Eliminating T as an independent syntactic head*

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Abstract

In this paper, I propose to eliminate T as an independent syntactic head from the computational system of human language. Adopting feature inheritance (Chomsky 2013, 2015) and assuming that tense (and other features, if any) is inherited from C by T, T does not have any contents in lexicon. It is doubtful that T can exist as a legitimate syntactic head, though tense feature definitely exists in human language. Based on Hosono's (2018) analysis on verb movement, I propose that in languages such as French and English, a verbal head moves and merges to the root, and it inherits tense (and any other functional features) after C merges; in V2 languages, a verbal head directly moves to C, and feature inheritance does not occur. In both cases, I argue, the object which has traditionally been called TP is unlabeled. I also introduce the framework of *workspace* proposed by Chomsky et al. (2017) and Chomsky (2017), who change the definition of the merging operation from Merge to *MERGE* and claim that only external and internal MERGE are legitimate, rejecting other merging operations, e.g. countercyclic movement such as verb movement. I argue that without T, the problem on the countercyclic property of verb movement is solved.

Key words: T(ense), feature inheritance, verb movement, labeling, workspace, MERGE, countercyclic property.

1. Introduction

It is no doubt that human language has tense as one of its features. Tense is embodied in different ways in different languages. In most human languages, tense is phonetically embodied on a verbal category, whether it is embodied by verbal inflection or by attachment of a tense particle to a verbal root (Comrie 1985). For instance, English expresses the past tense by verbal inflection (in regular patterns, e.g. *learn-learned*, *kiss-kissed*, and in irregular patterns, e.g. *take-took*, *get-got*). Japanese attaches a tense particle *-ta* to a verbal root to represent the past tense (e.g. *tabe-ta* (eat-*ta*) 'ate', *mi-ta* (see-*ta*) 'saw', etc.). In Chomskyan generative grammar, tense has been regarded as an independent linguistic category, since Chomsky (1957) separated an affix that carries tense inflection from a verbal root. Since Chomsky (1981), tense has been established as an independent syntactic head in various forms such as T(ense), as we will see in detail in the next section.

* Many thanks to Anders Holmberg for many helpful comments, suggestions and advice for this work. Thanks to Hisatsugu Kitahara and the participants in the Keio Study Group of Generative Grammar for insightful discussions on Chomsky's latest work. I am responsible for any errors.

Remarkably, none of the tense markers is a free word that can stand by itself: they are bound morphemes either that are part of a verbal category as illustrated by verbal inflection or that must be attached to a verbal category as illustrated by tense particles. According to Comrie (1985), there are ‘tenseless’ languages such as Burmese and Dyirbal. In these languages, the only marking on a verb is either realis or irrealis, which represents the modal opposition. Realis forms are kept for present and past time events, and irrealis forms are kept for future time events. In a Burmese sentence of *măcìthì sà-hpù-me htiñ-te* (tamarind (i.e. fruit) eat-ever-*me* think-*te* ‘(I) think (he) must have eaten tamarinds before’), the realis marker -*te* represents ‘the fact that I think something’, and the irrealis marker -*me* represents ‘my supposition that he may have eaten some fruits’. There are no oppositions in tense between ‘the time when I think something’ and ‘the time when he ate some fruits’.

In addition, since *feature inheritance* was adopted in Chomsky (2008), it has been assumed that tense (and other functional features, if any) is located in the head of the complementizer clause, C, and inherited by T. This means that T has no contents in lexicon, as we will see in detail in the next section. Is it valid, both empirically and theoretically, to assume T as an independent syntactic head that is involved in building syntactic structures of human language? Recall that tense feature is definitely present in human language.

An issue directly related to T concerns verb movement. A finite verb can appear in different positions in different languages. The finite verb *kisses* follows the adverb *always* in English; see (1a) (, which is referred to as type (1a) languages hereafter). *Embrasse* ‘kisses’ moves and precedes *toujours* ‘always’ in French; see (1b) (, which is referred to as type (1b) languages). *Kysser* ‘kisses’ moves not only across *alltid* ‘always’ but also across the subject *Jon* in V2 languages such as Swedish; see (1c) (, which is referred to as type (1c) languages).

(1) a. [$_{\text{TP}}$ John (*kisses) always [$_{\text{VP}}$ ($^{\text{OK}}$kisses) Mary]]. [Eng.]

b. [$_{\text{TP}}$ Jean ($^{\text{OK}}$embrasse) toujours [$_{\text{VP}}$ (*embrasse) Marie]]. [Fre.]
Jean kisses always kisses Marie
‘Jean always kisses Marie.’

c. [$_{\text{CP}}$ Marit ($^{\text{OK}}$kysser) [$_{\text{TP}}$ Jon (*kysser) alltid [$_{\text{VP}}$ (*kysser) Marit]]]. [Swe.]
Marit kisses Jon kisses always kisses
‘Marit, Jon always kisses (her).’

According to Chomsky (1995), the finite verb is located in the v*P domain in type (1a) languages; the tense affix is lowered and attached to a verbal head (*Affix-hopping*). In type (1b) languages, the finite verb moves to T, where tense is located. According to Holmberg and Platzack (1995), the finite verb moves to C, where tense is located, in type (1c) languages.[1] If T is not a valid syntactic head as stated above, how does the structure building proceed?

In this paper, I propose to eliminate T as an independent syntactic head from the

[1] See the traditional literature on verb movement, e.g. Emonds (1978), Travis (1984), Pollock (1989), Belletti (1990), Vikner (1990), Roberts (1993), Svenonius (1994), Grimshaw (2000), Matushansky (2006), Truckenbrodt (2006), among others.

computational system of human language. This paper is organized as follows. Section 2 introduces how tense has been dealt with in the history of Chomskyan generative syntax. Adopting feature inheritance (Chomsky 2013, 2015) and assuming that tense (and other features, if any) is inherited from C by T, T does not have any contents in Lex. It is doubtful, I argue, that T can exist as a legitimate syntactic head, though tense feature definitely exists in human language. Section 3 introduces the derivational system of *Labeling Algorithm* proposed by Chomsky (2013, 2015), which the analysis in this paper is based on. In section 4, based on Hosono (2018), in which verb movement is carried out in narrow syntax in terms of feature inheritance and copy deletion, I propose that in type (1a-b) languages, a verbal head moves and merges to the root, and it inherits tense (and any other functional features) after C merges; in type (1c) languages, a verbal head directly moves to C, and feature inheritance does not occur. In both cases, I argue, the object which has traditionally been called TP is unlabeled. Section 5 introduces the latest framework of *workspace* proposed by Chomsky et. al. (2017) and Chomsky (2017), who change the definition of the merging operation from Merge to *MERGE* and claim that only external and internal MERGE are legitimate, rejecting other merging operations, e.g. countercyclic movement such as verb movement. I argue that without T, the problem on the countercyclic property of verb movement is solved. Section 6 briefly concludes this paper.

2. Tense as an independent syntactic head

The way to deal with tense has been greatly changed in the history of Chomskyan generative syntax. In Chomsky (1957), English morphemes such as *-ed*, which represents past tense, and *-ing*, which represents progressive aspect, were unified and notated as *Af*(fix). *Modal*s and *Aux*(iliaries) were also established as categories independent of main verbs. In Chomsky (1964), the linguistic features that represent past and present were unified and specified as *Tense*.

In Chomsky (1981, 1986a,b), the category that represents tense was notated as *Infl*(ection), the value of which was [+Tense] for finite and [-Tense] for infinitival. Under the *X-bar* theory, *I*(nfl) was assumed to be a functional head that takes VP as its complement, the projection of which was represented as *IP*. *C*(omplementizer) was assumed to be a functional head that takes IP as its complement, the projection of which was represented as *CP*.

In Chomsky (1995), the inflectional property and agreement property in I were separated: the former was established as the functional *T*(ense) head, and the latter as the functional *Agr*(eement) head. Later, with the claim that Agr does not have any meaningful contents in *Lex*(icon), Agr was eliminated from the *narrow syntactic* computational system of human language.

In Chomsky (2000, 2001, 2004), T had both tense and φ-features, the latter of which reflects the agreement property of human language. Within the *phase* framework, which assumes C and *v**, a functional head of a verbal category with transitivity, to be phase heads, it was claimed that a functional head probes a goal and that one’s uninterpretable features are valued by the other’s interpretable counterpart. For instance, T, as a probe, searched a nominal category as its goal. T's uninterpretable φ-features were valued by the interpretable counterpart of the nominal; the unvalued Case of the nominal was valued by the interpretable tense of T.[2]

Since Chomsky (2008) and in his subsequent works (Chomsky 2013, 2015), *feature inheritance* (cf. Richards 2007, Ouali 2008) has been adopted. According to this idea, functional features are located in a phase head, and they are inherited by a lower non-phase head. Specifically, functional features such as tense, φ-features, Q, and others if any, are located in C, and T inherits them from C in the C-T configuration; the same argument applies to the v*-R(=V) relation. In this current assumption, T gets the tense feature (and others) only after it inherits them from C. Thus, tense (and any other features that have been associated with T) is not an inherent property of T. T is now an 'empty' functional head that does not have any contents in Lex.

Consider other head categories. *R*(oot = V) represents a verbal root, and verbs (e.g. *eat*, *walk*) are base-generated as the R(=V) head. v* acts as categorizing R(=V) as a verb. It is phonetically null in most cases, but affixes such as *-en* of *strengthen* phonetically embody the v* head. C specifies a clausal category, and the complementizer *that* is base-generated as the C head. Nouns (e.g. *cake*, *apple*) and adjectives (e.g. *beautiful*, *difficult*) are base-generated as the nominal head *N* and as the adjectival head *Adj* respectively. These head categories have their own inherent meaning and contents that are derived from the items base-generated as those head categories. Thus, all these categories are 'legitimately' present in Lex.

On the contrary, adopting feature inheritance and assuming that tense (and other features, if any) is inherited from C by T, there are no contents in T in Lex. A category that does not have any contents is equivalent to a category that does not have any meaning. At this point, the current status of T is the same as that of Agr. Agr, without any meaningful contents in Lex, was eliminated from the computational system of human language.[3] In the same way, it is doubtful that T can exist as a legitimate syntactic head in Lex, though the tense feature definitely exists in human language.

3. Derivation within the framework of *Labeling Algorithm* (Chomsky 2013, 2015)

Chomsky (2013, 2015) claims that Merge, both external and internal, can occur freely. He claims, contrary to the previous frameworks (Chomsky 1981, 1986a,b, 1995), that there is no necessity to assume that a head always projects. But a syntactic object needs a label so that it can be interpreted at the interfaces.[4] It is claimed that a syntactic object is labeled in the course of a derivation by *Labeling Algorithm* (LA). LA is assumed to be a minimal search operation. As soon as LA finds a possible candidate of a label, a syntactic object is immediately labeled.

Specifically, when LA finds phase heads, v* and C, LA labels a syntactic object <v*/C>, which results in either $[_{\langle v^* \rangle}$ v*, XP] or $[_{\langle C \rangle}$ C, XP]. When LA cannot find a phase head,

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2 Cf. Pesetsky and Torrego (2001).

3 Expletives such as *it* and *there* are meaningless items themselves. But the former originates from a pronoun, and the latter from a locative adverb. The expletive use of these items is derivative.

4 The term *syntactic object* refers to a structure that has already been built, as meant here. It also refers to a lexical item in the discussion on the *workspace* in section 5.

one way to label a syntactic object is that either one of the categories moves out, and the remaining category determines the label. That is, in configuration [XP, YP], after one of the categories moves out, LA is blind to the copy in its original position and finds the head of the remaining category by minimal search: either [XP [$_{<Y>}$ ~~XP~~, YP]], which is labeled with the head of YP taken, or [YP [$_{<X>}$ XP, ~~YP~~]], which is labeled with the head of XP taken. The other way is that a label is determined by the shared feature(s) between two categories. Specifically, in configuration [XP, YP], when XP and YP have matching φ-features, feature valuation occurs between them. LA finds the shared φ-features and labels the projection <φ,φ>, which results in [$_{<\varphi,\varphi>}$ XP$_{[\varphi]}$, YP$_{[\varphi]}$]. When a non-phase head, either T or a verbal root R, which cannot label itself by assumption, merges with XP, either XP itself or a category inside XP, say YP (i.e. [$_{XP}$ … YP …]), moves to 'strengthen' that non-phase head.[5] The non-phase head and the raised category go on to the procedure of feature valuation. LA finds the φ-features shared between them and labels the entire projection <φ,φ>, which results in either [$_{<\varphi,\varphi>}$ XP$_{[\varphi]}$ [R$_{[\varphi]}$, ~~XP~~]] or [$_{<\varphi,\varphi>}$ YP$_{[\varphi]}$ [T$_{[\varphi]}$ [$_{XP}$ … ~~YP~~ …]]].[6]

On the basis of the labeling procedure introduced above, the derivation of *John kisses Mary* proceeds as illustrated in (2), which illustrates the derivational process until when β<v*> (= v*P, in the traditional notation) is transferred.[7]

(2) a. [kiss(=R) [$_{\delta}$ Mary]]
b. [$_{\gamma}$ Mary [kiss(=R) [$_{\delta}$ ~~Mary~~]]]
c. [v*$_{~~[\varphi]~~}$ [$_{\gamma}$ Mary [kiss(=R)$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]
d. [v*$_{~~[\varphi]~~}$ [$_{\gamma<\varphi,\varphi>}$ Mary [kiss(=R)$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]
e. [kiss(=R)$_{[\varphi]}$+v*$_{~~[\varphi]~~}$ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]
f. [T [$_{\beta}$ John [kiss(=R)$_{[\varphi]}$+v*$_{~~[\varphi]~~}$ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]
g. [$_{\alpha}$ John [T [$_{\beta<v*>}$ ~~John~~ [kiss(=R)$_{[\varphi]}$+v*$_{~~[\varphi]~~}$ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]
h. [C$_{~~[\varphi]~~}$ [$_{\alpha}$ John [T$_{[\varphi]}$ [$_{\beta<v*>}$ ~~John~~ [kiss(=R)+v*$_{[\varphi]}$[$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~ [$_{\delta}$ ~~Mary~~]]]]]]]]
i. [C$_{~~[\varphi]~~}$ [$_{\alpha<\varphi,\varphi>}$ John [T$_{[\varphi]}$ [$_{\beta<v*>}$ ~~John~~ [kiss(=R)+v*$_{[\varphi]}$[$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~ [$_{\delta}$ ~~Mary~~]]]]]]]]

The verbal root R, *kiss*, merges with the internal argument, *Mary*; see (2a). Since *kiss*(=R) is a non-phase head and weak by assumption, *Mary* moves to strengthen it; see (2b). The phase head v* merges with γ. Functional φ-features that are located in v* are inherited by *kiss*(=R). This means that phasehood is inherited by R from v*; see (2c). *Kiss*(=R) and *Mary* go on to the feature valuation procedure. The φ-features inherited by *kiss*(=R), which are unvalued, are assigned values by the valued counterpart of *Mary*, and an unvalued Case of the latter is assigned accusative Case.[8] LA finds the φ-features shared between *kiss*(=R) and *Mary*. LA

[5] When XP, which has already merged with a non-phase head as the complement, moves and merges to that existing structure again, the problem of anti-locality (Grohmann 2003) would arise. But in the spirit of 'free Merge', anything can move to anywhere. I assume the free Merge approach throughout this paper.
[6] Here, I notate all φ-features with [φ] for convenience sake, whether they are valued or unvalued. I introduce a detailed derivational process soon below.
[7] *John* and *Mary* each have an unvalued Case, [uCase]. I omit them from the notation in (2) for simplicity sake. Hereafter, the verbal root R is represented by an infinitival form in all languages.
[8] Chomsky (2016) revises his claim, saying that i) a category moves to strengthen a non-phase head, ii) a phase

labels γ <φ,φ>; see (2d). *Kiss*(=R) moves to v* to become a verbal category.[9] Phasehood is, at this stage, assumed to be activated in the original position of R.[10] The complement of R, δ, though it is already vacuous, is transferred; see (2e). The external argument of v*, *John,* and T merge in turn; see (2f). Since T is a non-phase head and weak by assumption, *John* in [Spec,β] moves to strengthen it. After *John* moves out, LA finds the phase head v* by minimal search, and β is labeled <v*>; see (2g). The phase head C merges with α. Functional features such as tense and φ-features that are located in C are inherited by T, which means that T inherits phasehood from C; see (2h). T and *John* go on to the valuation procedure. The φ-features inherited by T, which are unvalued, are assigned values by the valued counterpart of *John*. An unvalued Case of the latter is assigned nominative Case by tense. LA finds the φ-features shared between T and *John,* and labels α<φ,φ>. At this stage, it is assumed, phasehood is activated in T, and its complement, β<v*>, including γ<φ,φ>, is transferred; see (2i).

4. Inheritance of the tense feature by a raised verbal head

As stated in section 2, it is quite doubtful to assume T as an independent syntactic head, though tense feature definitely exists in human language. Therefore, I propose to eliminate T from the computational system of human language. Without T, how does a structure building operation proceed? And how is tense feature embodied in human language?

Within the LA framework, Hosono (2018) claims that verb movement should be carried out in narrow syntax in terms of feature inheritance and copy deletion.[11] Hosono proposes that φ-features and tense, which are located in C, are both inherited by T in type (1a-b) languages as illustrated in (3a), whereas only φ-features are inherited by T with tense

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head merges, iii) the raised category and the phase head go on to the valuation procedure, and iv) functional features such as φ-features located in that phase head are inherited by the lower non-phase head. In this derivational order, it is not clear why φ-features must be inherited by a non-phase head after the valuation procedure occurs between a phase head and a raised category. In this paper, I follow the system of Chomsky (2013, 2015).

[9] After R moves to v*, v* is assumed to be deleted due to its affixal nature (Chomsky 2015). In this paper, I notate R+v* in its final transferred position without a deletion line on v*.

Epstein et al. (2015) claim that head movement (of R+v*) is derived by *pair-Merge* (Chomsky 1995), which makes an ordered pair. Pair-Merge contains some problems. First, the operation itself has not been well defined. The resulting ordered set, <R, v*>, simply indicates that either R precedes v*, or v* precedes R. It is not clear which order is chosen and how that choice is determined. Secondly, linearization is now claimed to be a matter of *externalization*, which operation is assumed to be carried out in morphophonology (Chomsky 2013, 2015). Thus, an ordering information made in narrow syntax, if any, must be a kind of instruction from narrow syntax to morphophonology. This kind of instruction is totally different from the instruction in terms of features as carried out in *Distributed Morphology* (Halle and Marantz 1993, Embick and Noyer 2001). In Distributed Morphology, morphosyntactic features are present in narrow syntax and sent to morphophonology. Actual phonetic forms that match those features are then inserted. But here, there are no features that can send an instruction on linearization made in narrow syntax to morphophonology. It cannot be confirmed that such an instruction is actually executed in morphophonology. I turn to Distributed Morphology in section 4 again.

In his recent paper, Kayne (2018) adopts pair-Merge to give credit to *Linear Correspondence Axiom* (Kayne 1994), which claims that a c-commanding constituent precedes a c-commanded constituent. With the claim that linearization is a matter of morphophonology, it cannot be confirmed that the information on c-command is usable in morphophonology. Adopting pair-Merge is of no help for the reason stated above.

[10] Which is shown by [φ] without a deletion line in the original position of R in (2e).

[11] See Groat and O'Neil (1996), Bobaljik (2002), Nunes (2004), Landau (2006), and Trinh (2011) for the theory of copy deletion.

remaining in C in type (1c) languages as illustrated in (3b).[12]

(3) a. [$\mathrm{C}_{[\cancel{\mathrm{Tns},\varphi}]}$ [… [$\mathrm{T}_{[\mathrm{Tns},\varphi]}$ …]]] (=type (1a-b))
b. [$\mathrm{C}_{[\mathrm{Tns},\cancel{\varphi}]}$ [… [$\mathrm{T}_{[\varphi]}$ …]]] (=type (1c))

Hosono claims that the verbal functional head v* has an unvalued tense feature, [uTns], whereas the valued counterpart, [Tns], is located in a higher functional head, and that after verb movement takes place, feature valuation occurs between [uTns] and [Tns], with the former valued by the latter.[13] In type (1a-b) languages, R+v* moves to T, where [Tns] is located. [uTns] of (R+)v* is valued by [Tns]; see (4a). In type (1c) languages, [Tns] remains in C. Hosono claims that R+v* in the v* head position skips T and directly moves to C.[14] [uTns] of (R+)v* is valued by [Tns] located in C; see (4b).[15]

(4) a. [$\mathrm{C}_{[\cancel{\mathrm{Tns},\varphi}]}$ [… R+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$+$\mathrm{T}_{[\mathrm{Tns},\varphi]}$ [… R+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$ … [~~R~~ …]]]] (=type (1a-b))
b. [… R+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$+$\mathrm{C}_{[\mathrm{Tns},\cancel{\varphi}]}$ [… $\mathrm{T}_{[\varphi]}$ [… R+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$ … [~~R~~ …]]]] (=type (1c))

Hosono claims that which copy, the one in the highest position or the one in the original position, is actually pronounced is a matter of morphophonology.[16] In type (1a-b) languages, when the copy of R+v* in the v* head position is chosen to be pronounced, a finite verb appears in the v* head position, as illustrated by type (1a) languages; see (5a).[17] When the copy of R+v* in T is chosen, a finite verb appears in T, as illustrated by type (1b) languages; see (5b). In English, a type (1a) language, the finite Aux(iliary verb) *have* and the finite *be* appear in T: e.g. *John has not read that book* (cf. *John did not read that book*). This fact results from choosing their copy in T to be pronounced in morphophonology, as illustrated in (5c). In type (1c) languages, the copy of R+v* in C is chosen to be pronounced in the unmarked case, and a finite verb appears in C; see (5d).[18]

(5) a. [$\mathrm{C}_{[\cancel{\mathrm{Tns},\varphi}]}$ [… ~~kiss(=R)+v*~~$_{[\cancel{\mathrm{uTns}}]}$+$\mathrm{T}_{[\mathrm{Tns},\varphi]}$ [… kiss(=R)+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$ … [~~kiss(=R)~~ …]]]]] (=1a)
b. [$\mathrm{C}_{[\cancel{\mathrm{Tns},\varphi}]}$ [… embrasser(=R)+$\mathrm{v}^*_{[\cancel{\mathrm{uTns}}]}$+$\mathrm{T}_{[\mathrm{Tns},\varphi]}$ [… ~~embrasser(=R)+v*~~$_{[\cancel{\mathrm{uTns}}]}$ … [~~embrasser(=R)~~ …]]]]] (=1b)

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12 Miyagawa (2010, 2017) has claimed that some of the functional features located in C are inherited by T but others remain in C, depending on individual languages. According to Holmberg and Platzack (1995), the finiteness feature is located in C in V2 languages, whereas it is located in T in non-V2 languages. Hereafter, I omit φ-features of v*, which are relevant to Case assignment to an internal argument, from the notation.

13 See, e.g. Biberauer and Roberts (2010) and Holmberg and Roberts (2013), for recent proposals on the analysis of verb movement.

14 See Holmberg and Hróarsdóttir (2003) and Chomsky (2008), who propose that a category can skip the closest target position and directly move to the next target position. See also Roberts (2010), who suggests that v* directly moves to C in V2 languages.

15 (4a-b) represent the syntactic objects that have not yet been transferred. R+v* in the v* head position is represented without a deletion line.

16 Cf. Groat and O'Neil (1996).

17 The deletion line on the v* head position and on the T head position simply means that a relevant copy is not pronounced at that position. In (5a), for instance, it is not the case that T is separated from the verbal head with the latter detached and remaining in the v* head position.

18 See Hosono (2018) for the case of *that*-clauses in type (1c) languages in which the copy of R+v* in the v* head position is chosen to be pronounced, and also an analysis of *do*-support in type (1a) languages.

c. [C~~$_{[Tns,\varphi]}$~~ [… have(=R)+v*~~$_{[uTns]}$~~+T$_{[Tns,\varphi]}$ [… ~~have(=R)+v*$_{[uTns]}$~~ … [~~have(=R)~~ …]]]]

d. [… kyssa(=R)+v*~~$_{[uTns]}$~~+C$_{[Tns,\varphi]}$ [… T$_{[\varphi]}$ [… ~~kyssa(=R)+v*$_{[uTns]}$~~ … [~~kyssa(=R)~~ …]]]] (=1c)

Eliminating T from the computational system of human language, I propose, based on Hosono (2018), that in type (1a-b) languages, R+v* moves and merges to the root (cf. Matushansky 2006),[19] and it inherits tense (and any other functional features) after C merges.[20] Specifically, the derivation of (1a) proceeds as follows. Assume that the derivation has proceeded to the stage illustrated in (2e). The external argument of v*, *John*, and the adverb *always* merge in turn, as illustrated in (6a). R+v* moves and merges to the root; see (6b).[21] The subject *John* moves and merges to the root.[22] After *John* moves out, LA finds the phasal head v* by minimal search, and β is labeled <v*>; see (6c). C merges to α. Tense and φ-features are inherited from C by the raised R+v*; see (6d). The valuation procedure occurs between matching features. The φ-features located in the raised R+v*, which are unvalued, are assigned values by the valued counterpart of *John*. An unvalued Case of the latter is assigned nominative Case by (valued) tense. When phasehood is activated in C, β<v*> is transferred; see (6e).

(6) a. [always [$_{\beta}$ John [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]

b. [[kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~] [always [$_{\beta}$ John [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]

c. [$_{\alpha}$ John [[kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~] [always [$_{\beta<v*>}$ ~~John~~ [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]]

d. [C~~$_{[Tns,\varphi]}$~~ [$_{\alpha}$ John [[kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]$_{[Tns,\varphi]}$ [always [$_{\beta<v*>}$ ~~John~~ [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]]]

e. [C~~$_{[Tns,\varphi]}$~~ [$_{\alpha}$ John [[kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]$_{[Tns,\varphi]}$ [always [$_{\beta<v*>}$ ~~John~~ [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]]]

Note that α, which has traditionally been called TP, is unlabeled. As can be seen in the description made in section 3, the feasibility of labeling depends on either the presence of a phase head or the inheritance of phasehood. When LA finds a phase head, LA takes it as a label immediately. When a non-phase head, R, inherits φ-features from v*, it inherits phasehood too. LA finds the φ-features shared between R and an object raised to its Spec and labels a relevant projection <φ,φ>. Thus, LA takes as a label either a phase head itself or the φ-features possessed by a head that inherits phasehood.[23]

However, there is no inherent relation between C and R+v* in which phasehood is

[19] Matushansky (2006) claims that V moves and merges to the root (to the Spec of T in her words); V and T go on to the process of the *morphological merger* in morphophonology.

[20] There are many cases in which a complex form composed of more than one item has a feature. In i), *which* and *book* compose a *wh*-phrase *which book*. It has [wh] as a complex; it is not the case that either of the elements, *which* or *book*, has [wh].

i) Which book did you read?

[21] To avoid confusion with copy deletion, R+v* is not represented with a deletion line both in the v* head position and in the raised position in (6).

[22] Recall that Merge is free.

[23] The same argument applies to the labeling of configuration [XP, YP], in which procedure either XP or YP moves out and the remaining category determines the label. This pattern is actually limited to the case in which the head of the remaining category is a phase head. As illustrated in (2g) and (6c), after a subject moves out, LA finds the phase head v* and takes it as the label of the relevant projection. In successive cyclic movement of *wh*-phrases as illustrated in i), after the *wh*-phrase moves out, LA finds the phase head C and takes it as the label of intermediate clauses.

i) [Who do [you think [t_{wh} C [Mary believed [t_{wh} C [John kissed t_{wh}]]]]]]?

inherited from C by R+v*. Being an amalgam, R+v* cannot project. Even if C takes a complement, R+v* cannot be the head of the complement. Neither v* itself nor R itself has an inherent relation with C, either. Thus, phasehood cannot be inherited from C by (either of) R+v*. Therefore, though LA might find the φ-features shared between the raised R+v* and the subject *John*, LA does not qualify [φ] as the label. Without a head that inherits phasehood from C, the transferred domain at the stage when phasehood is activated in C is β<v*>, which is the largest legitimate syntactic object with a label below C.[24]

In both type (1a-b) languages, the derivation proceeds in the same way as illustated in (6). In type (1a) languages, the copy of R+v* in the v* head position is chosen to be pronounced; see (7a). In type (1b) languages, the copy of R+v* in the raised position is chosen to be pronounced; see (7b). When the finite Aux (and the finite *be*) appears in type (1a) languages, as in *John has not read that book*, the copy of R+v* in the raised position is chosen to be pronounced, as illustrated in (7c).[25]

(7) a. [C$_{[\text{~~Tns,φ~~}]}$ [$_{\alpha}$ John [~~[kiss(=R)$_{[\varphi]}$+v*$_{[\varphi]}$]~~$_{[Tns,\varphi]}$ [always [$_{\beta<v^*>}$ ~~John~~ [kiss(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Mary [~~kiss(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Mary~~]]]]]]]]

b. [C$_{[\text{~~Tns,φ~~}]}$ [$_{\alpha}$ Jean [[embrasser(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]$_{[Tns,\varphi]}$ [toujours [$_{\beta<v^*>}$ ~~Jean~~ [~~embrasser(=R)$_{[\varphi]}$+v*$_{[\varphi]}$~~ [$_{\gamma<\varphi,\varphi>}$ Marie [~~embrasser(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marie~~]]]]]]]]

c. [C$_{[\text{~~Tns,φ~~}]}$ [$_{\alpha}$ John [[have(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]$_{[Tns,\varphi]}$ [not [$_{\beta<v^*>}$ ~~John~~ [~~have(=R)$_{[\varphi]}$+v*$_{[\varphi]}$~~ … [~~have(=R)~~ [read that book]]]]]]]

In type (1c) languages, the derivation proceeds as illustrated in (8). Assume that the derivation of Swedish has proceeded to the stage illustrated in (2e). The external argument of v*, *Jon*, and the adverb *alltid* merge in turn, as illustrated in (8a). The subject moves and merges to the root. After *Jon* moves out, LA finds the phase head v* by minimal search, and β is labeled <v*>; see (8b). C merges. In cases such as (1c), in which the object moves to sentence-initial position, C will have, say, [Foc], in addition to [Tns] and [φ]; see (8c). R+v* in the v* head position directly moves to C. Feature inheritance does not occur in this case; all features located in C remain there. C, to which the raised R+v* merges, and *Jon* go on to the valuation procedure.[26] The unvalued φ-features are assigned values by the valued counterpart of *Jon*. An unvalued Case of the latter is assigned nominative Case by (valued) tense; see (8d).[27] The object *Marit* moves to sentence-initial position due to [Foc] located in C.[28] When phasehood is activated in C, β<v*> is transferred; see (8e). Finally, in morphophonology, the copy of R+v* in the C head position is chosen to be pronounced, as the deletion line on the copy in the v* head position indicates; see (8f).[29]

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[24] The argument here indicates that C might not take any syntactic object as its complement. I leave this issue for future research.

[25] In (7c), the details are omitted.

[26] Cf. Chomsky (2016). See also footnote 8. The crucial difference between his claim and mine is that feature inheritance does not occur in the claim here.

[27] Here too, R+v* is not represented with a deletion line both in the v* head position and in the raised position to avoid confusion with copy deletion.

[28] Strictly speaking, since Merge is free, *Marit* can move whether C has [Foc] or not. See Chomsky et al. (2017), who claim that discourse-related features such as [Foc] are not syntactic features, rejecting the *cartographic* system (Rizzi 1997, Cinque 1999).

[29] The derivational process is the same in the case of the unmarked SVO order such as *Jon kyssa alltid Marit*.

(8) a. [alltid [$_{\beta}$ Jon [kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ Marit [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]

b. [$_{\alpha}$ Jon [alltid [$_{\beta\langle v*\rangle}$ ~~Jon~~ [kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ Marit [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]]

c. [C$_{[Foc,Tns,\varphi]}$ [$_{\alpha}$ Jon [alltid [$_{\beta\langle v*\rangle}$ ~~Jon~~ [kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ Marit [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]]]

d. [[kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]+C$_{[Foc,Tns,\varphi]}$ [$_{\alpha}$ Jon [alltid [$_{\beta\langle v*\rangle}$ ~~Jon~~ [kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ Marit [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]]]

e. [Marit [[kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]+C$_{[Foc,Tns,\varphi]}$ [$_{\alpha}$ Jon [alltid [$_{\beta\langle v*\rangle}$ ~~Jon~~ [kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ ~~Marit~~ [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]]]]

f. [Marit [[kyssa(=R)$_{[\varphi]}$+v*~~$_{[\varphi]}$~~]+C$_{[Foc,Tns,\varphi]}$ [$_{\alpha}$ Jon [alltid [$_{\beta\langle v*\rangle}$ ~~Jon~~ [~~kyssa(=R)$_{[\varphi]}$+v*$_{[\varphi]}$~~ [$_{\gamma\langle\varphi,\varphi\rangle}$ ~~Marit~~ [~~kyssa(=R)~~$_{[\varphi]}$ [$_{\delta}$ ~~Marit~~]]]]]]]]]

Note that in the case above too, α, i.e. TP in a traditional sense, is unlabeled. Feature valuation occurs between C (, to which the raised R+v* merges) and the subject *Jon*. But feature inheritance from C does not occur. Actually, there is no head inside α but above β<v*> that would inherit φ-features from C and share them with *Jon*. LA cannot find shared φ-features inside α and cannot label α.

The proposed derivational way can apply to modal Aux verbs such as *can* and *should*, which have been established as categories independent of main verbs since Chomsky (1957) as stated in section 2. Some of the modal Aux verbs have both the present and past tense forms: e.g. *can-could*, *will-would*, etc. They would be possible candidates that are base-generated in T. The meaning that each of the modal verbs expresses differs: *can* expresses possibility, *should* expresses obligation, and so on. In the *cartographic* study (Cinque 1999), a syntactic head is established for each of the modal verbs: e.g. Mod(al)$_{\text{poss(ibility)}}$ for *can*, Mod$_{\text{obli(gation)}}$ for *should*, and so forth. Adopting feature inheritance, however, T-related features all originate in C. The modal feature Mod should not be an exception and should originate in C. Thus, *can*, as an Aux verb that expresses possibility, simply merges to a root, say v*P. When a sentential adverb such as a negation appears, the Aux moves across that adverb; otherwise, it does not move. After C merges, it inherits [Mod], [Tns] and any other T-related features from C.

The proposal here might look similar to, but is totally different from, the idea of *reprojection* (Hornstein and Uriagereka 2002), according to which, a label can change in the course of a derivation by reprojection by the head of a raised category.[30] Specifically, in [XP [$_{Y'}$ Y ~~XP~~]], XP moves and merges to Y'. The label of the entire structure is YP in the unmarked case: [$_{YP}$ XP [$_{Y'}$ Y ~~XP~~]]. But according to Hornstein and Uriagereka, the head of the raised XP, X, can reprojects. This reprojection results in the structure [$_{XP}$ [$_{X'}$ …X…][$_{YP}$ Y ~~[$_{XP}$ …X…]~~]], in which X takes YP, the former Y', as its complement, and the label of the entire structure is XP.[31] In the proposal here, crucially, the raised R+v* is not involved in labeling. In type (1a-b) languages, the raised R+v* does not inherit phasehood. The φ-features that it inherits from C

Merge is free, so the subject *Jon* moves (even directly; cf. Holmberg and Hróarsdóttir 2003) to sentence initial position, even when C does not have [Foc]. Feature valuation occurs between C and the subject in the raised position. See also the traditional literature, e.g. Zwart (1993), who claims that a subject in V2 languages is located in [Spec,TP], not in [Spec,CP], in the SVO order.

[30] Thanks to Anders Holmberg (p.c.) for letting me notice their proposal.

[31] Hornstein and Uriagereka restrict this operation to the cases that contain quantifiers such as *most*. But it is now not necessary to assume that a head always projects (Chomsky 2013, 2015). Still, the difference between their reprojection and Chomsky's LA is that the label is not automatically determined in the latter. After feature valuation occurs, LA must find shared feature(s) to label a relevant structure, as illustrated in section 3. See also Donati (2006), who argues that a *wh*-phrase such as *what* can reproject in a *wh*-clausal complement.

are not qualified as a label. In type (1c) languages, feature inheritance does not occur. R+v* raised to C is involved neither in feature valuation nor in labeling.

Based on the argument here, it is no longer necessary to assume [uTns] on a verbal head, contrary to the literature (Hosono 2018, Biberauer and Roberts 2010). When T was present as an independent syntactic head, it was necessary to account for why R+v* moves to T in type (1a-b) languages, but to C in type (1c) languages. The argument was complicated with the assumption of feature valuation between [Tns] and [uTns]. In Hosono (2018), for instance, it was claimed that in type (1a-b) languages, R+v* was raised to T, since T inherits [Tns] from C and [uTns] of R+v* could be valued there. In type (1c) languages, R+v* was raised to C, since [Tns] remains there and [uTns] of R+v* could be valued there. Without T, the argument is quite simple: [Tns] is inherited by the raised R+v* in type (1a-b) languages; in type (1c) languages, in which R+v* moves to C, [Tns] remains in C. No extra assumptions such as feature valuation between [Tns] and [uTns] are necessary.

One of the problems on verb movement is its countercyclic property.[32] Especially in v*-to-T as illustrated in (5b), which is repeated in (9), according to Hosono's (2018) account, R+v* moves and adjoins to T, after (the subject and) C merges. That is, R+v* merges to an element inside the already built structure. This movement does not extend a tree, which violates the *Extension Condition* (Chomsky 1995).[33]

(9) [C$_{\sout{[Tns,\varphi]}}$ [… embrasser(=R)+v*$_{\sout{[uTns]}}$+T$_{[Tns,\varphi]}$ [… ~~embrasser(=R)+v*~~$_{\sout{[uTns]}}$ … [~~embrasser(=R)~~ …]]]](=5b)

Eliminating T, R+v* now moves and merges to the root, as illustrated in (6b); then, the subject and C merge in turn. The problem on the countercyclic property of verb movement does not arise here.[34]

As illustrated in (6) and (8), α is not labeled, which accounts for a traditional issue, namely, the asymmetry between VP and CP on one hand and TP on the other. TP cannot be a syntactic unit, though VP and CP can be (Rizzi 1982):

(10) a. [$_{VP}$ Go to war], he actually did ~~[$_{VP}$ …]~~.
b. [$_{CP}$ that Mary got married with Bob], John said ~~[$_{CP}$ …]~~.
c. *[$_{TP}$ Mary got married with Bob], John said [$_{CP}$ that ~~[$_{TP}$ …]~~].

VP can be isolated and fronted as a unit; see (10a). CP can also be isolated and fronted; see (10b). But TP cannot be isolated and fronted as a unit, with the complementizer *that* left behind;

[32] See the literature given in footnote 1 for the properties of verb movement.
[33] See Richards (2001), who proposes the operation called *tucking-in*, claiming that if demands such as Case-agreement are satisfied in a higher position, a sentential element can be raised into a tree-internal position.
[34] Claiming that V moves and merges to the Spec of T (i.e. to the root), Matushansky (2006) actually solves the problem on the countercyclic property of verb movement. But her argument holds only when verb movement takes place before a subject (and any other sentential element) moves and merges to the root. In the current system, after the subject moves out, LA finds the phase head v* and takes it as a label, as illustrated in (2g). If R+v* moved to T before *John* moves out, β could not be labeled.

see (10c).[35] This fact is straightforward here. T does not exist. TP that it projects does not exist either. The object notated as TP in (10c), i.e. α in (6) and (8), is unlabeled, as we have seen. It is neither a maximal projection nor a legitimate syntactic unit.

Without T, where does tense morphology such as *-ed*, which has been assumed to be base-generated in T, originate? In *Distributed Morphology* (Halle and Marantz 1993, Embick and Noyer 2001), morphosyntactic features build a structure in narrow syntax, and after it is sent to morphophonology, phonetic forms that match those features are inserted (*Late Insertion*, Embick and Noyer 2001). It has been claimed here that the raised R+v* inherits [Tns] (and [φ]) from C in type (1a-b) languages. Based on the idea of Distributed Morphology, after a built structure is sent to morphophonology, the morpheme that matches [Tns] (and [φ]), i.e. *-es* for the English present tense (third singular) and *-e* for the French present tense (third singular), is inserted respectively into the position where [Tns] is located. In type (1c) languages, R+v* moves to C. Feature inheritance does not occur, and [Tns] (and [φ]) remains in C. In morphophonology, the morpheme that matches [Tns] (and [φ]), i.e. *-er* for the Swedish present tense, is inserted into the position where [Tns] is located. According to the literature (e.g. Embick and Noyer 2001, Bobaljik 2002, Matushansky 2006), the features that are adjacent to each other can merge to each other. The raised R+v* merges to [Tns] (and [φ]) and appears as *kisses* in English, as *embrasse* in French, and as *kisser* in Swedish. Thus, the origin of tense morphology is accounted for in terms of the embodiment of tense feature in morphophonology, by adopting the late insertion analysis proposed in Distributed Morphology.[36]

Note that adopting feature inheritance and Distributed Morphology, it is no longer necessary to assume lowering operations, which have been problematic since May (1977): they violate the *Proper Binding Condition*, which states that a trace must be properly governed (Chomsky 1980). As stated in section 1, in *Affix-hopping* (Chomsky 1995), a tense affix located in T is lowered and attached to a verbal head in V. The tense affix lowered onto the verbal head in V does not c-command its trace in T. But in feature inheritance, in which features are inherited from a higher head by a lower head, no traces are left in the higher head position. In Distributed Morphology, it is assumed that the item that matches a feature sent from narrow syntax is inserted in morphophonology into the position where that feature is located. As claimed above, in type (1a-b) languages, in which [Tns] is inherited by the raised R+v*, an item that matches [Tns] is inserted into the position where [Tns] is located in each of the languages. No requirement such as c-commanding a trace by a tense affix arises.[37]

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[35] TP cannot be a syntactic unit also in extraposition, pseudoclefting, and so forth (Chomsky 2001).

[36] The same argument applies not only to languages that express tense by verbal inflection as illustrated by type (1a-c) languages but also to languages that express tense by tense particles. As stated in section 1, Japanese attaches a tense particle *-ta* to a verbal root to represent the past tense, e.g. *tabe-ta* (eat-*ta*) 'ate', *mi-ta* (see-*ta*) 'saw', etc. In narrow syntax, [Tns] is located in a verbal head: e.g. [*tabe*]$_{[Tns]}$. In morphophonology, the item that matches [Tns], i.e. *-ta*, is inserted into the position where [Tns] is located. The verbal head and the particle merge to each other.

[37] In Hosono's (2018) analysis on verb movement, R+v* in the v* head position has [uTns]. R+v* is raised to T and its [uTns] is valued there in type (1a-b) languages. In type (1a) languages, R+v* in the v* head position is chosen to be pronounced; see (5a). But here, R+v* inherits [Tns] from C in its raised position. R+v* in the v* head position is not associated with [Tns]. When the copy of R+v* in the v* head position is chosen to be pronounced, [Tns], which the raised R+v* inherited from C, might be isolated, as illustrated in (7a). It will be possible to say that before β<v*> is transferred (see (6e)), [Tns] in R+v* in the raised position is copied onto R+v* in the v* head

5. From Merge to MERGE (Chomsky et al. 2017; Chomsky 2017)

In this section, I introduce the latest framework of *workspace* (Chomsky et. al. 2017; Chomsky 2017), and discuss issues on tense and verb movement. Chomsky claims in a series of his latest works that the Merge operation assumed so far is not sufficient to account for human language computation. Until Chomsky (2015), Merge was assumed to take two syntactic objects (, which correspond to lexical items), e.g. a and b, and simply combine them, which results in a set, {a, b}.[38] However, human language also produces a new structure from two syntactic objects that have already been built independently. For instance, the construction of *the boy likes the girl* starts with merging *the* and *girl*, which results in the set {the, girl}. This set in turn merges to *likes*, which results in the set {likes, {the, girl}}. In addition, the subject *the boy* must be built in parallel by merging *the* and *boy*, which results in the set {the, boy}. These syntactic objects that have been built independently of each other are then merged, which results in the entire structure {{the, boy}, {likes, {the, girl}}}. According to Chomsky, to construct such XP-YP structures without modifying the internal structure that has already been built in each of them, it is necessary to assume a space, which he calls a *workspace*.[39] He claims that the merging operation should apply not to individual syntactic objects, but to workspaces, which has led him to change the definition of the merging operation from Merge to *MERGE*.

MERGE is defined as the mapping from a workspace, WS, to another, WS'.[40] Any two accessible items in a WS are candidates to be merged. When a WS is updated to a WS', the lexical items that were contained in the WS but not chosen to be merged are all kept in the WS'. External MERGE proceeds as follows. Assume a WS, [a, b, c], which contains three lexical items, a, b and c. Assume that MERGE applies to the WS, taking a and b and merging them, which procedure is represented as MERGE (a, b, WS). A newly updated WS' is represented as [{a, b}, c], where {a, b} represents the set composed of a and b, and c, which was contained in the WS but not chosen to be merged, is left as it is.

Internal MERGE proceeds in the following way. Assume a WS, [{a,{b, c}}], in which

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position, which process I leave for future.

In Hosono's proposal, [φ] and [Tns] are both inherited by T in type (1a-b) languages, whereas only φ-features are inherited by T with [Tns] remaining in C in type (1c) languages. One of the advantages of this proposal is that it provides a syntactic account for a traditional observation that the Romance languages, type (1b) languages, have a richer inflectional system than the Germanic languages, type (1c) language: with both [φ] and [Tns] embodied by R+v* located in T, the inflection is rich in the former, whereas with only [Tns] remaining in C but no [φ] there, the inflection will not be so rich in the latter.

It is claimed here that [φ] and [Tns] are both inherited by the raised R+v* in type (1a-b) languages, whereas [Tns] and [φ] both remain in C in type (1c) languages. Biberauer and Roberts (2010) too assume that both φ-features and tense remain in C in V2 languages, due to which they need a lot of assumptions to provide a syntactic account for the difference between type (1b-c) languages. Here, the difference in the embodiment of inflection between languages is a matter of morphophonology, based on Distributed Morphology. What kind of item and how many items a language has is determined in each language. No matter how rich (or how poor) the inflectional system of a language is, an item that matches a feature sent from narrow syntax is simply inserted into the position where that feature is located.

[38] See footnote 4.

[39] A precise definition of workspace is ongoing, which I leave aside here.

[40] Here again, a precise definition of MERGE is ongoing, which I leave aside here.

b and c externally merge, resulting in the set {b, c}, to which a externally merges, resulting in the set {a,{b, c}}. Assume that MERGE applies to the WS, taking c and {a,{b, c}} and merging them (i.e. c moves and merges to {a,{b, c}, in a traditional wording}, which procedure is represented as MERGE (c,{a,{b, c}}, WS). In this case, there are no lexical items left in the WS. An updated WS' contains only the set composed of c and {a,{b, c}}, which is represented as [{c,{a,{b, c}}}].

Chomsky et al. (2017) and Chomsky (2017) claim that merging operations other than external and internal MERGE are illegitimate. Chomsky (2017) proposes *seven desiderata*, to which he claims the application of MERGE must conform. Two among seven desiderata are mainly related to the application of merging operations. One is *Restrict Computational Resources* (RCR), which states that MERGE must not expand WSs. This means that syntactic objects/lexical items contained in a WS must not increase after the application of MERGE. The other is *Determinacy*, which states that accessible terms can appear in a WS only once. This means that more than one copy of the item that is accessible to further merging operations must not be produced by the application of MERGE.[41]

Specifically, in external MERGE illustrated above, the updated WS' is represented as [{a, b}, c]. The three syntactic objects, i.e. a, b and c, in the original WS are reduced to two syntactic objects, i.e. {a, b} and c, in the updated WS'. This merging operation does not violate RCR. No copies of the same item are produced. Determinacy is not violated either. In internal MERGE, the updated WS' is represented as [{c,{a,{b, c}}}]. The number of syntactic objects does not change before and after MERGE applies. The original WS contains one syntactic object, i.e. {a,{b, c}}; the updated WS' too contains one syntactic object, {c,{a,{b, c}}}. This merging operation does not violate RCR. The updated WS' [{c,{a,{b, c}}}] contains two copies of c. Since they would both be accessible to further operations, the application of internal MERGE would violate Determinacy. But only the higher copy is found by minimal search and is accessible to further merging operations; thus, this case can be legitimate.

Consider how merging operations other than external and internal MERGE proceed, taking verb movement, which is an countercyclic operation, as example. Assume a WS, [{a,{b,{c, d}}}], in which c and d externally merge, resulting in the set {c, d}, to which b externally merges, resulting in {b,{c, d}}, to which a externally merges, resulting in the set {a,{b,{c, d}}}. Imagine that a is a subject, b is T, c is a verbal head, and d is an object, and imagine v*-to-T, in which the verbal head moves to T. MERGE applies to the WS, taking b and c and merging them, which procedure is represented as MERGE (b, c, WS). A newly updated WS' is represented as [{b, c}, {a,{b,{c, d}}}]. {b, c} represents the set composed of b and c. {a,{b,{c, d}}}, the syntactic object that was contained in the WS but not chosen to be merged, is left as it is.[42] In this merging operation, the number of syntactic objects in the original WS

[41] The five desiderata other than these two are: *Descriptive Adequacy*, a guideline to build a syntactic theory; *Strong Minimalist Thesis*, the conditions of, e.g. no-tampering, inclusiveness and phase-impenetrability, which belong to the third factor principle; *Stability*, which states that the interpretation of a SO (including copies) must not be changed throughout a derivation; *Recursion*, which states that a generated SO must be accessible to further syntactic operations; and *Strictly Binary*, which states that only two SOs can be candidates of MERGE.

[42] Recall the motivation to assume WS: to construct structures (such as XP-YP) without modifying the internal structure that has already been built. In that sense too, the already built entire structure, {a,{b,{c, d}}}, must be

increases in the updated WS', i.e. from one syntactic object, {a,{b,{c, d}}}, to two syntactic objects, {b, c} and {a,{b,{c, d}}}. This merging operation violates RCR. The updated WS', [{b, c}, {a,{b,{c, d}}}], contains two copies of c. Since they are contained in different syntactic objects, neither of them can be found by minimal search. In other words, they are both accessible to further operations. This merging operation violates Determinacy. Thus, the illegitimacy of countercyclic operations is attributed to the violation of RCR and Determinacy.

Without T, as claimed here, the problem on verb movement above is solved. The derivation will proceed as follows. Imagine a WS, {a,{c, d}}, in which a is a subject, c is a verbal head, and d is an object. Without T, the verbal head moves and merges to the root. That is, MERGE applies to the WS, taking c and {a,{c, d}} and merging them, which procedure is represented as MERGE (c, {a,{c, d}}, WS). There are no lexical items left in the WS. A newly updated WS' is represented as [{c,{a,{c, d}}}], where {c,{a,{c, d}}} represents the set composed of c and {a,{c, d}}. The number of syntactic objects does not change before and after MERGE applies: the original WS contains one syntactic object, i.e. {a,{c, d}}; the updated WS' too contains one syntactic object, {c,{a,{c, d}}}. This merging operation does not violate RCR. The updated WS', [{c,{a,{c, d}}}], contains two copies of c. They would both be accessible to further operations, but only the higher c is found by minimal search and is accessible to further merging operations; thus, this operation can be legitimate, not violating Determinacy either. Then, the subject a will further move and merge to the root, as has been claimed here.

Note that the derivational way in terms of MERGE would rule out even R-to-v* as countercyclic. Assume WS_1, [a, b, c], in which a is v*, b is R, and c is an object. Recall the derivational process illustrated in (2), which will proceed in the following way. MERGE applies to WS_1, taking b and c and merging them, which results in WS_2, [a, {b, c}]. MERGE applies to WS_2, taking c and {b, c} and merging them (i.e. object movement), which results in WS_3, [a, {c,{b, c}}]. MERGE applies to WS_3, taking a and {c,{b, c}} and merging them, which results in WS_4, [{a,{c,{b, c}}}]. MERGE applies to WS_4, taking a and b and merging them (i.e. R-to-v*), which results in WS_5, [{a, b}, {a,{c,{b, c}}}]. Here, the number of syntactic objects has increased from one in WS_4 to two in WS_5, which violates RCR. Two copies of a and two copies of b are all accessible to further operations, which violates Determinacy.

Intuitively, as long as R moves to v* before a subject merges, we do not want to say that R-to-v* is countercyclic. That is, when an element moves and merges to another element inside an existing tree, it is countercyclic, as illustrated in v*-to-T. But when an element moves and merges to the highest element in a tree, it is not countercyclic, as illustrated in R-to-v*.[43]

Let us consider the derivational procedure above again. MERGE applies to WS_4, [{a,{c,{b, c}}}], taking a (=v*) and b (=R) and merging them (i.e. R-to-v*), which results in WS_5, [{a, b}, {a,{c,{b, c}}}]. What R-to-v* means, however, is neither that b merges to a that is separated from the existing structure, {a,{c,{b, c}}}, nor that a and b are both extracted and they merge, composing a set separately from {a,{c,{b, c}}}. b simply merges to a, part of the existing structure, {a,{c,{b, c}}}. Furthermore, a has two copies in WS_5. This is quite odd,

left as it is.

[43] The same argument applies to v*-to-C as illustrated in (8).

considering that it is only b, not a, that moves.

Let us say that in WS_5 above, a in {a,{c,{b, c}}} is replaced by {a, b}, which results in [{{a, b}, {c,{b, c}}}]. This WS represents that the set composed by a and b merges to {c,{b, c}}. The number of syntactic objects does not change: WS_4 contains one syntactic object, {a,{c,{b, c}}}, and WS_5 also contains one syntactic object, {{a, b}, {c,{b, c}}}. RCR is not violated. Both {a, b} and {c,{b, c}} are contained in the same syntactic object. The copy of b in {a, b} is located higher than the copy of b in {c,{b, c}}. Only the copy of b in {a, b} is found by minimal search and accessible to further merging operations. Determinacy is thus not violated either. There are no copies of a, which conforms to the fact that a does not move.[44]

6. Conclusion

In this paper, I have proposed to eliminate T as an independent syntactic head from the computational system of human language. Adopting feature inheritance (Chomsky 2013, 2015) and assuming that tense (and other features, if any) is inherited from C by T, T does not have any contents in Lex. It is doubtful that T can exist as a legitimate syntactic head, though tense feature definitely exists in human language. Based on Hosono (2018), in which verb movement is carried out in narrow syntax in terms of feature inheritance and copy deletion, I have proposed that in type (1a-b) languages, R+v* moves and merges to the root, and it inherits tense (and any other functional features) after C merges; in type (1c) languages, a verbal head directly moves to C, and feature inheritance does not occur. In both cases, I have argued, the object which has traditionally been called TP is unlabeled. That is, in type (1a-b) languages, the raised verbal amalgam R+v* inherits φ-features from C in its raised position, but cannot inherit phasehood from C; the φ-features that it inherits from C are not qualified as a label. In type (1c) languages, R+v* moves to C and feature inheritance does not occur; LA does not find shared features and cannot label a relevant object. I have also introduced the framework of *workspace* proposed by Chomsky et. al. (2017) and Chomsky (2017), who change the definition of the merging operation from Merge to *MERGE* and claim that only external and internal MERGE is legitimate, rejecting other merging operations, e.g. countercyclic movement such as verb movement. I have argued that without T, the problem on the countercyclic property of verb movement is solved.

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[44] Depending on the interpretation of seven desiderata, the replacement procedure here might violate the desiderata other than RCR and Determinacy. Strictly following the definition of, e.g. *Stability* (see footnote 41), when a is replaced by {a, b}, the interpretation will differ between before and after the replacement. Also, the argument here might violate *Strong Minimalist Thesis*, since replacing a by {a, b} can mean that the already built structure is tampered with. I leave these problems for future.

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