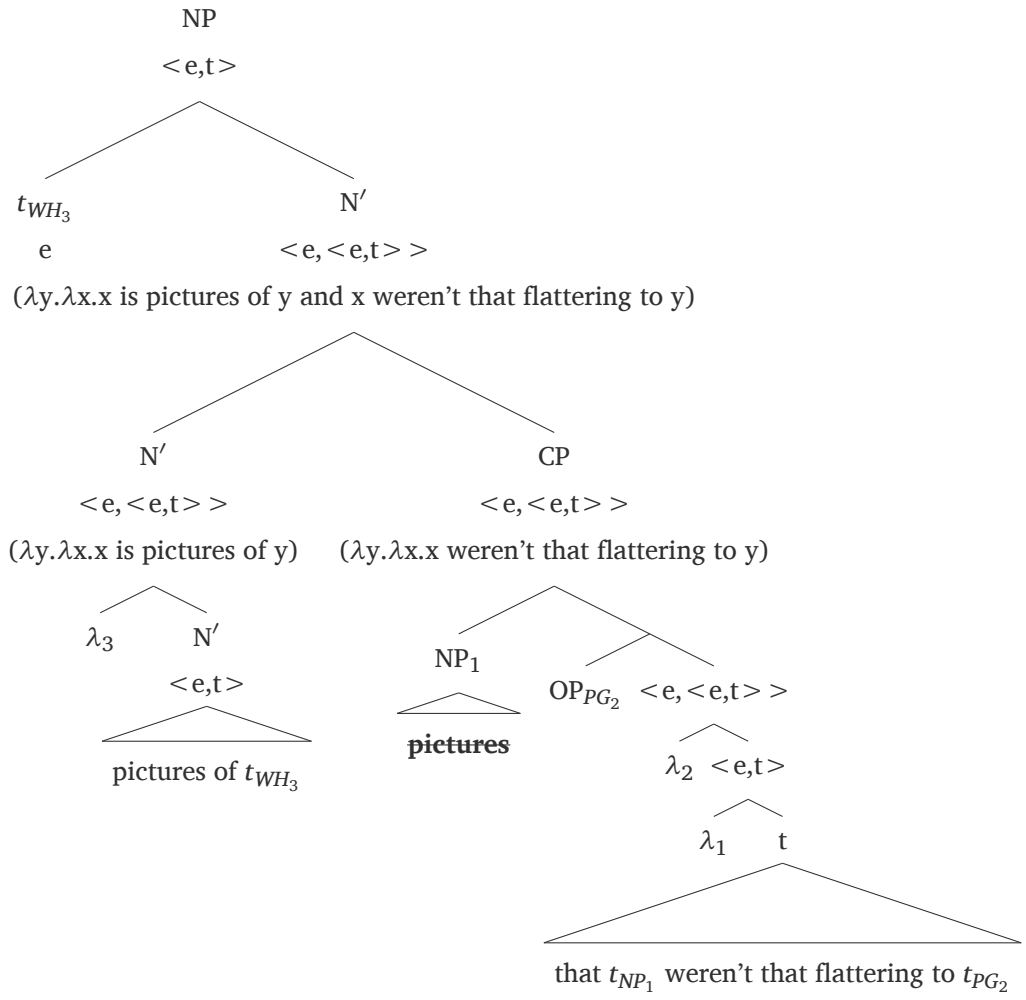
(13) *Relativization via movement of deleted matching phrase*
This is the $[_{NP}\ [_{N'}$ **picture** $[_{CP}\ [_{NP}$ ~~**picture**~~$]_1\ \lambda_1$ that I like t_1]]]

Like operator movement, this NP movement must not saturate the λe that it creates, or else the containing CP would not be type <e,t>, and thus it would be unable to combine with NP via

Predicate Modification. Therefore this relativizing NP movement must reconstruct, as is typical for A-bar movements. The derivation for a matching relative clause with a PG is shown in (14) below. The only relevant difference between this and the operator derivation in (9) above is that OP_{REL} in (9) is replaced with a moved and elided NP matching the relative clause's head noun in (14):

(14) *PG in a relative clause under the matching analysis*

Who$_1$ did Mary take **[pictures of t_1 [that weren't that flattering to PG$_1$]]** ?



5.1 Prediction: The raising analysis is incompatible

There is also the *raising* analysis, for which the head NP moves from within the relative clause and lands in the edge of the CP, which is then selected by D. In this situation, we expect movement of the NP to trigger Predicate Abstraction at C′, making it type <e,t>, and allowing it to combine with the NP via Predicate Modification. Their conjoined meaning is inherited by CP, which

then combines with D. The semantics of this configuration is no different than the relativization scenarios we have already discussed, except that the conjoined meaning of NP and the relative clause is inherited by a CP node in this case, not an NP node, since here CP is the sister of D:

(15) *Relativization via NP raising to spec-CP*
These are the $[_{CP_{<e,t>}}\ [_{NP_{<e,t>}}$ pictures$]_1\ [_{C'_{<e,t>}}\ \lambda_1$ that I like t_1]]

If a relative clause is an adjunct to NP as in the operator and matching analyses, successive-cyclic extraction through spec-NP can license a PG in the relative clause, since this movement creates an $<e,<e,t>>$ N′ that can combine with a PG-containing relative CP of the same type. However, in a raising configuration like (15) above, a similar derivation would fail. I have shown in (9) and (14) above that positing tucking-in of the PG-operator below relativizing movement creates the correct interpretation. Similarly, in a raising derivation the PG-operator presumably tucks-in below the raised NP, stacking its λe above the λe that the raised NP created, as (16) below shows. This yields a type $<e,<e,t>>$ C′, which is the sister of the raised NP in spec-CP. Notice that here the trace of movement through spec-NP immediately saturates the $<e,<e,t>>$ N′ that it creates, yielding a type $<e,t>$ NP. This NP cannot semantically combine with its sister, the type $<e,<e,t>>$ C′, by either Functional Application or Predicate Modification. Thus such a structure is uninterpretable:

(16) *Relativization via raising: Predicted type mismatch between NP and C′*
WH_3 … D *$[_{CP}\ \underline{[_{NP_{<e,t>}}\ t_3\ [_{N'_{<e,<e,t>>}}\ \lambda_3\ [_{N'_{<e,t>}}\ \text{pictures of } t_3]]]_1}\ \underline{[_{C'_{<e,<e,t>>}}}\ OP_2\ \lambda_2\ \lambda_1$
$[_{C'_t}$ that t_{NP_1} were not flattering to t_2(=PG)]]]

Therefore we predict that a raising derivation is incompatible with PG-bearing relative clauses. Reversing the order of movement for the PG-operator and the raising NP does not change this. In this case, the same type mismatch between the $<e,t>$ NP and the $<e,<e,t>>$ C′ occurs, but at a lower point in the CP edge. Reconstructing the raised NP to its base position at LF also fails, since this leaves us with a type $<e,<e,t>>$ CP, which is the wrong type to combine with D/Q. While it is beyond the scope of this paper to argue about the proper derivation(s) available for relative clauses more broadly, head raising (if possible in principle) should be unavailable in this construction.

Support for this conclusion can be found by examining principle C. Under the head raising analysis, if the head NP of a relative clause moves from within it, then usual reconstruction of this A-bar movement should cause a principle C violation, if there is any R-expression in that NP which is co-indexed with another referential element that c-commands the original position of the NP. Works such as Sauerland (1998) argue that when such an expected principle C violation does not occur, it is because the relative clause was formed not by head raising but by matching. This is because in matching, the head NP and the matching elided NP need not be totally the same,

and so potential R-expressions in the head NP are not necessarily represented identically within the matching NP. In my judgment, a PG-bearing relative clause does not display a principle C violation, as (17) shows. Here "t_2" represents the position that the head NP would have moved from under a raising analysis, though the point is that such raising does not in fact occur:

(17) *No principle C reconstruction for PG-containing relative clause*
Guess who$_1$ Mary saw [a [$_{NP}$ funny video by **John**$_3$ about t_1]$_2$ [that **he**$_3$ said (t_2) will be very embarrassing for PG$_1$]]?

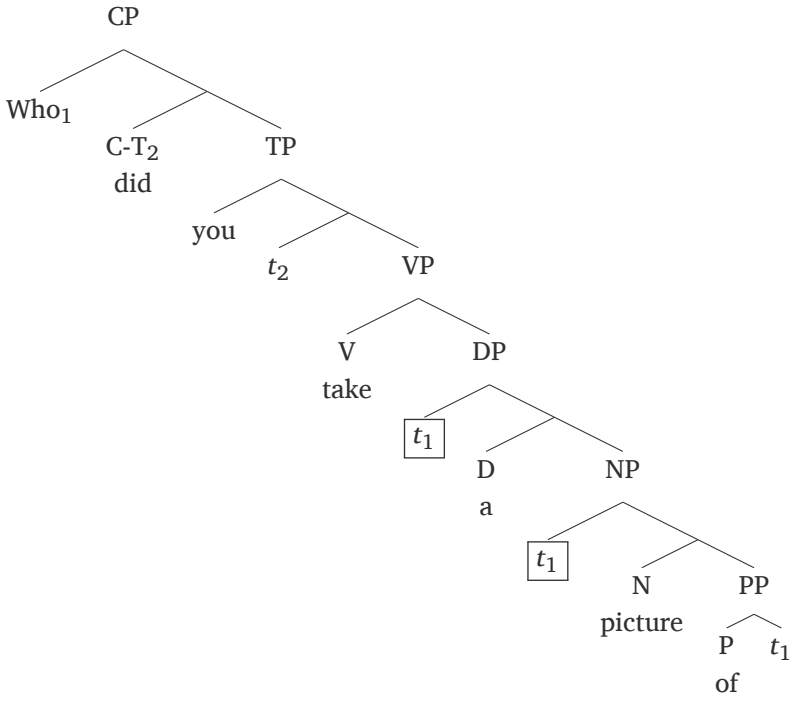
This is consistent with a non-raising derivation, as predicted. Further confirmation, and testing of similar diagnostics, should be performed in future work.

6 Further theoretic implications

I have argued that successive-cyclic movement through the NP edge is possible. This is consistent with the hypothesis that NPs are phases, which as discussed in section 1, has independent precedent. While a theory of NP phasehood predicts that such movement should be required, I have shown only that it is possible. Whether required or optional, such movement has several consequences for syntactic theory.

DP is often regarded as a phase. If so, when extraction from DP passes through NP (perhaps to license a PG), such extraction would also have to pause in spec-DP:

(18) *Movement through edge of NP and DP (omitting irrelevant details)*



Several works have argued that movement from the specifier of a given phrase, to the specifier of the immediately dominating phrase, is not permitted (Bošković 2016; Erlewine 2016, a.o.). This is often considered a version of a constraint termed *anti-locality* (Grohmann 2003; Abels 2012). Notice that movement from spec-NP to spec-DP is precisely the sort of movement that such anti-locality should ban. Thus if such a derivation is required for extraction from DP in a language like English, such extraction should fail, though in reality it succeeds in many cases. There are several potential methods of repairing this incorrect prediction.

On one hand, the anti-locality hypothesis itself may be flawed. Alternatively, there may be other functional structure between NP and DP, such that DP does not immediately dominate NP (see Borer (2005), for instance). This would make anti-locality irrelevant here. Another possibility is that DP is not a phase (Sabbagh 2007; Chomsky et al. 2019; Davis 2021), and thus there is no obligation for movement through spec-NP to be followed by movement through spec-DP. These theoretic possibilities represent several avenues for further research. This will be supported by testing other diagnostics for successive-cyclicity. For instance, other work on successive-cyclicity uses facts about binding (Sauerland 2003; Legate 2003; Abels 2012) and stranding (McCloskey 2000; Davis 2020) as evidence. Finding analogous tests that are applicable within the nominal domain is a relevant task that I leave for future work.

The above considerations also have consequences for theories of left branch extraction from NP (LBE; Ross 1967, a.o.) of elements like adjectives. While such LBE is banned in many languages, including English, others such as Serbo-Croatian permit it:

(19) *Serbo-Croatian LBE*
Skupa$_1$ on voli [$_{NP}$ t_1 **kola**].
expensive he loves cars
'He loves expensive cars'
(Adapted from Bošković 2016: ex. 17)

Bošković (2005; 2016) argues that in languages with LBE, NPs lack DP, and that thus specifiers/adjuncts of NP can be directly extracted. In contrast, he argues that in languages with DP like English, the phasehood of DP requires LBE from the edge of NP to pass through spec-DP, which cannot occur due to anti-locality. This bans adjective LBE in English, assuming that this constraint applies equally to movement of specifiers and adjuncts:

(20) *Anti-locality prevents (adjective) LBE in English*
* Expensive$_1$ he loves [$_{DP}$ t_1 [$_{NP}$ t_1 cars]]

If anti-locality is in fact not applicable in DP,[7] or if DP is not a phase, then this account is incorrect. Bošković (2005) offers another analysis that avoids these problems, by arguing that the presence of D causes a labeling issue that prevents LBE in DP languages. Such an account is compatible with this paper's results.

Finally, recall that not all speakers allow PGs in relative clauses. It is possible that such speakers do permit the needed movement through NP, but reject the PG examples due to processing difficulty. Barring this, the problem would need to be structural (not semantic, given that no special interpretive mechanisms are needed here). If such speakers do have a DP phase, for them extraction would have to bypass the NP edge in order to avoid anti-locality (implying that NP is not a phase and assuming a conservative NP/DP structure). This account implies that phasehood can vary. This is a proposal with some precedent, which raises unsolved questions about what determines the variation (see Davis (2020) for relevant discussion). It is also possible that spec-NP is not a valid landing site in such speakers' grammars for independent reasons. What those reasons may be requires further investigation.

7 Conclusion

PGs in relative clauses reveal successive-cyclic movement from NP, given that PG-licensing requires successive-cyclic movement, and that relative clauses adjoin to NP. This result has consequences for theories of relative clauses and of nominal syntax, but this would not hold if either of those hypotheses is false. However, since both have received much support in the literature, this finding is relevant to theoretic inquiry. This result does not prove that such successive-cyclic movement is required, as theories positing NP phasehood would predict. Determining whether this is the case is another topic for future research.

[7] There is evidence that anti-locality is indeed not applicable here. English sometimes shows DP-internal adjective fronting (Bresnan 1973), which following Adger (2003) is movement of the adjective to spec-DP:

(21) He's [$_{DP}$ [$_{AdjP}$ **that reliable**]$_1$ a [$_{NP}$ t_1 man]]. (Adapted from Bresnan 1973: ex. 111a)

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Competing interests

The author has no competing interests to declare.

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