Chapter 2
Mechanism of Search and Float for Internal Merge

Chomsky (2004) proposes that movement is simply a special case of Merge, named internal Merge, in which one of the syntactic objects (SOs) to be merged is picked up from within a structure S and is merged with S. This contrasts with the original notion of Merge, now named external Merge by Chomsky (2004), which simply picks up two disconnected SOs. Although it is surely a desirable move to unify two apparently distinct syntactic operations into one simple operation, i.e., Merge, that creates an unordered set $\{SO_1, SO_2\}$, internal Merge is peculiar in that one target of Merge is "buried" within a structure. In this chapter, I argue that there are two prerequisite operations that make internal Merge possible: one is to "dig" into a structure to find a target of Merge, which I call Search, and the other is to make this target reach the top of the structure, which I call Float.

In order to see how this mechanism works, let us take a subject raising case for illustration:

(1) John seems to be honest.

Under the standard assumptions, *John* undergoes successive-cyclic A-movement, as shown below:

(2) [$_{TP}$ John seems [$_{TP}$ <John> to [$_{vP}$ <John> be honest]]]

In the probe-goal system proposed by Chomsky (2000), the matrix T probes for ϕ-features and finds *John* as its goal to check these features, as schematically shown below:

(3) [$_{TP}$ T seems [$_{TP}$ to [$_{vP}$ John be honest]]]



This probing amounts to what I call Search here. The next step is to move *John* to the matrix Spec-TP. A crucial question to ask here is how to ensure that *John* undergoes successive-cyclic movement, passing through the embedded Spec-TP. It

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J. Abe, *Minimalist Syntax for Quantifier Raising, Topicalization and Focus Movement: A Search and Float Approach for Internal Merge*, Studies in Natural Language and Linguistic Theory 93, DOI 10.1007/978-3-319-47304-8_2

has been standardly claimed that this is due to the EPP requirement on TP, but as Chomsky (2008) explicitly notes, this is nothing but a stipulation. Abe (1997) and Bošković (2002), on the other hand, argue that this is due to *Minimize chain links* (MCL), proposed by Chomsky and Lasnik (1993), which requires that each step of movement cannot skip possible landing sites. Given that the embedded Spec-TP is a possible landing site for *John* to move to the matrix Spec-TP in (3), *John* must pass through this position to satisfy MCL. Adopting this mechanism, I claim that from the stage of derivation given in (3), *John* undergoes Float, which takes it to the top of the structure in (3) for merging it with this structure and that Float is subject to MCL, hence requiring *John* to be merged with the embedded infinitival TP on its way to the top.

Search can go down a given structure as deeply as it can in principle, as witnessed by the fact that the successive-cyclic A-movement involved in a subject raising case such as (1) can be prolonged infinitely by adding raising predicates and thereby increasing the number of embedding, as shown below:

(4) John seems to be likely … to win the lottery.

This consideration naturally leads us to claim that the same mechanism of Search and Float should be extended to A'-movement. Let us consider a *wh*-movement case such as the following:

(5) Who do you think that John saw?

Under the standard assumptions, *who* undergoes successive-cyclic A'-movement, as shown below:

(6) [$_{CP}$ who do [$_{TP}$ you think [$_{CP}$ <who> [$_{TP}$ John saw <who>]]]]

We can account for this successive-cyclicity of A'-movement under the mechanism of Search and Float in the same way as in the subject raising case: First, the matrix C searches for a *wh*-phrase, as shown below:

(7) [$_{CP}$ C [$_{TP}$ you think [$_{CP}$ [$_{TP}$ John saw who]]]]



After this search finds *who* as its goal, this *wh*-phrase undergoes Float, and since this operation obeys MCL, it forces the *wh*-phrase to pass through the embedded Spec-CP to reach the top of this structure. In this case as well, Search can go down a given structure as deeply as it can in principle, as witnessed by the fact that the successive-cyclic A'-movement involved in such a *wh*-movement case as (5) can be prolonged infinitely, as illustrated below:

(8) Who do you think that Mary said … that John saw?

If we are to deal with successive-cyclic A'-movement on a par with successive-cyclic A-movement in terms of Search and Float, this leads us to claim that the notion of phase devised by Chomsky (2000) should be abandoned, since our approach will not be compatible with this notion. Note that the phase theory that has been standardly assumed since Chomsky (2000) fails to capture the parallelism between A- and A'-movement regarding successive-cyclicity: it only captures the successive-cyclicity of A'-movement and leaves the apparently similar property of A-movement to something else, such as the EPP. One might claim that to abandon the phase theory is to stay back from the minimalist conception that computational load must be minimized. However, even under the phase theory, it must be admitted that probing can go down a given structure as deeply as it can in principle in the case of successive-cyclic A-movement. Given this possibility, it is not at all unnatural to make the same claim regarding successive-cyclic A'-movement.[1]

2.1 Minimal Search

As mentioned above, Search plays the same role as probing under the probe-goal system, but is characterized as a prerequisite operation for Internal Merge rather than Agree, as in Chomsky (2000, 2008).[2] In this sense, the present approach is compatible with the so-called Agreeless approach, advocated by Hornstein (2009), who argues that the operation of Agree should be dispensed with. Noting that "UG equips FL [=Faculty of Language] with *two different* ways of establishing long distance dependencies, one via Move (itself just an instance of the VCN [=Virtually Conceptually Necessary] Merge operation) and the other via AGREE," (p. 129) Hornstein argues that once Move is characterized as a special case of Merge, namely Internal Merge, it cannot be dispensed with. On the other hand, the effects of Agree, which Chomsky (2000) proposes as an operation alternative to covert movement, can be recaptured when a chain produced by Internal Merge has its bottom member pronounced. I depart from Hornstein (2009), however, in claiming that even under the Agreeless approach, Search is a necessary step to make Internal Merge possible.

I assume that Search is minimal (hence referred to as minimal Search), just as probing is under the probe-goal system. Let us first consider superiority cases, illustrated in (6) of Chap. 1, reproduced below:

(9) a. Whom$_i$ did John persuade t_i [to visit whom]?

b. *Whom$_i$ did John persuade whom [to visit t_i]?

[1]See Boeckx and Grohmann (2007) for an extensive discussion on phases and a skeptical view on this notion as presently used.

[2]See Larson (2015) for a similar view on Internal Merge.

We have seen in Chap. 1 that the ungrammaticality of (9b) follows from the Minimal Link Condition (MLC). This condition is now reduced to minimal Search, which requires the following:

(10) Minimize Search of a phrase bearing a relevant feature.

Let us consider the stage of derivation shared by (9a,b) in which the matrix C searches for a phrase bearing a *wh*-feature:

(11) [$_{CP}$ C_Q [John did persuade whom$_i$ [to visit whom$_j$]]]

Minimal Search finds *whom*$_i$ as its goal, but not *whom*$_j$, which is located further down the structure. Thus, (9a) is successfully derived by applying Float to *whom*$_i$ after this phrase is picked up by minimal Search, whereas (9b) fails to be derived since *whom*$_j$ cannot be picked up by this operation.

Let us now consider Rizzi's (1990) Relativized Minimality (RM) cases given in (3b,c) of Chap. 1, reproduced below:

(12) a. *John$_i$ seems [that [$_{TP}$ IT is certain [t_i to fix the car]]]

b. *guess [$_{CP}$ how$_i$ [John wondered [WHY [we fixed the car t_i]]]]

We have seen that these cases are regarded as violations of MCL by Chomsky and Lasnik (1993) and as violations of the MLC by Chomsky (1995). Here I adopt Chomsky's (1995) line of analysis, claiming that (12a,b) are violations of minimal Search. Let us consider the stages of derivations of these sentences in which minimal Search of phrases bearing ϕ-features and a *wh*-feature is going to apply (let us abbreviate the former case as minimal Search[ϕ] and the latter as minimal Search[WH]:

(13) a. [T seem [that [$_{TP}$ it is certain [John to fix the car]]]]

b. guess [C_Q [John wondered [why [we fixed the car how]]]]

In (13a), minimal Search[ϕ] finds *it* rather than *John* as its goal and hence (12a) is underivable. Likewise in (13b) minimal Search[WH] finds *why* rather than *how* as its goal and hence (12b) is underivable. The only sentences derivable from (13a, b) are the following:

(14) a. *it seems [that [$_{TP}$ <it> is certain [John to fix the car]]]

b. *guess [$_{CP}$ why [John wondered [<why> [we fixed the car how]]]]

I assume that the ungrammaticality of these sentences is due to the effects of what Rizzi (2006) calls "criterial freezing": once a phrase reaches its designated position, it cannot move up further. Thus, in (14a), *it* moves to the embedded Spec-T to satisfy its ϕ-features and nonetheless moves further to the matrix Spec-T, in which the same array of features could be checked. Likewise, in (14b), *why*

moves to the embedded Spec-C to satisfy its *wh*-feature and nonetheless moves further to the matrix Spec-C, in which the same *wh*-feature could be checked.[3]

Note that if we assumed the phase theory, there would arise a redundancy problem with (12a,b), since under this theory, these sentences are simply underivable due to the fact that *John* and *how* are embedded too far down the structure to be probed due to phase boundaries. Hence, once minimal Search is assumed, we will face a redundancy problem that arises from the overlapping locality effects induced by this operation and by minimal computation forced by the phase theory. Hence, this suggests another reason for abandoning the phase theory.

2.2 Float

Given that Move is reduced to a special case of Merge, namely internal Merge, Float may be claimed to be a residual operation of Move in the sense that it "moves" a phrase down in a structure to its top. Thus, Float must be applied upward, as is implied by the name of this operation, just like movement in its traditional sense. Float differs from Move, however, in that it simply takes an SO upward to a given dominating category without "attaching" it to the latter category; it is the Merge operation that takes care of this attachment. To put it in other words, the traditional notion of Move is now factored into two separate operations: Float and Merge. Thus, Float of α may be defined as an operation comparable to Move without merging α with a target phrase. I have proposed that this operation, together with minimal Search, is a prerequisite for internal Merge. Under this conception, the following condition is operative in the relationship between Float and Merge:

(15) An SO contained in a structure S cannot be merged with S unless it reaches S by way of Float.

Thus, when the present mechanism of Search and Float is compared with Chomsky's (2008) system of probe-goal and internal Merge, it will be clear that its peculiarity resides in this requirement.

It has usually been assumed in the minimalist framework that the upward property of movement is derived from the Extension Condition imposed upon (internal) Merge (cf. Chomsky (1993)), which requires that structure be extended or the No Tampering Condition (cf. Chomsky (2008)), which also has the effect of (internal) Merge taking place at the root. But these assumptions are not compatible with the present system of Search and Float. Recall that I have argued above that

[3]See Abe (2016) for an attempt to derive the ungrammaticality of (14a,b) from failure of labeling under the labeling algorithm proposed by Chomsky (2013). Note that (14a,b) are independently ruled out due to the fact that *John* fails to check its Case-feature in (14a) and *how* cannot stay in situ in (14b), but these are simply accidental properties of these sentences.

Float obeys MCL, which derives the successive-cyclicity of A- and A'-movement. The relevant examples are reproduced below, together with their output representations:

(16) a. John seems to be honest.

b. [$_{TP}$ John seems [$_{TP}$ <John> to [$_{vP}$ <John> be honest]]]

(17) a. Who do you think that John saw?

b. [$_{CP}$ who do [$_{TP}$ you think [$_{CP}$ <who> [$_{TP}$ John saw <who>]]]]

Under the present assumptions, *John* and *who* in (16b) and (17b), after they are picked up by minimal Search, each undergo Float to the top of the structure, and they must stop by the embedded TP and CP for merging with them in order to observe MCL. These Merge operations, however, clearly violate the Extension Condition or the No Tampering Condition. One might claim that these conditions are imposed not upon (internal) Merge itself but rather upon minimal Search. Although it is true that this assumption is compatible with the present mechanism of Search and Float, this alone will not guarantee the upward property of movement. Let us consider the following example:

(18) Who do you think that the man who said that Mary was smart saw?

This sentence is a variant of (17a) where *John* is replaced by *the man who said that Mary was smart*. In this case, we want to claim that *who* undergoes successive-cyclic A'-movement in exactly the same way as that in (17a) does; that is, it stops by the Spec of the CP complement of *think* for internal Merge without violating MCL. Thus, it must be the case that the Spec of the CP complement of *said* is not regarded as a possible landing site for the Float operation in question. This will follow from the assumption that Float must be upward. There will be a number of ways to deduce this upward property of Float, but I will simply assume the following without further argument:

(19) Float of α can go through only those phrases dominating α.

Given this condition, Float of *who* in (18) can go though the CP complement of *think*, since the latter dominates *who*, which thus enables *who* to merge with this complement clause on its way to the matrix CP. On the other hand, this Float operation does not go through the CP complement of *said*, since the latter does not dominate *who*, which thus makes it impossible for *who* to merge with this

complement clause. This derives the fact that the Spec of the CP complement of *said* does not count as a possible landing site for *who* in (18).

In addition to the assumption that Float is subject to MCL, it will not be unnatural to claim that Float is also subject to island conditions, whose typical examples are given below:

(20) a. *Who$_i$ do you like books that criticize t_i?

(Huang 1982: 492)

b. *Who$_i$ did John come back before I had a chance to talk to t_i?

(ibid.: 497)

(20a) illustrates a case of relative clause island violation and (20b) a case of adjunct clause island violation. In these cases, it can be claimed that although minimal Search finds the *wh*-phrase *who* as its goal, Float cannot take this *wh*-phrase to the top of the structure due to the islandhood of relative and adjunct clauses. In this book, I will not address the question of how the islandhood of a given configuration is determined and why this restriction is imposed upon Float.

There is good reason to regard island conditions as applying to Float rather than Search.[4] This is concerned with the fact, observed by Saito (1985), among others, that scrambling, a movement operation whose main role is to change word order, is also subject to these conditions, as illustrated below with Japanese examples:

(21) a.?*[Sono hon-o]$_i$ [John-ga [Mary-ni t_i ageta] hito-o kiratteiru (koto)

that book-ACC John-NOM Mary-DAT gave person-ACC hate fact

'Lit. That book$_i$, John hates the person [who gave t_i to Mary].'

b.?*[Sono hito-o]$_i$ [John-ga [Mary-ga t_i syokuzi-ni sasotta node]

that person-ACC John-NOM Mary-NOM dinner-to invited because

rakutansiteiru (koto)

is-depressed fact

'Lit. That person$_i$, John is depressed [because Mary invited t_i to dinner].'

It is standardly assumed (cf. Fukui 1993, among others) that scrambling is an "optional" movement in that no triggering feature is involved in applying this operation. Under the present mechanism of Search and Float, it is most plausible to capture this property of scrambling by assuming that it is a Search-free operation,

[4]However, see Goto (2015) for the contrary claim that it is Search that is subject to island conditions and that islandhood is derived from lack of a label.

hence allowed to pick up any phrase to apply Float to. Then, the fact that scrambling shows island sensitivity follows from the assumption that it is Float rather than Search that is subject to island conditions.

It is predicted under the present characterization of scrambling as a Search-free operation that it will not show *wh*-island effects such as shown in (12b), since these effects are derived as a result of minimal Search violations. This prediction is in fact borne out, as Saito (1985) notes that scrambling shows very weak effects of *wh*-islands, as illustrated below:

(22) ?[Sono hon-o]$_i$ [John-ga [Bill-ga dare-ni t_i ageta ka] siritagatteiru (koto)

that book-ACC John-NOM Bill-NOM who-DAT gave Q want-to-know fact

'Lit. That book$_i$, John wants to know who$_j$ Bill gave t_i to t_j.'

In order to derive this sentence, we can just pick up *sono-hon-o* 'that book-ACC' and apply Float to this phrase. Since no islands in the sense relevant here intervene in this operation, Float can successfully take *sono hon-o* to the top to the structure for applying Merge.[5]

To sum up this chapter, I have argued that internal Merge requires two additional operations, unlike external Merge: Search and Float. Search finds a target of Merge within a given structure, and this operation is minimal in that it must pick up the closest phrase that carries a relevant feature. Float takes this targeted phrase to the top of a given structure for Merge, and this operation is subject to island conditions and MCL, which requires that it not skip possible landing sites.

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[5]It is also predicted that scrambling is free from superiority effects, but this prediction is not fully borne out: while clause-internal scrambling does not exhibit such effects, long-distance scrambling does show such effects, as observed by Takahashi (1993). Here I will not dwell on why this contradictory property holds, but see Abe (2015) for relevant discussion.

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2017, VIII, 240 p., Hardcover
ISBN: 978-3-319-47303-1