On the Locality of Extraposition from NP in English: A View from the Markovian Property of Derivation*

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Abstract

Extraposition from NP (EXNP) is subject to the locality constraint that bars rightward displacement across a finite clause and a verb phrase (Ross (1977); Baltin (1981); Culicover and Rochemont (1990), among others). Adopting Chomsky (2021, 2024a, b) and Chomsky et al.'s (2023) idea that derivation is Markovian (i.e., it does not look back at the derivational history), this article proposes that an extraposed phrase is base-generated in a surface position and c-commands a structurally identical element in the sister of a modified phrase, with these two items taken to be a copy pair at the interfaces. This article also demonstrates that the locality restriction on EXNP follows from copy formation locally applied at v*P and CP phases.

***Keywords*:** Extraposition from NP, the Right Roof Constraint, Markovian property of derivation, copy formation, Phase Theory

1. Introduction

The aim of this article is to account for the locality constraint on Extraposition from NP (EXNP) in English. EXNP is an operation to detach an element modifying NP from its canonical position to the right periphery of a clause. For example, EXNP applied to the relative clause in (1a) yields the sentence in (1b), where the relative

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clause in the sentence final position is separated from its antecedent *a book*.

(1) a. A book which was written by Chomsky appeared.
b. A book appeared which was written by Chomsky. (Baltin (2017:1))

In generative literature, it has been widely acknowledged since Ross (1967) that EXNP is clause-bounded: It is not possible to extrapose an element out of a subject clause, as shown in (2).

(2) a. That a gun which I had cleaned went off surprised no one.
b. *That a gun went off surprised no one which I had cleaned.
(Ross (1986: 4))

This is known as the Right Roof Constraint. Extraposition from an embedded subject is blocked not only by the subject clause in (2) but also by the complement clause in (3).

(3) *John has hoped that a review will appear for a long time which deals with Bill's new book. (Nakajima (1985: 148))

It is also known that not only a clause but also a verb phrase serves as a barrier for extraposition (Baltin (1981); Culicover and Rochemont (1990), among others). Culicover and Rochemont (1990) argue that this is evidenced by VP-ellipsis in (4).

(4) a. John met a man last week (who was) from Philadelphia, and George met a man last week (who was) from Philadelphia too.
b. John met a man last week (who was) from Philadelphia, and George did *e* too.
c. *John met a man last week (who was) from Philadelphia, and George did *e* who was from Philadelphia.

(Culicover and Rochemont (1990: 28))

In these sentences, the relative clauses are extraposed from the objects to the end of the first clauses. The contrast between (4b) and (4c) shows that the phrases that have undergone EXNP must be contained in the constituents elided by VP-ellipsis. Culicover and Rochemont (1990) also provide evidence that a verb phrase is a boundary for EXNP by examining VP-preposing in (5), which shows that the extraposed phrase must be contained in the preposed VP.

(5) a. John met a man last week who was from Philadelphia, and meet a man last week (who was) from Philadelphia he did.
b. *John met a man last week who was from Philadelphia, and meet a man last week he did (who was) from Philadelphia.

(Culicover and Rochemont (1990: 28))

From the facts noted above, we may conclude that a clause is a barrier for extraposition from a subject, and a verb phrase is a barrier for extraposition from an object. However, lesser noticed is the fact that the locality restriction on EXNP is relaxed in a certain context. As observed by Nakajima (1985), a relative clause modifying an embedded subject cannot be extraposed out of a *finite* clause, whereas it can be taken out of *non-finite* one, as shown in (6).[1]

(6) a. *John has hoped that a review will appear for a long time which deals with Bill's new book.
b. ?John has hoped for a review to appear for a long time which deals with Bill's new book. (Nakajima (1985: 147-148))

This fact requires a theory about the locality of EXNP to explain not only why a finite clause and a verb phrase is a barrier for EXNP, but also why the barrierfood is relaxed in a non-finite context. These facts also raise the question of why the locality constraint on EXNP, an instance of rightward displacement, is stricter than the one on leftward displacement such as *wh*-movement in (7a) and topicalization in (7b), which is unbounded.

(7) a. Who did Fred pretended that Bob claimed that Mary liked *t*?
(Baltin (1981: 259))
b. This book, I think that you should read *t*.
(Lasnik and Saito (1993: 80))

In generative literature, the locality restriction on EXNP has been analyzed in terms of Bounding Theory (Baltin (1981)), Binding Theory (Nakajima (1985, 1989)), Government Theory (Culicover and Rochemont (1990, 1997); Guélon and May (1984)), a stranding approach under Linear Correspondence Axiom (Kayne (1994), Takonai (1995)), and Phase Theory (Mizuguchi (2009); Tanaka (2011); Kitada (2012)). This article demonstrates that it is straightforwardly accounted for by copy formation applied at each phase, which follows as a null hypothesis from the Markovian property of derivation, a general property of derivation without looking back at the history (Chomsky (2021, 2024a, b); Chomsky et al. (2023)).

This article is organized as follows. In section 2, we briefly introduce theoretical framework proposed by Chomsky (2021, 2024a, b) and Chomsky et al.

(2023). Section 3 attempts to explain EXNP and its locality restrictions in terms of copy formation that follows from the Markovian property of derivation. Chapter 4 compares the proposed analysis with a previous phase-based analysis by Tanaka (2011). Chapter 5 is a conclusion.

2. Framework

This section briefly outlines the most recent minimalist framework (Chomsky (2021, 2024a, b), Chomsky et al. (2023)), introducing the notion of Merge, phase, and Markovian derivation.

2.1. Merge

Merge is the only structure building operation in human language. Merge is maximally simply defined by Chomsky (2021) and Chomsky et al. (2023) as a set-forming operation applied freely to a workspace (WS), a set of syntactic objects (SOs). However, since Merge operates within the human faculty of language, third-factor conditions understood in the context of laws of nature (Chomsky 2005) and conditions specific to human language (Language Specific Conditions, LSCs) impose several restrictions on forms and functions of Merge. To be more specific, Chomsky (2024b) proposes that Merge is constrained by conditions attributed to Principle [S] and [T] in (8).

(8) a. Principle [S]: The computational structure of language should adhere as closely as possible to SMT. (Chomsky (2024b:19))

b. Principle [T]: All relations and structure-building operations (SBO) are thought-related, with semantic properties interpreted at CI. (Chomsky (2024b:22))

Principle [S] states that the computational system of human language conforms the

Strong Minimalist Thesis (SMT), which requires that structures of I-language are generated by maximally simple operations governed by third-factor principles such as computational efficiency. Principle [T] is the idea that language is a thought-generating system, and every structure-building operation is associated with interpretation at the Conceptional-Intentional (CI) system.

Merge observing Principle [S] has two forms: External Merge (EM) and Internal Merge (IM). EM takes two members of WS located by Minimal Search (MS), yielding the binary set {P, Q}. Internal Merge (IM) picks out a member of WS P = {Q, R} and then chooses its term Q under MS, yielding the binary set {P, Q} = {Q, {$_P$ Q, R}}. Principle [T] also requires that Merge be associated with theta-structure interpreted at CI to the effect that only EM creates a theta-structure, whereas IM is applied only to an item in a theta-position.

2.2. Phase

This highly restrictive notion of Merge proposed in Chomsky (2024b) brings about an important consequence of eliminating successive-cyclic movement: Once an item has undergone IM from a theta-position to a non-theta position, it never moved out of there via IM because it is not applicable to an item in a non-theta position. Building on this idea, Kitahara (2024) and Kithara and Seely (2024) attempt to deduce the Phase Impenetrability Condition (Chomsky 2000, 2001)) from eligibility of Merge. To see this, consider the structures of CP and v*P phases in (9), where the external argument (EA) and internal argument (IA) are obligatorily raised from theta-positions (i.e., sisters of v*P and V) to non-theta positions (i.e., Spec-I and Spec-V) where phi and Case features get valued.

(9) a. {C, {EA, {I, {$_{v*P}$ t_{EA}, v*P}}}}
b. {v*, {IA, {V, t_{IA}}}}

Since EA and IA in Spec-I/V are not in theta-positions, they are not eligible to IM. The lower copies t_{EA} and t_{IA} are not eligible to IM either, although they are in theta-positions. This is because they are c-commanded by the higher copies EA and IA, and hence MS for the lower copies are blocked by the higher ones (i.e., t_{EA} and t_{IA} are "protected" from MS by EA and IA, in Chomsky's (2021) sense). Therefore, neither the higher copies nor the lower ones undergo further IM from the phase-head-complements. Notice that this framework simplifies phase structures by eliminating phase edge as an "escape hatch" for movement: Since nothing can be extracted out of a phase-head-complement by IM, Spec-C/v* does not serve as a landing site of movement out of IP/VP.

As successive-cyclic movement is eliminated, Chomsky (2024b) proposes that A'-movement such as *wh*-movement and topicalization is not derived by IM but by a phase-level operation accessing an internally merged item for instruction at the interfaces. Behind this idea is the notion of duality of semantics, a component of Principle [T], according to which EM creates a theta-structure (propositional domain) whereas IM creates a discourse-related structure (clausal domain). Given this, an item that has undergone IM is rendered inaccessible to interpretation at the propositional domain, but instead receives interpretation at the clausal domain, with the internally merged item assigned a scope at a higher phase and (optionally) pronounced there. This system is called Box Theory. On the basis of Box Theory, Kitahara (2024) and Kitahara and Seely (2024) claims that EA and IA are rendered accessible to CP phase-level operations associated with discourse-related interpretations by virtue of obligatorily raising to Spec-I/V, thereby taking a scope and being externalized at a higher Spec-C.[2] (10a) and (10b) show the structure of subject and object *wh*-questions, respectively, in which the *wh*-phrases WH raised to Spec-I/V are rendered accessible to the matrix phase head C_Q (put in a square box for exposition), with WH pronounced and interpreted at Spec-C_Q.

(10) a. $\{C_Q, \ldots \{C, \{\boxed{WH}, \{I, \{_{v^*P}\, t_{WH}, v^*P\}\}\}\}\}$

b. $\{C_Q, \ldots \{v^*, \{\boxed{WH}, \{V, t_{WH}\}\}\}\}$

Now, we have to clarify what constitutes a phase. This article assumes that a finite complementizer (C_{finite}) and a transitive or unergative little verb (v*) are phases, whereas a non-finite complementizer ($C_{non\text{-}finite}$) and a passive or unaccusative little verb (v) are not.

(11) a. C_{finite} and v* are phases.

b. $C_{non\text{-}finite}$ and v are not phases.

These are independently assumed in previous literature. Argument for non-phasehood of non-finite CP is found in Kanno (2008) and Sakumoto (2021). See also Saito (2017a, b), which argues that non-finite C does not transfer IP. Non-phasehood of passive and unaccusative little v is assumed in Chomsky (2000). This article also assumes with Epstein, Kitahara and Seely (2016) that a bridge verb is selected by a transitive v*, but its phasehood status is cancelled and it induces no phase-level operations associated with the interfaces.

2.3. Markovian Derivation

As a general property of derivation, Chomsky (2021, 2024a) and Chomsky et al. (2023) propose that it is Markovian: the computational system does not have capacity to access information about an earlier step of derivation. This hypothesis predicts existence of a pair of structurally identical elements X and Y taken to be copies of each other at the interfaces (Markovian-gap, M-gap), because interfaces that cyclically access syntactic structures at each phase-level cannot look back at the history of derivation to distinguish whether these identical two items have been created by IM or have been independently introduced to the structure by EM.

Chomsky (2024) claims that X and Y satisfying the following conditions are taken to be an M-gap.[3]

(12) X and Y are interpreted as a copy pair at the interfaces if and only if
  a. X is structurally identical with Y,
  b. X c-commands Y, and
  c. X belongs to the same phase with Y.

Given two structurally identical items X and Y in a c-command configuration (cc-configuration), the interpretive components accessing a structure at each phase-level (finite CP and v*P) construe them as a copy pair, irrespective of whether X has been created by IM of Y or X and Y are independently introduced by EM, because these components cannot know how they are integrated into the structure by looking back at the history of derivation.

This hypothesis allows Chomsky (2021, 2024a) and Chomsky et al. (2023) to analyze obligatory control (OC) without assuming Control Theory and PRO. They propose that in an OC construction, two structurally identical elements that serve as a controller and a controlee are base-generated in theta-positions by EM, and they are taken to be a copy pair at the interfaces. To see this, let us consider the structure of *John tries to win the race* shown in (13).

(13) {C, {John$_3$, {I {John$_2$, {v*, {try {to {John$_1$, {v*, {win, {the, race}…}

Assuming that only EM yields theta structures, *John*$_1$ in the embedded theta-position and *John*$_2$ in the matrix one are independently introduced by EM. However, at the matrix CP phase-level, in which the interpretive components access the structure in (13) to provide instructions to CI and externalization, these components cannot identify whether *John*$_2$ is created by IM of *John*$_1$ or EM has independently

introduced them because they cannot look back at the history of derivation. Thus, these are interpreted identically at the interfaces, with *John*$_1$ deleted at externalization and interpreted as a bound variable at CI.

3. A Proposed Analysis

This subsection argues that EXNP is analyzed as an M-gap: In an EXNP construction, an extraposed phrase base-generated in a surface position c-commands within a phase a structurally identical element independently introduced to the sister of a modified noun, and these two items are taken to be a copy pair at the interfaces.

3.1. EXNP as an M-gap

Let us consider extraposition from a subject like (14), whose derivation is shown in (15).[4]

(14) A book appeared which was written by Chomsky.

(15) a. {{a, {book, RC_1}}, {I, {v, {appear, t_{subj}}}}} (IM to Spec-I)

b. {RC_2, {{a, {book, RC_1}}, {I, {v, {appear, t_{subj}}}}}} (EM of RC)

c. {C, {RC_2, {{a, {book, RC_1}}, {I, {v, {appear, t_{subj}}}}}}} (EM of C)

First, the subject *a book* accompanied with the relative clause (RC_1) *which was written by Chomsky* is raised from the theta-position (the sister of the unaccusative verb *appear*) to Spec-I in one-fell-swoop, as in (15a). Second, the relative clause RC_2 structurally identical with RC_1 externally merges with the structure in (15a), yielding (15b).[5] Finally, the phase head C is introduced by EM as in (15c), with the CP phase closed. At this point, the interpretive components access the structure in (15c) and construe RC_2 and RC_1 as a copy pair, because RC_2 and RC_1 enter into cc-configuration within the CP phase. Thus, RC_1 is deleted at externalization.

RC_2 is interpreted at CI as the modifier of the antecedent *a book* thanks to the

copy relation with RC_1. To be more specific, this article proposes that copy formation converts RC_1 into an <e, t> type variable bound by RC_2. Given this, (15c) is represented as in (16) at CI (F stands for an <e, t> type variable).

(16) $\{_{CP}$ C, $\{_{IP3}$ RC, $\{_{IP2}$ λF_i $\{_{IP1}$ $\{_{DP}$ a, $\{_{NP}$ book, $F_i\}\}_j$ $\{_{I'}$ I, $\{_{vP}$ v, $\{_{VP}$ appeared, $t_j\}\}\}\}\}\}$

More formally, the semantic representation of IP_2 is derived by Lambda Abstraction in (17a), followed by Functional Application with RC in (17b).

(17) a. $[\![IP_2]\!]$ = λF_{et}. $\exists$x [λx. book(x) & λx. F(x) & λx. appeared(x)]

b. $[\![IP_3]\!]$ = λF_{et}. $\exists$x [λx. book(x) & λx. F(x) & λx. appeared(x)]($[\![RC]\!]$)
= $\exists$x [λx. book(x) & λx. $[\![RC]\!]$(x) & λx. appeared(x)]
= $\exists$x [λx. book(x) & λx. [λy. wrote(c, y)](x) & λx. appeared(x)]
= $\exists$x [λx. book(x) & λx. wrote(c, x) & λx. appeared(x)]

Notice that the complex predicate *λx. book(x) & λx. F(x)* in (17a) is obtained by Predicate Modification in (18) applied to the <e, t> type predicate *book* and the <e, t> type variable F, which are sister nodes of each other.

(18) Predicate Modification
If α is a branching node, $\{\beta, \gamma\}$ is the set of α's daughters, and $[\![\beta]\!]$ and $[\![\gamma]\!]$ are both in $D_{<e,t>}$, then $[\![\alpha]\!] = \lambda x: x \in D_e . [\![\beta]\!] (x) = [\![\gamma]\!] (x) = 1$.
(Heim and Kratzer (1998: 65))

Let us next consider the derivation of extraposition from the object in (19), which is shown in (20).

(19) George met a man last week who was from Philadelphia.

(20) a. {{a, {man, RC_1}}, {V, t_{obj}}} (IM to Spec-V)

b. {last week, {{a, {man, RC_1}}, {V, t_{obj}}}} (EM of *last week*)

c. {RC_2, {last week, {{a, {man, RC_1}}, {V, t_{obj}}}}} (EM of RC)

d. {v*, {RC_2, {last week, {{a, {man, RC_1}}, {V, t_{obj}}}}}} (EM of v*)

First, the object with RC_1 *a man who was from Philadelphi*a is raised from the theta-position (the sister of *meet*) to Spec-V as in (20a), followed by EM of the adjunct *last week* as in (20b). Second, RC_2, which is structurally identical with RC_1, is externally merged with the structure in (20b), yielding (20c). Finally, the phase head v* is introduced by EM as in (20d), with the v*P phase closed. Here, the interpretive components access the structure in (20d), taking the RC_2 and RC_1 in cc-configuration within the v*P phase as a copy pair. Thus, RC_1 is deleted at externalization and the extraposed relative clause is interpreted as the modifier of the antecedent *a man*.

One may claim that the proposed analysis of EXNP violates Principle [T], since an extraposed phrase and its lower copy is introduced by EM. If we interpret Principle [T] strictly to the effect that only EM creates theta-structure *and* EM creates only theta-structure, an adjunct cannot be introduced by EM because it is immune to theta-marking. One possible solution to this problem is to introduce an extraposed phrase and its copy not by EM but by a structure building operation distinct from EM, Pair-Merge (Chomsky 2004). Pair-Merge is an operation to create an ordered pair <P, Q>, where P is an adjunct adjoined to Q. Given this, (20d) is represented as {v*, <RC_2, {last week, {{a, <man, RC_1>}, {V, t_{obj}}}}>}, with RC_2 and RC_1 interpreted as a copy pair. Assuming that Pair-Merge is associated with a modification relation, as suggested by Chomsky (2004: 118), deriving EXNP with Pair-Merge does not violate Principle [T] in the strict sense because it is associated with modification at CI.

Another solution is that EM is associated not only with theta-roles but also

predication and modification (extended theta roles (ETRs), Chomsky (p.c.) to Nobu Goto), and it introduces an adjunct to a non-theta position right after every theta-role is discharged, as proposed by Blümel and Goto (2024). Given this, the extraposed phrase and its copy are introduced by EM without violating Principle [T], because they are associated with a modification relation. Notice that under Blümel and Goto's (2024) framework, an adjunct introduced by EM cannot undergo IM because it is not theta-marked. Thus, this framework does not allow us to derive (14) and (19) with IM, either.

One may also raise the question of whether (14) and (19) can be derived by IM from RC_1 to RC_2 rather than copy formation between RC_1 to RC_2. If they were derived by IM, the system would exhibit redundancy in that each of IM and copy formation would suffice to derive EXNP.[6] This article assumes that RC_1 in (15) and (20) does not undergo IM because relative clauses, being an adjunct, are not theta-marked from their antecedents. Recall that Principle [T] dictates that IM is applicable only to theta-marked phrases. Given this, IM is not an option for deriving extraposition of a relative clause. Similarly, extraposition of PP in (21a) is derived not by IM of PP_1 in (21b) but by copy-formation between PP_1 and PP_2, because the PP *with blond hair* is not theta-marked from the noun *man.*[7]

(21) a. A man came into the room with blond hair.
b. {C, {PP_2, {{a, {man, PP_1}}, {I, {t_{subj}, v*P}}}}}

The claim that extraposition of RC and PP is not derived by IM is supported by the fact that they do not undergo topicalization and *wh*-movement, as shown in (22) and (23).

(22) a. Someone just walked into the room who we don't know.
b. *Who we don't know, someone just walked into the room.
(Kayne (1994: 116-119))

(23) a. A man came into the room with blond hair.
b. *With blond hair, a man came into the room.
c. *With what color hair did a man come into the room?
(Culicover and Rochemont (1990: 23-24))

This contrast is explained by the assumption that only a theta-marked element is eligible to IM: Since the relative clause and the PP modifying a noun is not theta-marked, it is ineligible to IM thanks to Principle [T]. EXNP in (22a) and (23a) is grammatical because it is not derived by IM. In contrast, topicalization and *wh*-movement are not applicable to the relative clause in (22b) and the PP modifier in (23b, c), because they are not theta-marked and hence immune to IM accompanied with phase-level access.

The division of labor between copy formation and IM accounts for the boundedness of EXNP and unboundedness of *wh*-movement and topicalization, if we assume Box Theory by Chomsky (2024b) outlined in section 2.2. In Box Theory, long-distance *wh*-question and topicalization like (7), repeated here as (24), are derived not by successive-cyclic IM but by phase-level access to an internally merged item for instruction to the interfaces.

(24)a. Who did Fred pretended that Bob claimed that Mary liked *t*?
b. This book, I think that you should read.

In narrow syntax, (24a) and (24b) are represented as in (25a) and (25b), where the object *wh*- and topic phrases are raised to Spec-V by IM.

(25) a. {C_Q, {Fred, … {Bob, … {Mary, … {v*, {WH, {like, t_{WH}}}}}}}}
b. {C, {I, … {you, …{v*, {this book, {read, $t_{this\ book}$}

Being internally merged, it rendered accessible to interpretation at the clausal domain. At the matrix phase-level, the phase heads C_Q in (25a) and C in (25b) access these 'boxed' items for instruction to the interfaces, with these being externalized in the matrix Spec-C and taking a scope in the matrix CP at CI. A crucial assumption here is that phase heads may access a 'boxed' item penetrating into any number of phase boundaries. Thus, the *wh*- and topic phrases undergo long-distance displacement by virtue of phase-level access. This strategy is not available for EXNP, because a phase head is accessible only to a phrase that has undergone IM. In EXNP, however, an extraposed phrase is introduced not by IM but by EM (or alternatively, by Pair-Merge). Thus, a phase head in a higher clause cannot access an extraposed phrase penetrating into clause boundaries.

3.2. Locality Constraints on EXNP

The analysis proposed in the previous subsection offers a principled explanation for the locality constraint on EXNP. Let us first consider (3), repeated here as (26), whose derivation is shown in (27).

(26) *John has hoped that a review will appear for a long time which deals with Bill's new book.

(27) a. {{a, {review, RC_1}}, {I, {v, {appear, t_{subj}}}}} (IM to Spec-I)
b. {that, {{a, {review, RC_1}}, …}} (EM of *that*)
c. {hope, {that, {{a, {review, RC_1}}, …}}} (EM of hope)
d. {PP, {hope, {that, {{a, {review, RC_1}}, …}}}} (EM of PP)
e. {RC_2, {PP, {hope, {that, {{a, {review, RC_1}}, …}}}}} (EM of RC_2)
f. {v*, {RC_2, {PP, {hope, {that, {{a, {review, RC_1}}, …}}}}}} (EM of v*)

First, the embedded subject with RC_1 *a review which deals with Bill's new book* is raised to Spec-I as in (27a). Second, the complementizer *that* is externally merged as in (27b), reaching the CP phase-level. Third, the matrix verb *hope* is introduced by EM as in (27c), followed by EM of PP *for a long time* as in (27d). Fourth, RC_2, which is structurally identical with RC_1, undergoes EM with the structure in (27d), yielding (27e). Finally, the matrix v* is inserted by EM as in (27f). In this structure, however, RC_1 and RC_2 are separated by the CP phase boundary masked in (28).

(28) {v*, {RC_2, {PP, {hope, {that, {{a, {review, RC_1}}, …}}}}}}

Since a copy relation is established only two items within a single phase, they cannot be taken as a copy pair at the interface. Thus, (26) is successfully ruled out by the locality condition on copy formation.

Let us next consider why EXNP is applicable to a subject embedded within a non-finite clause, as illustrated in (6b), which is repeated as in (29).

(29) ?John has hoped for a review to appear for a long time which deals with Bill's new book.

The matrix v*P structure of (29) is shown in (30), where the extraposed relative

clause within the matrix VP c-commands the structurally identical one in the embedded subject.

(30) {v*, {RC_2, {PP, {hope, {for, {{a, {review, RC_1}}, …}}}}}}

Crucially, (30) is different from (28) in that the embedded clause is headed by a non-finite complementizer *for*. Given the assumption in (11b) that non-finite C is not a phase, RC_2 and RC_1 are successfully interpreted as a copy pair at the interface when the derivation reaches the matrix CP phase. Thus, RC_1 is deleted at externalization and the extraposed relative clause is interpreted as a phrase modifying the antecedent in the embedded subject.

Let us finally consider why a verb phrase is a bounding node for extraposition from an object, which is attested by VP-ellipsis in (4c), whose second clause is repeated here as (31).

(31) *George did ~~[VP meet a man last week]~~ who was from Philadelphia.

The structure of (31) is shown in (32), where the extraposed clause within IP c-commands the structurally identical one in Spec-V.

(32) {C, {RC_2, {George, {I, {t_{subj}, {v*, {last week, {{a, {man, RC_1}}, {meet, t_{obj}}}}}}}}}}

In this structure, copy formation between RC_1 and RC_2 is blocked because they are separated by the v*P phase boundary masked in (32). Thus, (31) is successfully ruled out by the phase-based locality condition on copy formation.

4. Comparison with a Previous Phase-Based Analysis

The analysis proposed above shares with Tanaka (2011) the basic idea that an extraposed RC is base-generated in a surface position, and CP and v*P phases serve as locality domains for EXNP. This section compares the analysis proposed in section 3 with that of Tanaka's (2011), arguing that the former overcomes some problems with the latter.

Tanaka (2011) tries to account for the locality constraint on EXNP in terms of Chomsky's (2008) Phase Theory. He proposes that when the derivation reaches a phase, the edge feature (EF) that derives A'-merger is inherited from a phase head (C/v*) to a non-phase head (I/V) and an extraposed phrase undergoes merger to Spec-I/V to check EF. Let us first consider the derivation of extraposition from the subject in (33).

(33) A book appeared which was written by Chomsky.

a. [$_{CP}$ C [$_{IP}$ I$_{[EF][AF]}$ [$_{vP}$ v [$_{VP}$ appear [$_{DP}$ a book]]]]] (Inheritance)

b. [$_{CP}$ C [$_{IP}$ [$_{IP}$ [$_{DP}$ a book] I$_{[EF][AF]}$ [$_{vP}$ v [$_{VP}$ appear t_{subj}]]] RC]]
(EM of RC; IM of the subject)

c. [$_{CP}$ C [$_{IP}$ [$_{IP}$ [$_{DP}$ a book] I$_{[EF][AF]}$ [$_{vP}$ v [$_{VP}$ appear t_{subj}]]] RC]]
(Transfer)

First, EF as well as agreement features (AF) that derives A-merger is inherited from C to I, as in (33a). Second, these features simultaneously derive subject raising and rightward EM of RC to Specs-I, as in (33b).[8] Finally, the phase-head-complement masked in (33c) is transferred to the interfaces. Tanaka (2011) claims that a modification relation holds between the antecedent and the extraposed phrase under the assumption in (34).

(34) The modification interpretation is formed within a single transferred domain. (Tanaka (2011: 183))

This makes sure that the extraposed phrase and its antecedent stay within the same Transfer domain. (34) also predicts that an extraposed phrase modifying a subject cannot be introduced to a position higher than IP, because the one generated above IP cannot enter into a modification relation with its antecedent in the subject position. Thus, Tanaka (2011) claims that Right Roof Constraint like (2b) and (3) is reduced to (34), because a phrase extraposed out of an embedded clause cannot establish a local modification relation with its antecedent.

Tanaka (2011) argues that extraposition from an object is derived in the same way. Consider (35).

(35) George met a man last week who was from Philadelphia.

a. $[_{v*P}$ v* $[_{VP}$ $V_{[EF][AF]}$ $[_{DP}$ a man]]] (Inheritance)

b. $[_{v*P}$ v* $[_{VP}$ $[_{VP}$ $[_{DP}$ a man] $[_{V'}$ $V_{[EF][AF]}$ t_{obj}]] RC]]
(EM of RC; IM of the object)

c. $[_{v*P}$ v* $[_{VP}$ $[_{VP}$ $[_{DP}$ a man] $[_{V'}$ $V_{[EF][AF]}$ t_{obj}]] RC]] (Transfer)

First, EF and AF on v* is inherited by V, as in (35a). Second, these features derive object-raising and EM of the extraposed phrase to Spec-V, as in (35b). Finally, the phase-head-complement VP undergoes Transfer, with the extraposed RC interpreted as a modifier of the object by virtue of (34). Tanaka (2011) further claims that (34) explains the fact that VP is a barrier for extraposition from an object, which is evidenced by (4) and (5), because a phrase extraposed out of VP cannot establish a modification relation with an object in Spec-V within a single Transfer domain.

Tanaka's (2011) analysis, however, is not without problems. The first problem is that it remains unclear how an extraposed phrase establishes a modification

relation with its host within a Transfer domain. Tanaka (2011: 183) states that (34) is obtained from the assumption that "a single transferred domain corresponds to the unit for the relevant semantic interpretation at the subsequent C-I interface." However, this does not explicitly describe what ensures a modification relation between an extraposed phrase and its antecedent, especially when they do not form a constituent. In a formal semantic framework like Heim and Kratzer (1998), it is standardly assumed that a modification relation is compositionally established between sister nodes by virtue of Predicate Modification in (18). In the sentence without EXNP in (1a), repeated here as (36a), Predicate Modification is applied to sister nodes N and RC, both of which are of the type <e, t>, yielding an <e, t> type expression in (36b).

(36) a. [$_{DP}$ A [$_{NP}$ [$_{N}$ book] [$_{RC}$ which was written by Chomsky]]] appeared.
b. ⟦NP⟧ = λx. book(x) & λx. wrote(Chomsky, x)

In Tanaka's structures in (33c) and (35c), however, Predicate Modification is not applicable to RC and its antecedent because they do not form a constituent. Thus, Tanaka (2011) has to introduce some additional device that ensures a modification relation between two nodes that do not form a constituent in a non-compositional way, which brings about complication in the interpretive component.

This problem does not arise in the analysis proposed section 3, because a modification relation is compositionally established between an extraposed phrase and its antecedent through copy formation, as discussed in section 3.1. Predicate Modification is applied to a noun and a lower copy of an extraposed phrase, which serves as an <e, t> type variable bound by a higher copy.

The second problem with Tanaka's (2011) analysis is that EF as the driving force of EXNP and the assumption in (34) exhibit redundancy to the effect that each suffices to determine distribution of an extraposed phrase, as far as I correctly

understood. On the one hand, the assumption in (34) dictates that an extraposed phrase stays within a phase head complement: IP (if the antecedent is in a subject position) or VP (if it is in an object position). On the other hand, EF inherited by I/V also determines that RC is merged within IP or VP. Thus, EF and the assumption in (34) overdetermine distribution of an extraposed phrase.

This problem is avoided in the system in the analysis proposed section 3. The distribution of an extraposed phrase is determined solely by the phase-based locality requirement on copy formation in (12): Although nothing in the structure-building component determines the position where an extraposed phrase is introduced, it successfully enters into a copy relation with another structurally identical item in the sister of a modified phrase only when the former c-commands the latter within a single phase. Thus, the proposed system exhibits no redundancy in determining the distribution of an extraposed phrase.

5. Concluding Remarks

To summarize, this article analyzed EXNP as an M-gap, a pair of structurally identical elements taken to be copies of each other at the interfaces. After introducing the notion of Merge, phase, and the Markovian property of derivation assumed in Chomsky (2021, 2024a, b) and Chomsky et al. (2023), section 3 proposed that an extraposed phrase base-generated in a surface position c-commands within a phase a structurally identical element independently introduced to the sister of a modified phrase, and these two items are taken to be a copy pair at the interfaces. Section 3 also demonstrated that the locality constraints on EXNP follows from the assumption that copy formation is applied at each phase. Section 4 compared the proposed analysis with a previous one by Tanaka (2011), which shares the idea with mine that CP and v*P phases serve as boundaries for EXNP, and argued that the proposed analysis overcomes some conceptual problems with Tanaka's (2011) analysis.

As Chomsky (2024a: 20) points out, the SMT — the thesis that the structures

of I-language are generated by maximally simple operations governed by third-factor principles — has a function to enable us to explain "why language [has] the properties and subsystems ("modules") that it does," because it "provides options and systems for language that would have no reason to exist if language did not abide by SMT." Notice that the analysis of EXNP proposed here is an example of the enabling function of SMT, because the existence of EXNP is predicted from the general architecture in which interfaces cyclically access syntactic structures without looking back at the history of derivation. In other words, the proposed analysis adheres as closely as possible to SMT, because it introduces no UG-specific properties or modules beyond Merge to account for the locality restrictions on EXNP, reducing (un)availability of EXNP to the general properties of derivation: the Markovian property of derivation.

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Notes

1) Nakajima (1985) also notes that PP modifying the embedded subject cannot undergo EXNP out of a non-finite clause

(i) *John has hoped [$_{CP}$ for a review __ to appear] for a long time [of Bill's new book]. (Nakajima (1985: 147))

This fact raises the question of why the non-finite clause is a barrier for extraposition of PP extraposition but not for a relative clause. Unfortunately, this is beyond the scope of this article, and I leave it for my future study.

2) In Chomsky's (2024) original framework, C_Q accesses elements in a v*P phase edge. For conceptual and empirical problems with this analysis, see Kitahara (2024), Kitahara and Seely (2024), and Nakashima (to appear).

3) Copy formation mechanism in Chomsky (2021, 2024a) and the one in Chomsky (2024b) differ in that the former postulates that the operation Form Copy applies at each phase-level, whereas the latter abandons such operation, proposing that the interfaces invariably take a pair of structurally identical items in a cc-configuration as a copy pair. Notice also that (12c) is not stipulated but follows from phase-based derivation that renders a phase that has already accessed by the interfaces inaccessible at the next phase. See Chomsky (2024b: 23, fn. 14).

4) Notice that a set generated by Merge has no information about word order, which is specified at externalization. Unfortunately, this article cannot explain why an extraposed phrase derived by copy formation is externalized at the right periphery of a clause whereas a *wh*- and topicalized phrase derived by phase-level access is at the left periphery, so I leave this issue for my future inquiry. A possible scenario would be that a higher copy that enters into agreement with a head (I/V in subject/object raising, C in

wh-movement and topicalization) is universally externalized on the left side of the head, whereas a higher copy introduced without agreement is linearized in accordance with head parameter (see also Saito and Fukui (1998) and Kitada (2012)). Given this, an extraposed phrase adjoined to IP/VP is linearized on the right side of I/V because English is a head-initial language.

5) One may raise the question of what ensures merger of RC_2 at the derivational point in (15b). Although nothing in the system designates an extraposed phrase to be merged at a certain structural position, it must be introduced after the subject but before C, because it must establish a copy relation with the subject under cc-configuration before CP phase is closed at (15c). Thus, the landing site of extraposition from a subject is uniquely determined as the outer Spec-I. This is sharply contrasted with Tanaka's (2011) phase-based analysis of EXNP, where an edge feature inherited by I dictates that an extraposed phrase is merged to Spec-I (see discussion in section 4). I am thankful for Norimi Kimura for bringing my attention to this issue.

6) I am thankful to Etsuro Shima for bringing my attention to this issue.

7) A potential problem with this analysis is that the proposed system redundantly generates extraposition of nominal complements in (i) either by IM or EM, if they are theta-marked from a head noun.

(i) a. I saw a (very good) picture yesterday of the museum.
b. I heard a similar rumor yesterday that you were quitting.

(Fox and Nissenbaum (1999: 139))

Unfortunately, this problem cannot be sufficiently addressed in this article, and left to my future study. One possible solution is to assume with Chomsky (2021) that

computational efficiency favors IM over EM when there is a choice: We cannot introduce the extraposed phrase in (i) with EM because (i) can also be derived by IM applied to the complement PP and CP, which is theta-marked from N and eligible to IM. If successful, this eliminates redundancy between IM and copy formation. The assumption that the nominal complement is eligible to IM is independently attested in (ii), which shows that the complement PP in (iia) can undergo *wh*-movement, whereas the adjunct PP in (iib) cannot.

(ii) a. Of whom did you see a painting *t*?
b.*??By whom did you see a painting *t*? (Fox and Nissenbaum (1999: 133))

8) Tanaka (2011) assumes that extraposition of a nominal complement is derived by IM, whereas that of a nominal adjunct is by EM, though he does not explain what derives the division of labor between IM and EM.

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