

FREEZING EFFECTS

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Abstract. The notion of Freezing refers to the phenomenon that a constituent becomes an island for extraction when that constituent has undergone syntactic movement (displacement). In other words, the constituent is opaque ('frozen') in its movement-derived position. This chapter presents different types of movement-derived syntactic configurations that display freezing effects and discusses various approaches that have been proposed in generative grammar in order to account for the frozen status of displaced constituents. The chapter further addresses the question as to whether a displaced constituent is an absolute barrier for extraction. That is, are there syntactic configurations from which extraction out of a displaced constituent is possible after all?

1 Introduction

Freezing is an island effect. It expresses the idea that a constituent becomes an island for extraction when that constituent has been moved (displaced). Thus, the constituent is opaque—in metaphorical terms: *frozen*—for extraction in its derived position. When it occupies its base position, the constituent is typically transparent for subextraction if the base position is a non-adjunct position.

The freezing phenomenon is exemplified in (1). In (1a), the direct object noun phrase (NP) *reviews of his books* occupies the base position (complement of V). (1b) shows that extraction from within this NP is possible. In (1c), the direct object NP has undergone topicalization within the embedded clause. (1d) shows that the NP is frozen in its derived position: *whose books* can no longer be moved out of the NP.

- (1)
- a. I think that John never reads [reviews of his books]
 - b. Whose books_i do you think that John never reads [reviews of t_i]?
 - c. I think that [reviews of his books]_j John never reads t_j
 - d. *Whose books_i do you think that [reviews of t_i]_j John never reads t_j?

The organization of this chapter is as follows. In section 2, two early generative-linguistic studies will be presented that discuss the phenomenon of freezing, namely Ross (1974) and Wexler and Culicover (1980). Section 3 presents an overview of syntactic configurations that have been argued to display the phenomenon of freezing. Section 4 discusses various theoretical analyses of the freezing effect that have been proposed in the generative-linguistic literature. Section 5 addresses the question whether a displaced constituent is an absolute barrier for extraction. That is, are there syntactic configurations from which extraction out of a displaced constituent is possible? Section 6 concludes this chapter.

2 Early generative-linguistic views on Freezing

The idea that a moved constituent is an island for extraction finds its origin in Ross's *Frozen Structure Constraint* (1967) and his *Immediate Self Domination Principle* (1974), and also in

Wexler and Culicover's (1977, 1980) *Generalized Freezing Principle*.

2.1 *The Frozen Structure Constraint and the Immediate Self Domination Principle*

As Ross (1967) pointed out in his seminal dissertation, certain phrase structure configurations are inaccessible to movement operations. These opaque domains are called *islands*. Sentential subjects, complex noun phrases (i.e., noun phrases containing a clause), and coordinate structures, among others, fall within this class of opaque domains and have been labelled, respectively, the Sentential Subject Constraint (SSC), the Complex Noun Phrase Constraint (CNPC), and the Coordinate Structure Constraint (CSC).

Ross (1967:172 ff.) also notes the island creating effect of movement. More specifically, he observes that no element of an extraposed relative clause may be relativized or questioned. This is exemplified in (2), in which relativization has applied twice. The relative clause *who had worn which*, which modifies the antecedent *a girl*, has been extraposed to a position following *came in*. It is impossible to apply relativization to the direct object *which* of this extraposed clause. That is, the relative pronoun *which* cannot be moved out of the extraposed relative clause and move to the left periphery of the larger (i.e., containing) relative clause that modifies the antecedent *the coat*.

(2) **[The coat [which_j [a girl t_i] came in [who had worn t_j]_i] was torn*

As a first suggestion for the explanation of this ill-formed sentence, Ross proposes the following constraint:

(3) *The Frozen Structure Constraint*

If a clause has been extraposed from a noun phrase whose head noun is lexical, this noun phrase may not be moved, nor may any element of the clause be moved out of that clause.

Ross points out that the ungrammaticality of (3) can be reduced to his CNPC if the rule of *Extrapolation from NP* follows such movement rules as *Question formation* and *Relative clause formation* (see Chapters 45 for a discussion of extraction from complex NPs and Chapter 46 for discussion of Extrapolation). In other words, rule-ordering makes it possible to account for the ill-formedness of example (2) in terms of the CNPC. So, extraction of *which* takes place before the relative clause modifying *a girl* has been extraposed.

In Ross (1974), the question was raised whether (some of) the island constraints proposed in Ross (1967) could be subsumed under a more general island constraint. He argued that the Complex NP-configuration and the Coordinate Structure-configuration shared one phrase structural property: the containing node out of which an element is removed is a self-dominating node, i.e., a node which immediately dominates another node of the same type. This is illustrated in (4):

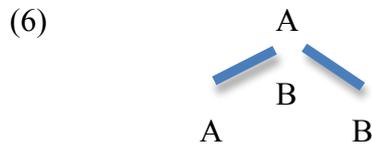
(4) a. *[_{NP} [_{NP} the fact] [_S which they uncovered]]*
b. *[_{ConjP} [_{ConjP} his socks] or [_{ConjP} his gloves]]*

The CNPC and the CSC were unified under what Ross called *The Immediate Self Domination Principle*, which is stated in (5).¹ Note that this principle evokes Chomsky's (1964) *A-over-A Principle*.

(5) *The Immediate Self Domination Principle (ISP)*

No element may be chopped out of a node which immediately dominates another node of the same type.

Given the fact that self-dominating nodes represent Chomsky-adjunction configurations, the ISP states that extraction of a constituent out of an adjoined structure is prohibited. Schematically:



As implied by the ISP, islandhood not only holds for base-generated adjunction configurations, but also for movement derived adjunction configurations. Ross illustrates this with the island creating effect of the transformational rule Complex-NP-Shift, which moves a constituent to the right of the clause.

- (7) a. She will send [a picture of the Waco Post Office] [to Inspector Smithers]
 b. She will send t_i [to Inspector Smithers] [a picture of the Waco Post Office] _{i}
- (8) a. [The Waco Post Office] _{j} she will send [a picture of t_j] [to Inspectors Smithers]
 b. ^{??}[The Waco Post Office] _{j} she will send t_i [to Inspector Smithers] [a picture of t_j] _{i}

As Ross (1974:103) observes, “it is more difficult to chop constituents from the shifted constituent than it is to chop them from an unshifted one.”² Compare (8b) and (8a). The ISP accounts for this contrast: after NP-shift, we get a phrasal S-node which immediately dominates another S-node (see (9)); removal of a constituent out of this (S-)adjunction configuration is blocked.

- (9) ^{??}[[The Waco Post Office] _{j} [_S [_S she will send t_i to Inspector Smithers] [_{NP} a picture of t_j] _{i}]]

2.2 The generalized Freezing Principle

The islandhood of moved constituents was independently observed by Wexler and Culicover (1977, 1980). They discern two types of frozen nodes (i.e., constituents):

- A node is frozen because it is raised (i.e., has undergone structure-preserving movement).³
- A node is frozen because it is non-structure preserving (i.e., the node has a non-base immediate structure).

The first type of frozenness corresponds to the islandhood of moved constituents. Wexler and Culicover define this type of frozenness in terms of their Raising Principle:

- (10) *Raising Principle*
 If a node A is raised, then no node that A dominates may be used to fit a transformation.

‘Raising’ refers here to structure-preserving movement of a constituent from one cyclic domain to another (S and NP being the traditional cyclic domains; cf. Chomsky 1977).

Wexler and Culicover illustrate the application of the Raising Principle with the following

example (among others):

- (11) a. [S [NP Some people *from Philadelphia*] greeted me]
 b. [S [NP Some people t_i] greeted me [*from Philadelphia*]_i]
 c. *[What city]_j did you expect [S [NP some people t_i] to greet you [PP from t_j]_i]?

In (11b), a PP has been extraposed from the cyclic node NP to a sentence-final position within the dominating cyclic node S. This PP-extraposition is structure-preserving, in the sense that the derived surface order V (*greet*) – NP (*you*) – PP (*from Philadelphia*) is a base-generable word order. Compare, for example, the derived order in (11b) with the base order V-NP-PP in (12):

- (12) [S Some people [VP [V greeted] [NP me] [PP with enthusiasm]]]

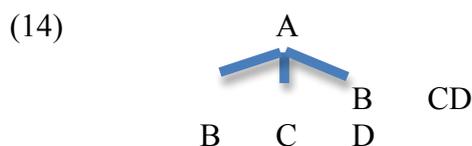
As shown by (11c), the extraposed PP cannot be analyzed by a transformation like Wh-fronting. The Raising Principle blocks subextraction from the raised (i.e., extraposed) PP. The extraposed PP is a frozen node. Notice that (11c) differs from an example like (13), in which the NP (i.e., the empty relative pronoun, here represented as *WH*) has been extracted from a (non-extraposed) PP that is part of an NP occupying a VP-final object position. The base-generated PP is not a frozen domain.

- (13) This is the only city [WH_j that [you have to provide [NP an analysis [PP of t_j]]]]

Let us now turn to the second type of frozen node: a non-structure preserving node. This type of frozen node results from the application of a non-structure preserving adjunction operation: a syntactic node gets frozen if a transformation changes the structure of that node so that it is no longer a base structure. Thus, those nodes that represent derived structures that are not base-generable form islands for transformational rules. Such rules which derive a non-base-generable node A are dubbed rules that are *non-structure-preserving at a node A*. This notion is the opposite of *structure-preserving at a node A*, which is defined as follows (definition taken from Culicover 1982):

A transformation is structure-preserving at a node A just in case the structure immediately dominated by A after the transformation has applied to A is a structure that could have been generated immediately below A as a base expansion by the phrase structure rules.

Given this definition, we could say that the derived structure represented by node A in (14) forms an island for extraction, if there is no Phrase Structure rule $A \rightarrow B C D$ which can base generate this order in the base component of the grammar. That is, the output B C D is non-base-generable, but the result of some transformational rule which is *non-structure preserving at node A*.⁴ Such nodes to which a non-structure preserving transformation has applied are *frozen nodes*. The principle of grammar that blocks extraction out of frozen nodes can now be stated as in (15):



- (15) *Freezing Principle (FP)* (Wexler and Culicover 1980:119)
 If a node A of a Phrase-marker is frozen, no node dominated by A may be analyzed by a transformation.

Consider now the following examples:

- (16) a. Who_j did John [_{VP} send an expensive book about horned frogs [to t_j]]?
b. *Who_j did John [_{VP} send t_i [to t_j] [an expensive book about horned frogs]_i]?]

If the base structure of the VP consists of the sequence V NP PP (i.e., $VP \rightarrow V NP PP$ in terms of phrase structure rules) and if the structural change of Heavy-NP-shift corresponds to the structure [_{VP} V PP NP] —a non-base-generable order— it follows by the definition of non-structure preserving that the VP in which heavy NP shift has applied is frozen. The Freezing Principle in (15) states that it is impossible to analyze this frozen VP. This is illustrated in (16): even though Wh-fronting may apply to the object of the preposition *to* in (16a), it is impossible to strand the preposition in (16b), a structure in which Heavy-NP-shift has applied. The node to which the adjunction is made, i.e., VP, is frozen.

Since in both types of frozenness discussed above, frozenness of A implies non-analyzability by transformational rules, the two subcases of freezing may be subsumed as subcases of a generalized Freezing Principle stating (cf. Wexler and Culicover (1980:542:note 6)):⁵

- (17) *The generalized Freezing Principle*
A node is frozen if (i) its immediate structure is nonbase, or (ii) it has been raised.

The essential characteristic of the Freezing Principle is clear from the following quote from Wexler and Culicover (1980:120): “In line with the Freezing Principle, we may think of the base grammar as providing *characteristic structures* of the language. Transformations sometimes distort these structures, but only these characteristic structures may be affected by transformations.”

2.3 Freezing and the Cycle

Before some further illustrations of the frozenness of moved constituents will be given in section 3, it is important to note the role of ordering of transformations in a derivation. The frozenness of moved constituents presupposes an ordering on the application of transformational rules. If no ordering would be imposed, one might simply propose an alternative potential derivation of a sentence like (16b) according to which extraction of the complement of P applies before the containing phrase (i.e., PP) is moved rightward. In that case, subextraction takes place prior to raising of the hosting phrase.

Although originally ordering was defined at the level of specific transformational rules (rule A applying before rule B, et cetera), it was captured by the more general principle of the Cycle as introduced in Chomsky (1964).⁶ In line with this principle, the rule extraposing the PP (cf. (16)) to a position adjoined to VP must apply first, because it involves the smallest domain, viz., VP. The rule that fronts the NP-complement of P must follow PP-extrapolation, since it involves a larger cyclic domain, viz., the clause (say, CP). Thus, the Principle of the Cycle will require that rightward movement takes place first. In the rest of this chapter, the principle of the Cycle is supposed to regulate the movement operations in the derivation of the various constructions that will be discussed; the application of this principle of grammar in the derivation of a given construction will not always be explicitly mentioned.

3 Freezing patterns

This section presents a (non-exhaustive) overview of freezing patterns that have been discussed in the literature. All these patterns have in common that extraction from a constituent is blocked or yields a deviant result if that constituent occupies a derived position. It should be noted here that in the generative linguistic literature different analyses have been proposed for one and the same movement phenomenon and, related to that, the nature of the landing site (i.e., the derived position). For example, topicalization has been analyzed as adjunction to IP but also as movement to the specifier position of a designated functional projection like TopP (Topicalization Phrase). I abstract away here from these different implementations of the movement phenomenon and present the freezing data from the perspective of a single implementation as proposed in the literature.

3.1 Topicalization and Freezing

As exemplified in (18), a constituent can be moved out of a direct object (DO) NP if the DO-NP is in its base position:

- (18) a. [Whose books]_j does John never read [_{NP} reviews of t_j]?
b. [Which phonological phenomenon]_j should I read [articles about t_j]?

It has been observed that DO-NPs can leave their base position as a result of clause-internal topicalization. This is illustrated in (19), where the DO-NP is topicalized within the embedded clause and ends up in a position in between the complementizer *that* and the subject-NP. This movement operation has been analyzed as an instance of leftward adjunction to IP (S); cf. Baltin (1978,1982), Lasnik and Saito (1992) and Johnson (1986).

- (19) a. I think that [reviews of his books]_i John never reads t_i
b. I think that [articles about vowel harmony]_i you should read t_i carefully

Under the assumption that the topicalized phrase is adjoined to IP, we get the following structure:

- (20) ...[_{CP} ...[_{IP} NP_i [_{IP}t_i]]]

This structure would be unanalyzable for further transformations both under Ross's ISP and under Wexler and Culicover's (Generalized) Freezing Principle. Under the ISP, the node IP would be a frozen node, since it is a self-dominating node. Under the Generalized Freezing Principle, IP would be a frozen node if the adjunction is non-structure-preserving.

As shown by the following examples from Lasnik and Saito (1990; 101), extraction out of the clause-internally topicalized noun phrase yields a very marginal sentence.⁷

- (21) a. ??Whose books_j do you think that [_{IP} [reviews of t_j]_i [_{IP} John never reads t_i]]
b. ??Vowel harmony_j, I think that [_{IP} [articles about t_j]_i [_{IP} you should read t_i carefully]]

As shown in (22), embedded topicalization also applies to PPs:

- (22) I think that [to Mary]_i John gave a book t_i

As Postal (1972) observed, extraction of the complement of P (P-stranding; see Chapter 89) is impossible (cf. (23a)) in a derived structure like (22). In other words, P-stranding is blocked after the PP has been topicalized within the embedded clause. Thus, the islandhood of the moved PP in (23) can also be characterized as a freezing effect. As exemplified by (23b), extraction is permitted from the base position:

- (23) a. *Who_j do you think that [PP to t_j]_i, John gave a book t_i
 b. Who_i do you think that John gave a book [PP to t_i]

3.2 Scrambling and Freezing

In languages like Dutch and German, complements of V can be scrambled leftward in the so-called Middle Field of the clause (cf. Weibelhuth 1989, Müller 1998, Fanselow 2001; see also Chapter 73). This scrambling process is illustrated by the German examples in (24) and (25), where the a-examples represent the base word order (the DO-NP follows the adverbial constituent) and the b-examples the derived word order (the DO-NP precedes the adverbial constituent).

- (24) a. Der Fritz hat letztes Jahr [ein Buch über Chomsky] geschrieben
 the Fritz has last year a book about Chomsky written
 'Last year, Fritz wrote a book about Chomsky.'
 b. Der Fritz hat [ein Buch über Chomsky]_i letztes Jahr t_i geschrieben
- (25) a. Otto hat immer [solche Romane] gelesen
 Otto has always such novels read
 'Otto has always read such novels.'
 b. Otto hat [solche Romane]_i immer t_i gelesen

Under the assumption that Scrambling involves adjunction to VP, we have the following derived structure:

- (26) ...[IP ...[VP NP_i [VP ADVP ..t_i V...]]]

As illustrated in (27a)-(28a), subextraction from a DO-NP is possible when the DO-NP occupies its base position. Subextraction is blocked, however, when the DO-NP occupies a movement-derived position (see Müller 1998, Diesing 1992); see (27b)-(28b).

- (27) a. [Über wen]_j hat der Fritz letztes Jahr [ein Buch t_j] geschrieben?
 about whom has the Fritz last year a book written
 'Who did Fritz write a book about last year?'
 b. *[Über wen]_j hat der Fritz [ein Buch t_j]_i letztes Jahr t_i geschrieben?
- (28) a. Was_j hat Otto immer [t_j für Romane] gelesen?
 what has Otto always for novels read
 'What kind of novels has Otto always read?'
 b. *Was_j has Otto [t_j für Romane]_i immer t_i gelesen?

Similar freezing effects in scrambling contexts can be found with PPs (cf. Ruys 2008).

Consider, for example, the contrast between (29) and (30) from Dutch. In (29), the PP-complement of V is in its base position (i.e., the position following the adverbial phrase); extraction of the pronominal element *daar* from within the PP is permitted (cf. (29b); see Van Riemsdijk 1978 and Chapter 89). In (30), on the contrary, the PP has been scrambled and does not occupy its base position anymore. As a consequence, extraction of the R-pronoun out of the PP is impossible.⁸

- (29) a. Jan had nog nooit [_{PP} daarvan] gehoord
 Jan had yet never there-of heard
 ‘Jan had never heard of it yet’
 b. Daar_j had Jan nog nooit [_{PP} t_j van] gehoord
 there had Jan yet never of heard
- (30) a. Jan had [_{PP} daarvan]_i nog nooit t_i gehoord
 Jan had thereof yet never heard
 ‘Jan had never heard of it yet’
 b. *Daar_i had Jan [_{PP} t_i van]_j nog nooit t_j gehoord
 there had Jan of yet never heard

Adopting an analysis in which the scrambled PP is left-adjoined to the VP, we get a structure like (31):

- (31) ...[_{IP} ...[_{VP} PP_i [_{VP} ADVP ..t_i V...]]]

Under both Ross's ISP and Wexler and Culicover's generalized Freezing Principle, this structure would be unanalyzable for further transformations. Ross's ISP would analyze the VP node as a frozen node, since it is a self-dominating node. Wexler and Culicover's theory could relate the frozenness of the scrambled PP to the Raising Principle in (10), under the assumption that the order PP - ADVP - V is an order that is base-generable (compare, for example, the derived order in (30a) with the base word order in a sentence like *Jan had [_{PP} gedurende zijn leven] [_{ADVP} nog nooit] gehuild* (Jan had during his life yet never cried), where the adjunct-PP *gedurende zijn leven* precedes the adverbial phrase *nog nooit*.

3.3 Movement to Spec,CP and Freezing

Movement to Spec,CP is a well-known displacement phenomenon. From the perspective of Freezing, the question obviously arises as to whether phrases moved into this landing position constitute frozen domains (see also sections 5.1 and 5.2 for discussion of this question). Before turning to some relevant examples, consider first the sentences in (32a-c), where a wh-phrase has been removed from an NP, AP and PP, respectively. Since these phrasal constituents occupy their base position, they are transparent for extraction.

- (32) a. I wonder [[whose books]_i John read [_{NP} several reviews of t_i]]?
 b. I wonder [[which son]_i John was [_{AP} very proud of t_i]]
 c. I wonder [[whose mouth]_i the dentist stuck his finger [_{PP} too far into t_i]]?

As illustrated by the examples in (33), it is possible to move a complex phrase (*in casu* a phrase whose head takes a complement) into Spec,CP:

- (33) a. I wonder [_{NP} how many reviews of Mary's book]_i John read t_i.

- b. I wonder [_{AP} how proud of his son]_i John really was _{t_i}.
- c. I wonder [_{PP} how far into John's mouth]_i the dentist stuck his finger _{t_i}.

Observe now that extraction from the displaced NP/AP/PP in Spec,CP yields a degraded sentence.^{9, 10}

- (34) a. *^{/??}[Whose book]_j do you wonder [[_{NP} how many reviews of _{t_j}]_i John read _{t_i}]?
 - b. *^{/??}[Which son]_j do you wonder [[_{AP} how proud of _{t_j}]_i John really was _{t_i}]?
 - c. *^{/??}[Whose mouth]_j do you wonder [[_{PP} how far into _{t_j}]_i the dentist stuck his finger _{t_i}]?

The frozenness of phrases that have been moved into Spec,CP has also been observed for German (cf. Fanselow 1987, Grewendorf 1989, Müller 1998, 2010). In German, it is possible to topicalize a phrase to the specifier position of an embedded clause in which Verb Second (movement of the finite verb to C) has applied. In (35a), for example, the VP *das Buch gelesen* has been moved into Spec,CP. Note that the finite verb *hat* has moved to C. As shown in (35b), it is impossible to move the wh-word *was* out of the topicalized VP. In other words, the displaced VP constitutes a frozen domain. Observe that movement of *was* to the specifier position of the matrix clause is possible when the VP headed by *gelesen* occupies its base position (see (35c)). Note that in (35c) the Verb Second operation has been applied to the finite verb.

- (35) a. Ich denke [_{CP} [_{VP} das Buch gelesen]_i [_C hat_k [_{IP} keiner _{t_i} _{t_k}]]]
 - I think that book read has noone
 - ‘I think no one read the book.’
 - b. *Was_j denkst du [_{CP} [_{VP} _{t_j} gelesen]_i [_C hat_k [_{IP} keiner _{t_i} _{t_k}]]]?
 - what think you read has noone
 - ‘What do you think no one read?’
 - c. Was_j denkst du [_{CP} _{t_j} [_C hat_k [_{IP} keiner [_{VP} _{t_j} gelesen] _{t_k}]]]?
 - what think you has noone read
 - ‘What do you think no one read?’

3.4 Rightward movement and Freezing

Consider the following structures that have been argued to involve rightward movement of the phrase in italics. In (36), the phrase *a book about linguistics* has undergone heavy/complex NP-shift. The examples in (37) illustrate PP-extrapolation (see Chapter 46). (38), finally, exemplifies the phenomenon of CP-extrapolation. In both (37a) and (38), extrapolation has taken place from within a noun phrase.

- (36) I gave _{t_i} to John [*a book about linguistics*]_i
- (37) a. I saw [*a book _{t_i}*] yesterday [*about lazy pronouns*]_i
 - b. John put his finger _{t_i} yesterday [*into his sister’s throat*]_i
- (38) a. John announced [*a plan _{t_i}*] yesterday [*PRO to fix Mary’s car*]_i
 - b. John met [*a student _{t_i}*] yesterday [*who read Syntactic Structures*]_i

The examples in (39) show that after heavy/complex NP-shift, the noun phrase has become an island for extraction. Thus, a rightward moved noun phrase is frozen.¹¹

- (39) a. *What_j did you give _{t_i} to John [*a book about _{t_j}*]_i?

- b. *Who_j did you see t_i yesterday [some beautiful pictures of t_j]_i?
- c. *Horned frogs_{s_j}, John sent t_i to Horace [an expensive book about t_j]_i?

The frozenness of extraposed PPs is shown by the ill-formedness of the following examples:¹²
13

- (40) a. *[What kind of pronouns]_j did you read [a book t_i] yesterday [about t_j]_i?
- b. *[Whose throat]_i did John put his finger t_i yesterday [into t_j]_i?

Thus, after extraposition of PP, preposition stranding is blocked. As shown in (41), preposition stranding is generally permitted if the PP occupies its base position:

- (41) a. [What kind of pronouns]_j did you read [a book about t_j] yesterday?
- b. [Whose throat]_j did John put his finger [into t_j] yesterday?

As shown in (38), a clause can be extraposed out of a noun phrase. It is well-known that a nonextraposed clause constitutes an island for extraction (cf. Ross's (1967) CNPC). As Wexler and Culicover (1980) observe, there is no complex NP after extraposition of the clause; however, removal of an element from within the clause is still impossible. This is exemplified in (42). This opacity of the extraposed clause follows if moved phrases are frozen, i.e. non-analyzable for subextraction operations (i.e., Wexler and Culicover's Raising Principle).¹⁴

- (42) a. *[Whose car]_j did John announce [a plan t_i] yesterday [PRO to fix t_j]_i?
- b. *[Which book]_j did you meet [a child t_i] yesterday [who read t_j]_i?

In short, the above phenomena show that rightward moved constituents are frozen, i.e., constituents contained within the moved phrase cannot be moved to a position external to it.

3.5 A-movement and Freezing

So far we have seen that movement operations involving adjunction to VP and IP or placement into Spec,CP yield a freezing effect: extraction from the constituent occupying the derived position is impossible. The question arises as to whether the phenomenon of freezing extends to derived positions that result from A-movement, more specifically movement to Spec,IP/TP.¹⁵ As suggested by the ill-formed status of the English examples in (43), A-movement also induces a freezing effect (cf. Huybregts 1976, Lasnik and Saito 1992, Collins 1994):^{16, 17}

- (43) a. *Who_j do you think that [_{IP} [pictures of t_j]_i were painted t_i]_i?
- b. *Which cars_{s_j} were [_{IP} [the hoods of t_j]_i damaged t_i]_i?

The embedded clause in (43a) and the main clause in (43b) involve passivization: the NP carrying the semantic role of Theme (*pictures of whom* and *the hoods of which cars*) has been moved to Spec,IP. As indicated in (43), extraction from this A-movement derived position is impossible.

In (44a), this freezing effect as a result of A-movement is exemplified for German (see Müller 1995). As opposed to English, German allows the Theme-NP (carrying Nominative case) of the passive clause to remain *in situ*. As shown in (44b), this base position is transparent for extraction.

- (44) a. *Worüber_j ist [ein Buch t_j]_i von keinem t_i gelesen worden?
 what-about is a book by noone read been
 'A book about what has been read by no one?'
 b. Worüber_j ist von keinem [ein Buch t_j] gelesen worden?

Since Kitagawa (1986) and Koopman and Sportiche (1991), the traditional view (see e.g., Chomsky 1965, 1981, 1986a) that the subject of the clause is base-generated in a VP-external position (say, [Spec,IP/TP]) has been abandoned. It is generally assumed that the subject noun phrase (i.e., the external argument) finds its origin lower in the clausal structure, more specifically in the specifier of the lexical projection VP or, alternatively, in the specifier position of the functional projection vP (cf. Chomsky 1995). A consequence of this VP-/vP-internal subject hypothesis is that subject noun phrases that are high in the clausal structure (i.e., in the specifier position of IP/TP) end up in that position as a result of movement (more specifically, A-movement); see (45a). In other words, subject NPs that occupy Spec,IP are in a derived position. The islandhood exemplified in (45b) consequently falls under the general heading of freezing effects.

- (45) a. [_{IP} [_{NP} a picture of Mary]_i [_{I'} I [_{VP} t_i hang on the wall]]]
 b. * [_{CP} Who_j does_k [_{IP} [_{NP} a picture of t_j]_i t_k [_{VP} t_i hang on the wall]]]?

The frozenness of the derived subject position is also nicely illustrated by the examples in (46), drawn from Lasnik and Park (2003); see also Stepanov (2007) and Lohndal (2011). (46a) shows that extraction of *which candidate* out of the subject NP is possible if the latter phrase occupies its base position. Note that in this example Spec,IP is occupied by expletive *there*. In (46b), the NP *posters of which candidate* has been moved to Spec,IP and, subsequently, *which candidate* is extracted out of the A-moved subject-NP. This last movement step induces a freezing effect.

- (46) a. [Which candidate]_j were_k [_{IP} there [_{VP} [_{NP} posters of t_j]_i t_k all over town]]?
 b. *[Which candidate]_j were_k [_{IP} [posters of t_j]_i [_{VP} t_i t_k all over town]]?

4 Analyses of freezing effects

In section 2 I discussed two early generative-linguistic analyses of the Freezing phenomenon. In this section, I will discuss a few other approaches towards the islandhood of displaced constituents that have been proposed during various stages of generative-syntactic research. As we will see, frozenness of a displaced phrase XP has been interpreted in terms of (i) locality (Barrierhood), (ii) chains, and (iii) extra-grammatical factors, more specifically processing and information structure.

4.1 Freezing as a locality effect

4.1.1 Freezing and Barrierhood

The islandhood of moved constituents has never had a very prominent place in general theories of locality. Other island effects, such as the complex NP island and the *wh*-island, have received much more attention in attempts to come to a more general, unified theory of locality. Neither Chomsky (1977; *On Wh-movement*) nor Chomsky (1986a; *Barriers*) contains a discussion of the

phenomenon of freezing. Johnson (1986: 3.2.2) shows, however, that the islandhood of moved constituents follows quite straightforwardly from Chomsky's Barriers theory.¹⁸ According to this theory, the extractability of a syntactic domain is designed around the complement/non-complement distinction. More specifically, a domain is transparent for extraction if it is L-marked (i.e., theta-marked by a lexical head) but opaque for extraction if it is not L-marked.¹⁹ As Johnson shows, after having been moved, a phrase occupies a non-L-marked (i.e., non-theta-governed) position. As a result of this, the phrase forms a Blocking Category (BC) and a Barrier for constituents that are dominated by it. Because the moved phrase is a BC, the maximal projection immediately dominating it (e.g., VP or IP) is also a Barrier. Movement out of a constituent that has itself been moved thus crosses two Barriers, and hence violates the Subjacency Condition.

Let us take as an illustration the examples in (39b) and (21a). The derived structures of these sentences are the following:

- (47) *_{[CP Who_j did [IP you [VP [VP see t_i yesterday] [some beautiful pictures of t_j]_i]]]]?}
- (48) *_{[CP Whose books_j do [IP you think [CP t_j that [IP [reviews of t_j]_i [IP John never reads t_i]]]]]]?}

In the derivation of (47), the NP *some beautiful pictures of who* undergoes heavy NP-shift and gets adjoined to the VP. Since the shifted NP does not occupy its base position (i.e., sister to V), the NP is not L-marked and hence forms a BC and a Barrier for extraction. When the wh-phrase *who* is moved out of the shifted NP to the specifier of the embedded CP, it crosses three Barriers: the shifted NP, the higher VP and IP.

In (48), the noun phrase *reviews of whose books* has been topicalized within the embedded clause. It ends up in a position left-adjoined to the IP-node. Extraction out the topicalized NP to the [Spec,CP] of the embedded clause violates the Subjacency condition. Two Barriers are crossed: the moved NP is a blocking category and a barrier, since it is not L-marked; the IP to which the moved phrase is adjoined is a barrier by inheritance.

4.1.2 Freezing and the Phase Impenetrability Condition

The Phase Impenetrability Condition (PIC), as formulated in (49), is a locality constraint that reduces computational complexity by minimizing search space in derivations (see Chomsky 2000, 2001, 2008):

- (49) *Phase Impenetrability Condition (PIC)*
 The domain of a head X of a phase XP is not accessible to operations outside XP; only X and its edge are accessible to such operations.

According to this condition, a constituent occupying the specifier position (i.e., edge) of a phase XP (e.g., v*P, CP) is accessible to displacement.²⁰ On the basis of the examples in (50), Chomsky (2008:147) argues that material inside the constituent occupying the edge position is inaccessible to displacement. In other words, the constituent occupying the specifier position of a phase XP is internally frozen.

- (50) a. [_{CP} Of which car_i did [_{TP} they_k T [_{v*P} t_k v* [_{DP} find [_{DP} the driver t_i]]]]]]?
 b. [_{CP} Of which car_i was [_{TP} [_{DP} the driver t_j] T [_{vP} v awarded a prize]]]]?
 c. *_{[CP} Of which car_i did [_{TP} [_{DP} the driver t_j] T [_{v*P} t_j v* cause a scandal]]]]?

Let us briefly consider the examples in (50); see Chomsky (2008) for detailed discussion. In

(50a), the PP-complement of *which car* has been extracted out of a direct-object-DP (an internal argument), in (50b) out of the subject (i.e., an underlying internal argument) of a passive sentence, and in (50c) out of the subject (i.e., external argument) of a transitive verb. Chomsky argues that there is a contrast in acceptability between (50b) and (50c). Extraction from the derived subject of the passive sentence yields a better result than extraction from the subject of the active sentence. From this, Chomsky concludes that extraction of the PP from the subject in (50b,c) does not apply from Spec,TP, since if that were the case, one would not expect the sentences to have the same acceptability status. Rather, extraction of the PP should take place from the subject in its base position. For (50b), this means that *of which car* is removed from within the external argument-DP occupying Spec,v*P, and for (50c), this means that the PP is extracted from within the internal argument DP. As shown by (50a), subextraction from a direct-object Noun Phrase (i.e., DP) is possible. The question then arises as to how subextraction of PP from within the internal-argument-DP and movement of that DP to Spec,TP derivationally apply. Chomsky proposes that A-movement (i.e., movement to Spec,TP) and A-bar-movement (i.e., movement of the PP-complement of *which car* to Spec,CP) take place in parallel. This is made possible by assuming that the phi-features (Agree-features) on T are inherited from the phase head C, which also carries the Edge-feature that must attract the wh-phrase. While the Edge-feature on C attracts the wh-phrase *of which car*, the phi-features on T inherited from C simultaneously attract the entire internal argument DP (*the driver of which car*) to Spec,TP. The ill-formedness of (50c) suggests that the PP contained within the external argument-DP (in Spec,v*P) cannot undergo A-bar movement in parallel with A-movement of the external argument-DP to Spec,TP. Chomsky suggests that the Edge-feature on the phase-head C cannot attract the PP from within the external argument, because the PP is too deeply embedded in a phase (viz. v*P) already passed in the derivation.

Working within the Minimalist framework (Chomsky 1995), Müller (2010) also develops a PIC-based analysis that accounts for Condition-on-Extraction-Domain-effects (CED-effects; Huang 1982) but also covers the frozenness (i.e., barrierhood) of moved phrases. A core ingredient of his analysis is the idea that a phrase (YP) occupying an edge (i.e., specifier) position of a phase head is a barrier for extraction only if it is the last-merged specifier within that phase. In other words, in the following representations, where ZP is a phase containing two specifiers (YP, UP), the outer specifier YP is a barrier/island for extraction, but the inner specifier UP is not.

(51) [ZP YP [Z' UP [Z' Z ...]]]

In line with Koster (1978a) and Van Riemsdijk (1978), Müller takes the position that all phrases (XPs) are phases; i.e., all phrases qualify as locality domains for movement. For (51), this means that (besides ZP) the phrases YP and UP are phases. In line with PIC, subextraction of an element from within a specifier (say UP) can only proceed via intermediate movement steps to the phase edge of that specifier (UP) and the phase edge of the containing phrase (ZP). These derivational steps are induced by edge features of the pertinent phase heads (say, U and Z). An important assumption made by Müller is that an edge feature can be assigned to (i.e., inserted on) a phase head *as long as that phase head is active*, where 'active' is defined as 'still having features to discharge'. Thus, after UP has been merged as a specifier of the phase head Z, the phase head Z can attract an item out of UP to an outer specifier, since the phase head Z is still active (i.e., it has an edge feature available that still needs to be discharged, viz. to YP). Subextraction out of YP, on the contrary, is not possible, since the phase head Z, having discharged all its features, has become syntactically inert. Thus, under Müller's analysis the frozen status of a moved phrase occupying the specifier position of a phase head relates to the inactive status of that phase head.

The spirit of Müller's analysis can be illustrated by means of the examples in (28),

repeated here as (52).

- (52) a. Was_j hat Otto immer [t_j für Romane] gelesen?
what has Otto always for novels read
'What kind of novels has Otto always read?'
b. *Was_j hat Otto [t_j für Romane]_i immer t_i gelesen?

In (52a), *was* can leave the direct object-DP via the edge position of DP and move to the next edge position (say, VP) and onwards to Spec,CP. In (52b), the DO-DP has been scrambled and becomes the (outer) specifier of VP. Since the object-DP is last-merged in Spec,VP, the phase head V has become inert, which implies that no element can be removed from the DO-DP occupying the outer Spec-position of VP.

Müller points out that a specifier (say, UP) of a phase ZP that is normally (i.e., if it is last-merged within the containing projection) an island for extraction should "melt" (i.e., cease to be a barrier) when some phrase YP becomes the outer specifier of the phase head Z as a result of movement. That is, in a configuration like (51), where UP is a displaced phrase that normally constitutes an island if it is the outer specifier of Z, UP becomes transparent for extraction (i.e., "melts") if another phrase YP becomes the outer specifier of Z as a result of an additional movement process. This melting phenomenon is exemplified in (53b), where the subject-NP *was für Bücher*, which normally blocks subextraction, becomes transparent for extraction after the DO-NP *den Fritz* has been scrambled to a pre-subject position. Since *was für Bücher* is no longer the outer specifier of the relevant phase head, subextraction of *was* becomes possible.

- (53) a. *Was_j haben [t_j für Bücher] [den Fritz] beeindruckt?
what have for books the Fritz impressed
'What kind of books impressed Fritz?'
b. Was_j haben [den Fritz]_k [t_j für Bücher] t_k beeindruckt?
what have the Fritz for books impressed

4.2 Freezing and Chains

4.2.1 Incomplete antecedents

In Huybregts (1976), the freezing phenomenon is explained in terms of a restriction on antecedents. He points out that by adopting Trace theory (cf. Chomsky 1976, Fiengo 1977) it is possible to give a unified explanation of certain ill-formed relationships between an antecedent-phrase and an element that is linked to it. His starting point is the observation made by G. Williams (1971) that incomplete antecedents (i.e., antecedents from which an element has been removed) are bad as antecedents for pronominal elements. Consider for this, the following pair (taken from Huybregts 1976):

- (54) a. The man who spoke to [the mother of the boy]_i said she_i was ill
b. *The boy who_j I saw [the mother of t_j]_i said she_i was ill

In (54a), the (complete) noun phrase *the mother of the boy* can function as the antecedent of the pronoun *she*. As shown by the ill-formedness of (54b), an antecedent-anaphor relationship is impossible when the antecedent (*[the mother of t_j]*) is incomplete. Thus, schematically, the following configuration is impossible:

- (55) ... Z ..._i[X ...t_Z...] ... pron_i.
Where t_Z is a trace of the moved element Z

Huybregts points out that the freezing-effect-configuration corresponds to the configuration in (56), the only difference with (55) being that instead of a lexical pronoun we have an empty element, more specifically a trace:

- (56) ... Z ..._i[X ...t_Z...] ... t_i.
Where t_Z is a trace of the moved element Z and t_i the trace of the moved element X

In short, the freezing effect is explained in terms of a restriction on antecedents: phrases from which an element has been removed are not proper antecedents for a dependency relation (e.g., antecedent-pronoun; antecedent-trace). This is stated more formally as follows (Huybregts 1976:346):

- (57) *Antecedent condition*
No rule can refer to X, Y in the structure:
.....X ..._αY.....] ...Z...
where Z is linked to α

Consider now how (58) is ruled out by this constraint:

- (58) ^{*/??}[_CP Who_j do [_IP you think [_CP t'_j that [_IP [pictures of t_j]_i [_IP John wanted t_i]]]]]]

The syntactic structure in (58) violates the Antecedent Condition: t_i is the trace of the incomplete antecedent noun phrase [*pictures of t_j*].

4.2.2 Freezing and Chain uniformity

Working within the framework of Chomsky's (1993, 1995) Minimalist Program, Takahashi (1994) develops an account of the extractability of a syntactic domain that is based on the conditions of Shortest Move and Chain Uniformity. According to the former condition, an element undergoing displacement should reach its target site by a series of short successive movement steps (adjunction operations) to the maximal projections along its path (see also Chomsky 1986a). According to the latter condition, a derivational process like movement should not disturb the uniform status of Chains. More specifically, Takahashi proposes the following constraint:

- (59) *Uniformity Corollary on Adjunction (UCA)*
Adjunction to a part of a nontrivial chain or coordination is not allowed.

Let us see how the UCA, in conjunction with the Short Movement Condition, explains the frozenness of the topicalized NP in (21b), repeated here as (60).

- (60) ^{*/??}[_CP Whose books_j do [_IP you think [_CP t'_j that [_IP [reviews of t_j]_i [_IP John never reads t_i]]]]]]

Notice that in (60) the various extraction sites are occupied by traces (*t*). Under the copy theory of movement (see among others Chomsky 1993, Corver and Nunes 2007), though, a trace is a copy

of the moved element that is deleted in the PF component (but is available for interpretation at LF). This means that the first movement step in (60), i.e., movement of the DO-NP *reviews of whose books* from the complement position of *wanted* to the position adjoined to IP yields the following configuration:

(61) [CP that [IP [reviews of whose books] [IP John never reads [reviews of whose books]]]]

The original and the copy constitute a chain. Displacement of *whose books* out of the topicalized noun phrase involves extraction from the higher link of the chain. Given the SMC, Takahashi argues that *whose books* can only leave the dominating DP by first adjoining to this DP. This yields the configuration in (62), where the boldface constituents *whose books* and *whose books* constitute a chain:

(62) ... [CP that [IP [DP **whose books** [DP reviews of **whose books**]] [IP John never reads [DP reviews of whose books]]]]

The UCA, however, disallows this movement step, because it involves adjunction to a part of a nontrivial chain (i.e., the chain {reviews of whose books, reviews of whose books}).²¹ In order to escape a violation of the UCA, *whose books* must skip adjunction to DP and move on to the next available intermediate landing site, viz., adjunction to IP. This creates the configuration in (63):

(63) ... [CP that [IP **whose books** [IP [DP reviews of **whose books**]] [IP John never reads [reviews of whose books]]]]]]

Although the adjunction step in (63) does not lead to a violation of the UCA, it does lead to a violation of the SMC, since the displaced element *whose books* skips a potential landing site, viz., DP. In short, extraction of *whose books* out of a topicalized phrase will always yield a violation of either the UCA or the Shortest Move condition.

In the spirit of Minimalism, Stepanov (2007) raises the question as to why the Chain Uniformity requirement, as proposed in Takahashi's analysis, should be part of the grammar. In the line of Ochi (1999), Stepanov takes Chain Uniformity to be a PF-requirement: at PF, chains that are created by movement are subject to deletion of all copies except the highest. As discussed in Nunes (2004), deletion of the lower copy/copies is needed for reasons of linearization; more specifically, the linear precedence relation of the chain with respect to (chain-external) elements cannot be established if more than one copy of the chain surfaces in the linear string at PF. Thus, to allow linearization, the lower copy/copies of the chain must be deleted. Importantly, deletion of a copy is only possible if the copies of the chain are fully identical, i.e. non-distinct (the well-known condition of recoverability of deletion). Notice now that in (62), the foot of the chain and the head of the chain are not fully identical (i.e., they are distinct) after the wh-word *whose books* has moved to the edge of the DP. Since the copies are non-identical to each other, PF cannot delete the lower copy, and an illegitimate/uninterpretable PF object results. In short, the frozenness of a moved constituent has a PF-related nature.

The connection between chains and freezing has been discussed in the literature more extensively. It should be noted, though, that in those discussions the notion of freezing is often used in a slightly different sense. Traditionally (see section 2), the phenomenon of freezing typically refers to the islandhood of a moved constituent; i.e., no material can be moved *out of* the moved constituent. More recently, the notion of freezing is also used to refer to the immobility of the moved constituent itself, once it has reached a particular landing site. Rizzi (2006), for example, formulates the principle in (64), which involves a constraint against multiple A-bar checking; see also Rizzi and Shlonsky (2007):²²

- (64) *Criterial Freezing*
 A phrase meeting a criterion is frozen in place.

The notion of 'criterion' refers to a position that is dedicated to a particular scope-discourse interpretive property (e.g., the interrogative Q-property, the Focus-property) in the terms of Chomsky (2001). Once a displaced element has moved into such a criterial position—typically, the specifier position of a functional (i.e., criterial) head—it is frozen in place and cannot undergo further movement to a distinct and higher criterial position. Consider, for example, the ill-formed sentence in (65):

- (65) *_{[CP} Which book_i does [Bill wonder [_{CP} t_i she read t_i]]]?

(65) is ungrammatical because the very same wh-phrase, *which book*, is involved in two operations involving checking of an interrogative Q-property, namely the Q-property of the embedded C and the Q-property of the matrix C.

Another illustration of *Criterial Freezing* is given by the Italian examples in (66); examples drawn from Rizzi 2006.

- (66) a. Mi domandavo quale RAGAZZA avessero scelto, non quale ragazzo
 I wondered which GIRL they had chosen, not which boy
 b. *Quale RAGAZZA mi domandavo -- avessero scelto, non quale ragazzo

(66a) shows that a wh-phrase permits a contrastive focus reading. This implies that the structure in (66b) is not ill-formed for interpretive reasons. Rather, a formal principle like (64), which can be thought of as an economy condition that contributes to minimizing movement, rules out the pattern in (66b). The wh-phrase (*quale ragazza*) satisfying the Q-criterion in an embedded interrogative clause resists further focus movement to the left periphery (say, Spec,CP) of the main clause.

Instead of blaming the ill-formedness of (65) and (66b) on (criterial) feature checking (that is, a constraint on derivations), Gallego (2009, 2010) accounts for their ungrammaticality in terms of an interface constraint barring chain occurrences from being assigned more than one discourse-oriented interpretation at the interface. Building on Chomsky's (1986b) hypothesis that every element must receive an (unambiguous) interpretation at the interfaces (Chomsky's Principle of Full Interpretation), he argues that Boeckx's *Principle of Unambiguous Chain* ("Chains must be defined unambiguously"; Boeckx 2003:13) suffices to explain the deviance that arises whenever an XP is assigned more than one interpretation of the same type.

4.3 Freezing as a failure of processing

Culicover and Winkler (2010) develop an analysis of freezing effects according to which the ill-formedness of a "freezing configuration" is due to a failure in the processing of a filler-gap dependency. In other words, the explanation of the freezing phenomenon lies outside syntax. This processing approach towards freezing can be exemplified on the basis of example (67), in which a wh-phrase (*who*) has been extracted out of a direct object noun phrase (*a picture of who*) that has shifted rightward as a result of the Heavy-NP-shift operation.

- (67) *Who_i did you give __ to Robin [a picture of t_i]?

The processor identifies a gap (here represented as '___') in between the verb *give* and the PP *to Robin*. This gap, which results from the application of Heavy-NP-Shift, is interpreted by the processor as being connected to the wh-phrase *who*. That is, the processor posits a wh-trace in this position that forms an A'-chain with *who*, as in (68). This A'-chain receives the object thematic role from the verb *give*.

(68) Who_i did you give t_i to Robin ...

When the processor reaches the shifted heavy NP, it is no longer possible for the processor to establish a chain relationship between *who* and the actual gap (represented as '___' in (69)).

(69) Who_i did you give t_i to Robin [a picture of ___]

Culicover and Winkler characterize the situation in (69) as a 'chain' garden path: the processor has built the wrong A'-chain and repair of this incorrect analysis involves dissolving the first A'-chain, building a new chain that consists of *who* and the trace within the shifted direct-object-NP, and analyzing the entire right-peripheral NP as the direct object of *give*. It is this garden-path effect which produces the ill-formedness judgment of a sentence like (67).²³

5 Thawing, smuggling and absence of freezing

The generalization formulated thus far is that a moved phrase forms an island for extraction. It was shown that a phrase XP that allows subextraction of an element when it occupies its base position turns into an island when it is in a derived position. Movement, in other words, has a freezing effect. Although in general it seems true that a node gets inaccessible for subextraction after movement, it has been argued in the literature that sometimes the moved phrase is mildly or even fully transparent for subextraction (see also Müller's (2010) melting effect, discussed in section 4.1.2). In section 5.1 I will discuss a number of examples from Spanish (first noted in Torrego 1985), in which a wh-phrase appears to be extracted out of a larger wh-phrase occupying the Spec,CP position of an embedded clause. In section 5.2 I will discuss a pattern in which a phrase becomes mildly transparent ("thawing") after movement. Section 5.3 discusses patterns in which a constituent has been said to be, or appears to be, extracted from a displaced constituent.

5.1 Extraction from wh-phrases in Spanish

Recall from section 3.3 that extraction out of a wh-phrase occupying Spec,CP generally does not yield an acceptable sentence in English (see though section 5.2). Torrego (1985) has argued for Spanish, however, that similar subextractions in Spanish are quite acceptable (see also Chomsky (1986a:25-26) for discussion). Torrego's example is given in (70). In this example *del que* is extracted from the fronted wh-phrase headed by *libros*.

(70) Este es el autor [del que]_i no sabemos [CP [NP qué libros t_i]_j leer t_j]
 this is the author by whom not we.know what books read

Torrego further observes that the impossibility of extraction from a subject NP (a violation of Huang's (1982) *Condition on Extraction Domains*) is overcome by *wh*-fronting of the subject. This is illustrated in (71):

- (71) a. *Esta es la autora [de la que]_i [IP [varias traducciones t_i] han ganado premios internacionales]
 this is the author by whom several translations have won international awards
 b. [De que autora]_i no sabes [CP [qué traducciones t_i] han ganado premios internacionales]
 by what author not you.know what translations have won international awards

On the basis of these Spanish facts, Chomsky (1986a:26) concludes in *Barriers* that there must be some process that allows V to L-mark a displaced *wh*-phrase in Spec,CP. If the *wh*-phrase in Spec,CP is L-marked, it does not constitute a barrier for extraction. Normally, L-marking holds of a theta-role assigning head and its complement (internal argument); for example, between V and a direct object clause (CP). For patterns like (70) and (71b), it must be stipulated that V can L-mark a constituent which is not an (internal) argument of V. In other words, the notion of L-marking has to be weakened in order to capture these facts.

Rizzi (2006, 2007) observes similar facts for Italian (see (72)) and notes that subextraction from within the *wh*-phrase occupying the specifier position of the embedded clause, is at odds with a strict interpretation of *Criterial Freezing* (see (64)). After the *wh*-phrase *quanti libri di quale autore* has reached the specifier position of the embedded CP (a criterial and hence island-inducing position), it is no longer possible to subextract material from within the phrase occupying Spec,CP.

- (72) ?[_{CP} Di quale autore; C [_{TP} ti domandi [_{CP} [quanti libri t_j]; C [_{TP} siano stati censurati t_i]]]]
 of which author CL-you wonder-2SG how-many books be-3PL been censored
 'Which author do you wonder how many books by have been censored?'

In order to account for the acceptability of (72), Rizzi (2007) weakens the original formulation of *Criterial Freezing* in (64) in the following way:

- (73) *Criterial Freezing*
 In a criterial configuration, the Criterial Goal is frozen in place.

According to this reformulation, only the higher *wh*-chunk *quanti libri* —a subpart dubbed 'criterial Goal' by Rizzi— is frozen. The 'remnant' *di quale autore*, i.e., the complement of *libri*, is still accessible to movement operations and can consequently leave the larger noun phrase.

As noted in Gallego (2009, 2010), Rizzi's weakened formulation of *Criterial Freezing* is consistent with the Spanish patterns in (70)-(71b) and the Italian pattern in (72), but raises the question how come the internal part of an XP does not freeze if the entire XP does. In view of this, Gallego proposes an alternative analysis of the pertinent Spanish and Italian examples. He discards a subextraction account and proposes that the apparently subextracted element (*del que*) is actually generated outside of the *wh*-phrase as an "aboutness"-dependent within the matrix clause. This analysis is reminiscent of Bach and Horn's (1976) approach to apparent subextraction from within NP, which they consider to be an inherent island (their *NP Constraint*). They argue that an example like *Who did you write a book about?* does not involve extraction from within NP, as in (74a), but rather extraction of a PP base-generated within the verbal projection, as in (74b).

- (74) a. They [_{VP} wrote [_{NP} a book about Nixon]]
 b. They [_{VP} wrote [_{NP} a book] [_{PP} about Nixon]]

According to Gallego's "aboutness"-analysis, the representation in (70), which involves subextraction from a larger noun phrase, is incorrect. Instead we have the structure in (75); i.e., a structure in which *del que* has not been removed from within a larger noun phrase but rather originates as an adjunct-PP within the clause containing *sabemos*.

- (75) Este es el autor [del que]_i no sabemos t_i [_{CP} [_{NP} qué libros]_j] leer t_j
 this is the author by whom not we.know what books read

5.2 Thawing effects

In section 5.1, several examples from Spanish were discussed in which an element was extracted from within a displaced wh-phrase. Although similar examples in English (see section 3.3) are considered to be far less acceptable, it has been argued that even in English extraction from a wh-phrase in Spec,CP is sometimes possible. Lasnik and Saito (1990, 100 ff.), for example, observe a thawing effect ("mild transparency") in the case of A'-moved subject-NPs (Compare the Spanish examples in (71)). They agree with the observation that extraction is better from a direct object-NP in its base position than from one in a derived position (e.g., [Spec,CP], as in (34a)) or adjoined to IP (cf. (21)). They point out, however, that for subject-NPs we have the opposite effect: extraction from a subject-NP in [Spec,IP] (cf. (76)) is worse than removal from a subject-NP that has been moved to [Spec,CP] (cf. (77a)) or to a position adjoined to IP (cf. (77b)). In other words, movement of a subject NP to [Spec,CP] or a position adjoined to IP has a thawing effect; extraction from the subject-NP is better when it is in a derived position (examples drawn from Lasnik and Saito 1990:101-102).²⁴

- (76) ^{??}*Who_j do you think that [pictures of t_j] are on sale

- (77) a. ^{??}Who_j do you wonder [_{CP} [which picture of t_j]_i [_{IP} t_i is on sale]]
 b. ^{??}Who_j do you think that [_{IP} [pictures of t_j]_i [_{IP} Mary believes t_i are on sale]]

The question, of course, arises how to account for the freezing effect with moved object-NPs and the thawing effect with moved subject-NPs. Or if one puts it in terms of Subjacency, why does extraction out of a moved object-NP yield a Subjacency violation and movement out of a moved subject weaken the Subjacency effect?

Lasnik and Saito account for the observed asymmetry in the following way. On the basis of the thawing effect in sentences like (77), they conclude that A'-moved constituents (i.e., A'-binders) are nonbarriers. Formally, this is achieved by adopting the following definition of barrier:

- (78) G is a barrier for b if
 a. G is a maximal projection
 b. G is not an A'-binder
 c. G is not L-marked, and
 d. G dominates b

Thus, the moved object-NPs in (21) and (34a), the topicalized subject-NP in (77b) and the wh-moved subject in (77a) do not constitute Barriers for extraction; they are A'-binders and therefore transparent for extraction.

The subject-NP in (76), on the other hand, does not occupy an A'-position. Not being an A'-binder, the subject-NP forms a Barrier for extraction; extraction out of the non-moved subject-

NP yields a Subjacency violation.

If A'-binders do not constitute Barriers for Subjacency, the question arises what accounts for the marginality (i.e., ^{??} according to Lasnik and Saito) of the examples in (21), (34a) and (77). Lasnik and Saito argue that their marginality is due to Kuno's (1973) Internal Constituent Constraint (ICC). This constraint roughly states that extraction cannot take place from clause internal constituents. Extraction is only possible from phrases that are in a clause-external (i.e., right-peripheral) position. This is exemplified by the following contrastive pair:

- (79) ^{??}Who_j did you give [pictures of t_j] to Bill?
(80) Who_j did you see [several pictures of t_j]?

Clearly, the moved phrases in (21), (34a) and (77) are not in right-peripheral position within the embedded clause. Extraction out of these phrases violates Kuno's ICC constraint. Notice that extraction out of the subject-NP in (76) violates both Subjacency and the ICC.

Summarizing, Lasnik and Saito interpret the "frozenness" of A'-moved constituents in terms of Kuno's Internal Constituent Constraint, rather than in terms of Subjacency. Clearly, the frozenness of rightward moved constituents (see section 3.4) cannot be subsumed under the ICC, since after rightward shift has applied to some phrase, this phrase is in a clause-peripheral position. Furthermore, the ill-formedness of these rightward movement constructions cannot be explained in terms of Subjacency, if movement is really involved; this for the reason that under such a movement analysis, the rightward moved phrase is an A'-binder, which following the definition in (78) does not count as a barrier. Lasnik and Saito (p. 104) are aware of the impossibility of explaining the islandhood of "rightward moved phrases" in terms of Subjacency. They point out this problem for their analysis on the basis of relative clauses that have been extraposed from a noun phrase (cf. (42)). They conclude that the problem can be solved if it is assumed that "extraposed" relative clauses are simply base-generated in a right-peripheral position. Being not in a derived A'-position, the relative clause counts as a barrier for extraction.

5.3. (Apparent) extractions from moved constituents

Thus far we have seen that when a phrase has been dislocated, it functions as an island for elements that are contained within the moved phrase. Extraction from within the displaced phrase is impossible. When a PP has been extraposed, or when an NP undergoes heavy NP-shift or wh-fronting to Spec,CP, movement from these phrases is typically barred. There are sentence patterns, however, for which it has been argued that extraction takes place from a moved phrase. A first example of this pattern is extraction from an extraposed clause (cf. Wexler and Culicover (1980:342) and Johnson (1986)). Consider the following examples:

- (81) a. Who_j is it obvious [that Mary met t_j]?
b. What_j was it clear [that Mary had bought t_j]?

Under a traditional analysis of these constructions, the postverbal clause has been moved from subject position.²⁵ The expletive element *it* is inserted in the vacated subject position, and forms a chain with the extraposed clause.

If movement is involved, the question, of course, arises why extraction out of the clause is not blocked. That is, why doesn't the extraposed clause constitute a frozen domain? Wexler and Culicover (1980) point out that one way out of this difficulty is to adopt the view that such "extraposition" structures as in (81) are not transformationally derived. Rather, the right peripheral subject clause is base-generated in a right peripheral position (cf. Koster 1978c). Since,

the argument-clause is base-generated, no freezing effect is invoked.²⁶

Absence of freezing has also been noted for SOV-languages like Dutch and German, which have their clausal complement to V in extraposed position at “surface structure”. While the direct object NP occurs in a preverbal position (cf. (82)), its clausal counterpart must occur in a postverbal position (cf. (83)). Consider, for example, the following examples from Dutch:

- (82) a. Jan heeft nooit *zulke dingen* gezegd
Jan has never such things said
b. *Jan heeft nooit gezegd *zulke dingen*
- (83) a. [?]* Jan heeft nooit [dat hij Marie aardig vond] gezegd
Jan has never that he Marie nice considers said
'Jan has never said that he considers Mary a nice girl'
b. Jan heeft nooit -- gezegd [dat hij Marie aardig vond]

According to the traditional analysis (cf. Koster 1975), the base position of the direct object is the preverbal position, i.e., the position where the direct object noun phrase can occur in “surface structure”. This means that postverbal direct object clause occupies a derived position. Hence, a freezing effect is expected. As shown by the following example, however, extraction out of the extraposed clause is possible:

- (84) Wie_j heeft Jan t_i gezegd [dat hij t_j aardig vond]_i
who has Jan said that he nice considered
'Who did John say that he liked?'

Given the transparency of the clause in (84), it has been argued that the right-peripheral clause in fact occupies its base position (cf. De Haan (1979), Hoekstra (1983)). There are various ways of implementing this, depending on one's theoretical assumptions. If one adopts directionality of case assignment (cf. Koopman (1984), Travis (1984)), one could say that the direct object-NP in (82a) is base-generated to the left of the verb in Dutch, since V assigns case to the left in Dutch. Since the clause does not permit case, it is base-generated to the right of the verb (as in (83b)). Under this analysis, both the preverbal direct object and the postverbal direct object clause are sisters to V, if it is assumed that theta-role assignment is not subject to a directionality requirement.

Another way to go would be to adopt Kayne's (1994) Antisymmetry theory and assume that all languages are underlyingly SVO. This means that the direct object clause in (83b) (and (84)) simply occupies its base position in Dutch (see Zwart (1993) for discussion). Consequently, no freezing effect is expected to be invoked. Notice, however, that under this analysis the surface position of the direct object noun phrase in (82a) is a derived position; the DO-NP is generally taken to be moved to the specifier of some functional head, e.g. AgrO or little v. If one adopts the view that movement induces freezing, one would expect extraction out of the preverbal direct object to be impossible. It turns out, however, that extraction out of the direct object-NP is allowed. Consider, for example, the following Dutch sentence, where the wh-element *wat* has been moved out of the direct object noun phrase (see Chapter 114).

- (85) *Wat* heb jij nog nooit [--- voor dingen] gezegd
what have you yet never for things said
'What kind of things haven't you ever said?'

Of course, one could stipulate that movement never induces any freezing effect. Scrambled constituents, however, typically display a freezing effect in a language like Dutch (see

e.g., (30), where a PP-complement has been scrambled). Possibly, the absence of freezing should be related to certain types of movement (e.g., movement to [Spec,AgroP]) but not to others. This, obviously, is something which needs further investigation.

Let me close of this section with another phenomenon, called smuggling (Collins 2005), which hints at the absence of freezing in certain movement contexts. Consider the raising construction in (86a), which has traditionally been analyzed along the lines in (86b), where <John> represents the lower copies ("traces") of the displaced DP *John*. Thus, *John* originates within AP, where it receives its theta role, moves to the Spec,IP-position of the infinitival clause, and from there moves on to the Spec,IP-position of the matrix clause via intermediate stops in the embedded Spec,IP and the matrix Spec,VP.

- (86) a. John seems to Mary to be lazy.
 b. [_{IP} *John* [_I I [_{VP} <John> seems to Mary [_{IP} <John> to [_{VP} be [_{AP} <John> lazy]]]]]]]

Collins (2005) points out that the derivation depicted in (86b) poses a problem for Relativized Minimality (Rizzi 1990) or the Minimal Link Condition (Chomsky 1995): the DP *Mary* should block movement of the DP *John* from the Spec,IP-position of the embedded clause (IP) to the matrix clause (specifically: Spec,VP), since the experiencer argument *Mary* c-commands <John>. In other words, the DP *Mary* is a closer potential binder for <John> in the embedded Spec,IP than is the DP *John* in the matrix clause. Evidence that the DP contained within the indirect-object-PP c-commands material within the embedded clause comes from various c-command tests (cf. Barrs and Lasnik 1986). For example, the quantification expression *every boy* is able to bind the pronoun *his* in the embedded clause (example taken from Collins 2005).

- (87) That dog seems to [_i every boy]_i to like [_i all of his_i toys]

Since the experiencer DP in (87) clearly c-commands into the embedded clause, one would expect raising of *John* across *Mary*, as in (86b), to be blocked by Relativized Minimality or the Minimal Link Condition. *Mary* intervenes, so to speak.

Collins's solution to this intervention problem is the following: it is not the DP *John* that moves from within the embedded infinitival clause to the matrix clause, crossing the intervening *Mary*. Rather, it is the (matrix) VP containing *John* that moves across *Mary*. In a certain way, the moved VP ('the smuggler') smuggles *John* ('the smuglee') past *Mary* (the potential 'blocker').

Without going into all details of the analysis, let us consider more closely the analysis that Collins proposes, starting at the point in the derivation in which *John* has been moved from the embedded IP to the Spec-position of the matrix VP (see (88a)). The next step in the derivation involves "extraposition of the embedded IP," which in the spirit of Kayne's (1994) LCA involves movement of IP to the Spec-position of some higher functional head X (see (88b)). Subsequently, the experiencer argument is introduced in the specifier position of an Applicative phrase (see (88c)). The next step in the derivation involves smuggling: after *v* has merged with the ApplP, the (matrix) lexical projection VP *John seems <IP>* moves to Spec,vP. This clause-internal VP-movement, an instance of remnant movement since it carries along a "trace", yields the structure in (88d); see Chapter 98 for discussion of Remnant movement. Importantly, it is not the DP *John* that moves across the c-commanding DP (*to*) *Mary*, but the VP *John seems <IP>*. Thus, VP smuggles *John* across *Mary*. As a final step in the derivation, *John* is moved out of the displaced VP and raises to the Spec,IP-position of the matrix clause (see (88e)). Crucially, under this analysis, extraction out of moved phrase is possible. In other words, freezing does not apply here.

- (88) a. [_{VP} John seems [_{IP} <John> to [_{VP} be [_{AP} <John> lazy]]]]]

- b. [_{XP} [_{IP} <John> to be <John> lazy] [_{X'} X [_{VP} John [_{V'} seems <IP>]]]]
- c. [_{AppIP} (to) Mary [_{AppI'} Appl [_{XP} [_{IP} <John> to be <John> lazy] [_{X'} X [_{VP} John [_{V'} seems <IP>]]]]]]]]
- d. [_{VP} [_{VP} John seems <IP>] [_{V'} v [_{AppIP} (to) Mary [_{AppI'} Appl [_{XP} IP [_{X'} X <VP>]]]]]]]]
- e. [_{IP} John [_{I'} I [_{VP} [_{VP} <John> seems <IP>] [_{V'} v [_{AppIP} (to) Mary [_{AppI'} Appl [_{XP} IP [_{X'} X <VP>]]]]]]]]]]

6 Conclusion

The Freezing phenomenon is an intriguing island phenomenon that has received relatively little attention in studies on locality effects on movement, certainly compared to such island phenomena as the Complex NP-constraint, the Wh-island constraint and the Subject condition. The major purpose of this chapter was to give an overview of the various ill-formed movement patterns that fall under the freezing effect and the types of explanations that have been given for this island phenomenon in the generative literature. The explanation of the freezing phenomenon depends on one's assumptions about movement: for example, is movement really involved in construction Y? And does the nature of the movement operation matter for freezing? Hopefully, discussions on freezing won't get "frozen". There are still many issues that deserve further investigation.

NOTES

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1. The ISP is counterexemplified by sentences like (i), in which an element is removed from one conjunct. See Ross (1967) and Lakoff (1986) for discussion of such extractions from coordinate structures.

(i) a movie [_{WH_i} that we [_{VP} sat around all day] and [watched _{t_i}]]

2. The judgment in (8b), i.e. "??", is the one given in Ross (1974). Wexler and Culicover (1980) assign a "*" to sentences in which a constituent is extracted from a phrase that has undergone heavy/complex NP-shift.

3. The notion of structure preservation was first incorporated into the theory of transformations by Emonds (1970). See also Emonds (1976).

4. The non-base-generable structure does not necessarily have to be a Chomsky-adjunction configuration. That is, structures containing a moved constituent that is attached via daughter-adjunction also form islands for extraction. See Wexler and Culicover (1980; 571, note 15).

5. Although in the literature, the Freezing effect is typically associated with the phenomenon of movement (i.e., a constituent cannot be moved out of a dominating node that is frozen), we should point out that in Wexler and Culicover (1980) freezing has a broader coverage. They argue, for example, that the rule of Gapping (a deletion rule) is sensitive to the freezing effect.

While Gapping is allowed in a (prepositional) double object construction like (i), it is blocked after the Dative shift transformation has applied (cf. (ii)):

- (i) John *gave* a book to Mary, and Bill – a magazine to Fred
- (ii) *John *gave* Mary a book, and Bill – Fred a magazine

The VP in (ii) is a derived environment in which the non-structure preserving operation Dative Shift has applied. As a consequence of this, the VP-node is frozen; Gapping is not permitted in such an environment. See Wexler and Culicover (1980:276) for further discussion.

6. For discussion of the Cycle, see also Freidin (1978). Chomsky and others initially assumed that only a subset of nodes, primarily S, S' and NP, were cyclic. It was Edwin Williams who, in his (1974) doctoral dissertation, proposed that all nodes were cyclic. More recently, Chomsky has tightened the notion of cyclicity by means of the Extension Condition (Chomsky 1993: 22). It is formulated as a condition on tree-building operations (including overt movement), requiring that they apply to the *edge* of the syntactic object at that point in the derivation. This means that internal movements are not allowed at all, not even within a given cycle.

7. The given judgments (??) are the ones given in Lasnik & Saito (1990). Other people judge these examples as completely ungrammatical (i.e., *).

8. See also Corver (1997) for freezing effects within the Dutch AP-domain that are due to scrambling.

9. See also Cinque (1990) for the islandhood (barrierhood) of phrases occupying the specifier position of CP (even if the phrase moved to Spec,CP is transparent in situ). Chomsky (1986) and Lasnik and Saito (1992) argue that a displaced phrase occupying Spec,CP is transparent for extraction (even if the phrase moved to Spec,CP is an island/barrier in situ). See also section 5.1 and 5.2 for discussion of the (non-)transparency of Spec,CP.

10. Observe that wh-movement out of an in situ wh-phrase (ib) yields a better result than wh-movement out of a displaced wh-phrase occupying Spec,CP (ia):

- (i) a. ^{*/??}[Which guy]_j did you wonder [which story about t_j]_i I had told t_i?
- b. [?][Which guy]_j did you tell me [which story about t_j]_i?

11. The examples (39a,b,c) are taken, respectively, from Lasnik and Saito 1994, Johnson 1986, and Wexler and Culicover 1980.

12. See, among others, Wexler and Culicover 1980, Huybregts 1976, Koster 1978b, Johnson 1986.

13. PPs that have been extraposed from a subject noun phrase are also frozen domains for extraction:

- (i) *What did [a review t_i] came out yesterday [of t_j]_i?

14. Ross (1967:173) also observes the islandhood of clauses that have been extraposed out of a noun phrase. See section 2.1.

15. Wexler and Culicover (1980) did not treat the islandhood of A-moved NPs in terms of a (generalized) Freezing constraint, since A-movement operations (like Passive formation) are structure-preserving.

16. It should be noted here that in the literature there is disagreement about whether A-moved phrases occupying Spec,TP are islands for extraction. According to some studies, among which Browning 1991, Collins 1994, Chomsky 1995, Rezac 2004, Broekhuis 2005, and Boeckx and Grohmann 2007, Spec,TP is an island for extraction. Other studies, on the contrary, suggest that Spec,TP is not, or not always, an island for subextraction; see e.g., Gallego and Uriagereka 2006, Chomsky 2008.

17. Huybregts (1976) observes that Freezing is also found in structures like (i), where Directional Adverb Preposing (i.e., Locative Inversion) has applied. If these locative inversion patterns are derived by movement to [Spec,IP] (see Hoekstra and Mulder 1990), we have another instance of Freezing induced by A-movement.

- (i) a. Peter claimed [_{IP} [_{PP} near that town]_i is situated [an old ruin] t_i]
b. *That town, he said [_{IP} [_{PP} near t_j]_i is situated [an old town] t_i]

18. Baltin (1984) discusses the impossibility of extracting out of an extraposed PP in terms of Huang's (1982) Condition on Extraction Domains. See Collins (1994) and Müller (1998) for a Barriers-type account of various freezing effects. It should further be noted that in some cases it appears that a verb L-marks a constituent moved to Spec,CP of its complement; see, for example, the Spanish examples from Torrego (1985) discussed in section 5.1.

19. In a similar vein, Chomsky and Lasnik (1993:79) "take a barrier to be an XP that is not a complement."

20. *v** stands for the light verb associated with verbs that take an external argument.

21. Extraction from DP is possible if the DP constitutes a simplex chain that occupies the base position; see (i). Not all chain links have been represented in (i); for example, the chain link in Spec,CP is missing.

- (i) **Whose books** do you think that John never reads [_{DP} ~~whose books~~ reviews of ~~whose books~~]?

22. Other studies on this second notion of freezing —i.e., the phenomenon that a moved constituent becomes immobile ("frozen") once it has reached a particular landing site— are the following (among many others): Grohmann 2003, Boeckx 2008, Bošković 2008, and Lohndal 2011. See also Chomsky's (2000, 2001) *Activity Condition*.

23. In their article, Culicover and Winkler discuss other types of freezing configurations and argue that their ill-formed status can also be explained in terms of garden path effects. Besides garden paths resulting from incorrect chain formation, they point out the existence of prosodic garden path effects.

24. Lasnik and Saito (1990) do not adopt the VP-internal subject hypothesis. So, the subject noun phrase is base-generated in [Spec,IP]. As pointed out by an anonymous reviewer, it should be noted that the judgments in (76)-(77) are very subtle and not at all certain. For certain speakers, (77b) turns out to be as bad as (76).

25. See e.g., Rosenbaum 1967, Emonds 1976, Stowell 1981, Safir 1982.

26. They conclude that the problem can be solved if it is assumed that "extraposed" relative clauses are simply base-generated in a right-peripheral position. Being not in a derived A'-position, the relative clause counts as a barrier for extraction.

SEE ALSO: Extraction from Complex NPs and detachment; Extraposition; Mittlefeld phenomena: scrambling in German; Preposition stranding; Remnant movement.

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