Title	On the notion copy under MERGE
Sub Title	
Author	北原, 久嗣(Kitahara, Hisatsugu)
Publisher	慶應義塾大学言語文化研究所
Publication year	2021
Jtitle	慶應義塾大学言語文化研究所紀要 (Reports of the Keio Institute of Cultural and Linguistic Studies). No.52 (2021. 3) ,p.133- 140
JaLC DOI	
Abstract	
Notes	研究ノート
Genre	Departmental Bulletin Paper
URL	https://koara.lib.keio.ac.jp/xoonips/modules/xoonips/detail.php?koara_id=AN00069467-00000052-0133

Reports of the Keio Institute of Cultural and Linguistic Studies 52 (2021), 133~140

On the Notion Copy under MERGE*

Hisatsugu Kitahara

I. Background Assumptions

A. Lexicon, Syntactic Object, Derivation, and Workspace

1. The lexicon LEX is the set of lexical items LIs.
2. At each derivational stage, the operation OP can access a set of syntactic objects SOs, provided by LEX and OP.
3. Let's call that set the workspace WS.
4. WS specifies the current derivational stage, and provides just the information needed to carry the derivation forward.

B. MERGE

5. MERGE is an operation on WS, not particular syntactic objects SOs.
6. What undergoes changes in a derivation is WS, and the operation that induces such changes is MERGE.
7. MERGE maps WS to WS' by selecting P, Q from WS, forming {P, Q}, and adding {P, Q} to WS'.
8. MERGE(P, Q, WS) = [{P, Q}, X_1, ..., X_n] = WS'

C. The 3rd Factor Principles

9. By definition, "newly created" {P, Q} appears in WS', but what else (X_1, ..., X_n) appears in WS' (other than {P, Q})?

10. $X_1,...,X_n \in WS'$ are deducible from 3rd factor principles such as the no-tampering condition and the resource restriction.
11. The No-Tampering Condition NTC (preservation of terms)
    WS' includes every term of WS as its term (where α is a term of β iff $\alpha \in \beta$, or $\alpha \in \gamma$, γ a term of β).
12. The Resource Restriction RR (minimum increase in accessibility)
    Accessibility increases by only one from WS to WS'.
13. NTC is a computationally natural principle in that no terms are added only to be removed (Epstein et al. 2012).
14. RR is some general property of growth and development, essentially some property of the brain (Fong et al. 2019).
15. The brain is very slow; it's a very slow computation; "the marvel we call the human brain is actually the weak link in our cognitive apparatus. There is ample evidence for this in the biological domain. Our sensory apparatus far outstrips the brain's capacity to process high-resolution input" (Fong et al. 2019).
16. The brain is essentially throwing out almost everything that comes in; the resource limitation is a 3rd factor principle, a property of neuro computation; the computation should be reduced to the minimum; not just from the means restricted to the minimum, but also the resources accessible to the means have to be restricted to the minimum. Significantly, this is the first time the structure of the brain has provided a 3rd factor condition that language must meet (Chomsky 2019/2020).

D. Consequences

17. external merge EM
    WS = [a, b, c]
    MERGE(a, b, WS)
    WS' = [{a, b}, c]
    i. WS' includes every term of WS as its term, thereby satisfying NTC.

ii. Accessibility increases by one (3->4), thereby satisfying RR.

18. Any other imaginable (crazy) output would be inconsistent with either NTC or RR or both.
    i. WS1 = [{a, b}] violates NTC and RR, because c is gone, and accessibility fails to increase by one (3->3).
    ii. WS2 = [{a, b}, a] violates NTC, because c is gone.
    iii. WS3 = [{a, b}, a, b] violates NTC and RR, because c is gone, and accessibility fails to increase by one (3->5).
    iv. WS4 = [{a, b}, a, b, c] violates RR, because accessibility fails to increase by one (3->6).
    v. WS5 = [{a, b}, d] violates NTC, because c is gone.
    vi. WS6 = [{a, b}, c, d] violates RR, because accessibility fails to increase by one (3->5).
19. Notice there is no need to appeal to the inclusiveness condition to exclude cases such as (v) and (vi). Inclusiveness is a theorem established on the basis of the proper formulation of 3rd factor principles such as NTC and RR.
20. internal merge IM

    WS = [{a, {b, c}}]

    MERGE(c, {a, {b, c}}, WS)

    WS' = [{c, {a, {b, c}}}]
    i. WS' includes every term of WS as its term, thereby satisfying NTC.
    ii. Accessibility increases by one (5->6), thereby satisfying RR.
    iii. WS' contains 7 terms, but only 6 of them are accessible under minimal search MS (Chomsky 1995, 2019/2020).
    iv. MS, an independently motivated 3rd factor principle, limits accessibility (Epstein et al. 2018, 2020).
21. EM and IM succeed in keeping accessibility increase to be minimum, namely one and only one, but all other applications of MERGE fail to do so; they increase accessibility by more than one.

a. Parallel Merge / Sideward Movement (where c is merged with a)

WS = [a, {b, c}]

MERGE(a, c, WS)

WS' = [{a, c}, {b, c}]

i. WS' includes every term of WS as its term, thereby satisfying NTC.

ii. Accessibility increases by two (4->6), thereby violating RR.

b. Late Merge (where {c, d} is merged with b)

WS = [{a, b}, {c, d}]

MERGE(b, {c, d}, WS)

WS'= [{a, b}, {b, {c. d}}]

i. WS' includes every term of WS as its term, thereby satisfying NTC.

ii. Accessibility increases by two (6->8), thereby violating RR.

c. Countercyclic Movement (where c is merged with {b, {c, d}})

WS = [{a, {b, {c, d}}}]

MERGE(c, {b, {c, d}}, WS)

WS' = [{c, {b, {c, d}}}, {a, {b, {c, d}}}]

i. WS' includes every term of WS as its term, thereby satisfying NTC.

ii. Accessibility increases by six (7->13), thereby violating RR.

iii. Some form of substitution must be added to replace "original" SO with "newly created" SO (Epstein et al. 2012)

22. Notice there is no need to appeal to Determinacy to block applications such as Parallel Merge, Sideward Movement, Late Merge, and Countercyclic Movement. Determinacy is a theorem established on the basis of the proper formulation of 3rd factor principles such as NTC, RR and MS.

23. Also notice set formation is a symmetric operation. That is, merger of a to b or b to a yield the same result, namely {a, b}. Thus, notions such as raising, lowering, sidewards, late and coutercyclic mergers are all illusions and misleading. What MERGE does is to map WS to WS' by selecting P, Q from WS, forming {P, Q}, and adding {P, Q} to WS'.

II. Proposal

E. Copy or Not

24. EM: MERGE maps WS to WS' by selecting a, b from WS, forming {a, b} and adding {a, b} to WS'.

    WS = [a, b, c]

    MERGE(a, b, WS)

    WS' = [{a, b}, c]

    i. WS' includes every term of WS as its term, thereby satisfying NTC.

    ii. Accessibility increases by one (3->4), thereby satisfying RR.

    (1) What is newly created is {a, b}, and {a, b} is added to WS' by definition.

    (2) a, b ∈ {a, b} in WS' are copies of a, b in WS, respectively. That is, a ∈ {a, b} in WS' is a copy of a in WS, and b ∈ {a, b} in WS' is a copy of b in WS.

    (3) If X is a copy of Y, then Y is a copy of X. We regard X and Y as copies.

    (4) Given (3), let's look at (2) again. Here a ∈ {a, b} in WS' is a copy of a in WS, and a ∈ {a, b} in WS' is not a copy of c in WS. But suppose c happens to be identical to a. Does that make a ∈ {a, b} in WS' is a copy of c in WS? No! a ∈ {a, b} in WS' is not a copy of c in WS. Rather, c just happens to be identical to a. When this happens, we say a (∈{a, b} in WS') and c (in WS, that happens to be identical to a) are not copies, but repetitions of a.

    (5) MERGE always creates "new" copies, but in EM, the "original" copies in WS do not show up in WS'. Do we need an operation Delete? No! The system just works out that way, as MERGE has no choice but works in accord with 3rd factor principles such as NTC, RR, and MS.

    (6) What guarantees that a, b ∈ {a, b} in WS' are copies of a, b in WS, and neither a nor b is a copy of c, regardless of whether c happens to be a (or b)? Chomsky (2019/2020) suggests that Stability does. What is Stability?

    (7) "We can regard Stability just as a property of a computational system, more

precisely a property of how it is interpreted. If some manipulation of inscription is not interpreted in terms of this principle, it is not a computation (proof, etc.). It is taken to be a defining property of a computation" (Chomsky, *personal communication*).

(8) Suppose we are constructing a proof and we have the lines p, p->q, and we then form q as the next line. Unless otherwise stipulated, we can't interpret this with $p \neq p$ or $q \neq q$. Stability is presupposed without comment.

25. IM: MERGE maps WS to WS' by selecting c, {a, {b, c}} from WS, forming {c, {a, {b, c}} and adding {c, {a, {b, c}} to WS'.

WS = [{a, {b, c}}]

MERGE(c, {a, {b, c}}, WS)

WS' = [{c, {a, {b, c}}}]

i. WS' includes every term of WS as its term, thereby satisfying NTC.

ii. Accessibility increases by one (5->6), thereby satisfying RR.

iii. WS' contains 7 terms, but only 6 of them are accessible under minimal search MS (Chomsky 1995, 2019/2020).

iv. MS, an independently motivated 3rd factor principle, limits accessibility (Epstein et al. 2018, 2020).

(1) What is newly created is {c, {a, {b, c}}}, and {c, {a, {b, c}}} is added to WS' by definition.

(2) c, {a, {b, c}} ∈ {c, {a, {b, c}}} in WS' are copies of c, {a, {b, c}} in WS. That is, c ∈ {c, {a, {b, c}}} in WS' is a copy of c in WS, and {a, {b, c}} ∈ {c, {a, {b, c}}} in WS' is a copy of {a, {b, c}} in WS.

(3) MERGE always creates "new" copies, and in IM, just like EM, "original" copies in WS do not appear in WS'.

(4) Stability guarantees that c, {a, {b, c}} ∈ {c, {a, {b, c}}} in WS' are copies of c, {a, {b, c}} in WS.

(5) Now notice, in IM, unlike EM, {a, {b, c}} ∈ the "newly created" {c, {a, {b, c}}} in WS' contains c as its term, which is a copy of c, a term of the

"original" {a, {b, c}} in WS. Thus, in WS', there are two copies of "original" c. They are "higher" c and "lower" c in the "newly created" {c, {a, {b, c}}}, added to WS'. This is just an inevitable consequence of free applications of MERGE: MERGE(P, Q, WS) selects P and Q from WS (in accord with 3rd factor principles).

(6) Given Stability, it must be the case that in IM, two copies always appear in the "newly created" two-membered set-theoretic object, added to WS'. Under MS, however, only the "higher" copy is accessible to MERGE, satisfying RR. For externalization, all "lower" copies get deleted, meeting the condition of computational efficiency.

26. There is no need to stipulate that IM creates copies, while EM creates repetitions of identical elements. MERGE always creates "new" copies. In both EM and IM, the "original" copies in WS do not appear in WS'. But in IM, unlike EM, the "newly created" two-membered set, added to WS', always include two copies as its terms under Stability.

F. After MERGE

27. How does the interpretive procedure INT interpret representations generated by MERGE?

(1) [John [T [X left]]

(2) [John [T [X admired Y]]

(3) [John [was admired Y]]

(5) [What [did [you file X]]

(6) *[What [did [you file LGB [Y1 before you read Y2]]]]

(7) [What [did [you file X [before you read what]]]]

(8) [What [did [you file X [Y1 before you read Y2]]]]

In (8), IM yields two pairs of copies (what, X) and (Y1, Y2), but can Y1 be interpreted as a copy of what by INT, even if no direct computational relation (i.e. IM) holds between them? Chomsky (2019/2020) suggests that unless

otherwise stipulated, it is free for INT to take what and Y1 to be either copies or repetitions as long as such interpretation is consistent with independently motivated principles (such as the duality of semantics and the phase-impenetrability condition). And if they are taken to be copies, then any lower ones among such computationally unrelated copies won't get pronounced; only the highest one (namely what) gets pronounced.

References

Chomsky, N. 1995. *The Minimalist Program*. Cambridge, MA: MIT Press.

Chomsky, N. 2019. The UCLA Lectures. [https://linguistics.ucla.edu/noam-chomsky/]. Edited transcript available at LingBuzz, October 2020. [https://lingbuzz.net/lingbuzz/005485].

Epstein, S. D., H. Kitahara, and T. D. Seely. 2012. Structure Building That Can't Be! In Uribe-Etxebarria, M. and V. Valmara (eds.), *Ways of Structure Building*, 253-270. Oxford University Press.

Epstein, S. D., H. Kitahara, and T. D. Seely. 2018. Can "Determinacy + PIC" Explain Descriptions of Remnant Movement Asymmetries? Paper presented at the 157th meeting of the Linguistic Society of Japan, November 17, 2018.

Epstein, S. D., H. Kitahara, and T. D. Seely. 2020. Unifying Labeling under Minimal Search in "Single-" and "Multiple-Specifier" Configurations. *Coyote Papers* 22, 1-11. University of Arizona Linguistics Circle.

Fong, S., R. Berwick, and J. Ginsburg. 2019. The Combinatorics of Merge and Workspace Right-Sizing. Paper presented at Evolinguistics Workshop 2019, May 25-26, 2019.

(kitahara@icl.keio.ac.jp)

* This is an edited version of the handout used in the workshop entitled "Some Issues on the Syntactic Notion Copy: Deriving Simplest Copy Formation," held at the 38th Conference of the English Linguistic Society of Japan (Online, November 8, 2020). I would like to thank the workshop participants, especially, Takashi Munakata, Toru Ishii, Nobu Goto, Norimasa Hayashi, Takashi Toyoshima, and Asako Uchibori for their very helpful comments and suggestions. This handout contains materials based on intensive discussions with a group originally formed by the late Samuel D. Epstein, and I would like to thank the group members, Noam Chomsky, T. Daniel Seely, Riny Huijbregts, Sandiway Fong, Andrew McInnerney, and Yushi Sugimoto, for very insightful and stimulating ideas. I also thank the Keio Study Group of Generative Grammar for valuable feedback. All remaining errors are, of course, my own.