Biolinguistic Minimalist Syntax

Takashi Imai

The Department of English
Tsuru University 2013

The Department of English, Tsuru University
3-8-1, Tahara, Tsuru-shi, Yamanashi, Japan 402-8555

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Preface

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1 Move and Economy of Derivation

0. Introduction

The goals of the linguistic theory would be eventually the goals of the scientific inquiry which constitute the investigation of optimal operations of the organic systems.[1] In what follows, I will limit myself here to rather informal observations on economy of derivation with special reference to displacement. In the biolinguistic minimalism (BLM), the operations may produce the maximal outcomes with the minimal effort, based primarily on the ecomnomy principles. The system of any form consisiting of various contents independently exists. These contents self-organize the higher and larger system in the sense of the complexity approach to phyisics.[2]

1. Move: the Operation of Attract, Copy and Merge

In the biolinguistic program,[3] such operations as Move, Copy, and Merge would be uniquely reformulated as Merge. In the earlier minimalist

program (MP), Merge is an independent operation, while Copy and Attract are parts of operation, Move. Under the copy theory of displacement, Move is an operation composed of Attract/Copy/Merge (Set Merge), which turns out to be heavier and costly in the sense of economy consideration. Consequently the operation: Move is a Last Resort manipulation of displacement of items to transform inperfection to perfection in computation of human language, C_{HL}.

The operation: Move is executed as follows: A feature set in some Head, **H** as Atractor, **Ar** forms a chain between it and Attractee, **Ae** which shares a set of features of **Ar**. A chain is formed to create paths between the attractee and its target, **T**, actually SPEC position of attractor in the head domain satisfying locality conditions such as the Minimal Link Condition among others. If a chain is not properly formed, i.e. violating some locality conditions, at this point the derivation crashes and cannot proceed any further operations. On the contrary, a chain is formed satisfying locality conditions, then, it creates paths from the position in which the attractee originally appears to the target postion to which the attractor attracts the attractee phrase for feature cheking. Note that some features are to be checked between Attractor and Attractee items. The following chain is postulated under the operation: Move:

(1) (α_1, α_2, …α_i, …α_{n-1}, α_n)

Where α_1 = the head and α_n = its tail. A feature set in α_n is copied to α_{n-1}, and it is copied to another members satisfying locality conditions recursively up to the head, α_1. As has been mentioned above, the chain is formed under the condition of locality, thus, the formed chain is uniform and perfect in the sense of derivation. Consequently, it is not so impossible to reduce the chain into a simple chain only consisting of the head and its tail as in (2);

(2) (α_1, α_2)

In (2), α_1= Head, α_2 = Tail

This renormalizaton is a sort cut for economy. α_1 is a clone of α_2, which is a trace of α_1 in a classical model of generative grammar. Trace is in fact a set of features including FF, semantic features, ϕ-features among others.[4] In the copy theory of the early MP, traces visible at (Narrow) LF, while they may or may not be invisible at PF in human languages.[5] In the Copy theory, traces are visible at (narrow) LF, while they are invisible at PF. By visible, we mean that traces can be seen as a set of features in the original position to subsequent intermediate positions in a cyclic

derivations at LF. At PF we can only see the head of a chain, thus, cannot see traces consequently. (Cf. Chomsky 2000a.) Note that the trace of the tail possesses a set of full features (a bundle of features) satisfying the FI. On the other hand, intermediate traces are not necessarily a set of full features. Intermediate members of a chain (α_2,... α_{n-1}) may or may not lack some features of the trace of the tail of a chain as long as the chain is uniform. It follows that the intermediate members of a chain must be uniform. If the intermediate members of the chain possess different features as such a case that some traces possess a feature, which other members of the traces do not possess, then the chain in question would no longer maintain uniformity. Thus, the derivation crashes.

2. The Optimal Derivations of Relative Clauses

As is well-known, there exist two types of relative clauses (RC): one is an external headed RC, which has two variants with regard to the position of the head, either head-initial or head-final as in (3a,b), while the other is an internally headed RC as in (3c):

(3) a. DP [$_{RC}$ ..... e .....] (Head-Initial RCs)
b. [$_{RC}$ ..... e .....] DP (Head-Final RCs)
c. [$_{RC}$ .....DP .....] α (Head-Internal RCs)

Where DP is a head (antecedent) of RCs in each structure, and *e* shows a gap, which associates with its antecedent. The structure as in (3a) is an instance for the head initial language, while the one like (3b), an example for the head final language. A special attention goes to (3c). The structure is that of the head-internal relative clauses, which is not compatible with the classification of the head position of the language. Furthermore, the structure of this type also contains an element, α that follows the RC, which at PF appears to be an allomorpheme with the determiner overtly or covertly dependent upon languages. Or the element turns out to be a category similar to a nominal marker (nominalizer) as is observed in Japanese (no).

Under the Copy theory, the structures in (3) would be as follows:

(4) a. DP $[_{RC}$ γ [..... rel-β .....]] (Head-Initial RCs)
b. $[_{RC}$ [..... rel-β .....] γ] DP (Head-FinalRCs)
c. $[_{RC}$ .....rel-DP .....] α (Head-Internal RCs)

The feature set of β is copied to γ with the overt/covert category of relative feature indicating as rel- in (4). Thus, some informal expressions of (4a-b) would be as follows:

(5) a. DP [$_{RC}$ rel-DP [..... rel-DP ....]]
b. [$_{RC}$ [..... rel-DP .....] rel-DP] DP

The feature, rel- can be realized as a relevant syntactic form subject to the respective languages. English for example, uses relative pronouns which are coincidentally paralleled to interrogative pronouns as are the cases in most of the European languages. Note also that English uses covert relative pronouns informally explained as the deletion of relative pronouns at PF. (3c) would be a structure as (6):

(6) [$_{RC}$ .....rel-DP .....] rel-DP

Hindi RC structures are very peculiar as standard relativization in that there are three types of RCs, which include all of the above mentioned types. Hindi relativization undergoes in such a way that the relative pronoun appears with a demonstrative pronoun which is called a correlative pronoun or marker of relative pronoun **jo**. Both relative and correlative pronouns can change their respective forms according to number and Case, but not gender. Let us consider the following examples:

(7)

a. [jo mera: bha:i: daftar se der se lauta:] vah
rel my brother office from late returned correl
kal ra:t bilkul nahi: soya
last night at all not slept
“My brother who returned late from the office did not sleep at all last night.”

b. [jo: mera: bha:i: daftar se der se lauta:] ϕ kal ra:t bilkul nahi: soya:

c. vah mera: bha:i: [jo: daftar se der se lauta:] ϕ kal ra:t bilkul nahi: soya:

d. vah mera: bha:i: [jo: daftar se der se lauta:] vah kal ra:t bilkul nahi: soya:

e. mera: bha:i: [jo: daftar se der se lauta:] ϕ kal ra:t bilkul nahi: soya:

f. mera: bha:i: [jo: daftar se der se lauta:] vah kal ra:t bilkul nahi: soya:

In (7a-b), the head is internalized in the relative clause and the correlative appears in the rightmost position immediately dominated by DP. These two examples are quite similar to the structure of internally headed RCs. Hindi has relative pronoun **J** which must precede and properly c-command the head of RC. The only difference between (7a) and (7b) is that in (7b), the correlative pronoun, **U** (or determiner in the sense of Williamson (1987)) is phonetically null, presumably a

kind of empty categories. (7c) and (7e) are both a head initial head (antecedent) type RCs which may be innovative structures in Hindi. The difference between the two examples is that in (7c) the determiner **vah** appears in the head DP while in (7e) the determiner does not show up. It follows that **vah** represents the restrictive clause while in (7e) **vah** is not introduced. Then, it leads to be non-restrictive. Note that Masica (1972) mentions that the unmarked instances as (7a-b) show non-restrictive. (7d) and (7f) are similar constructions in which **vah** appears as a correlative.

Let us consider the following example, which is also possible in Hindi:

(8) [ra:m ne jo xari:di:] vah kita:b
Ram ag. rel bought correl book
bahut mahangi: thi:
very expensive was
'The book which Ram bought was very expensive."

Under the Copy theory of traces, all the variants illustrated in (7)-(8) would be reduced into the expressions as in (8'a-b) respectively:

(8')
a. [J-mera: bha:i: daftar se der se
rel my brother office from late

lauta:] U-mera: bha:i: kal ra:t bilkul nahi: soya:
returned correl at all last night not slept
"My brother who returned late from the office did not sleep at all last night."

b. [ra:m ne J-kita:b xari:di:] U-kita:b
Ram ag. rel-book bought correl book
bahut mahangi: thi:
very expensive was
"The book which Ram bought was very expensive."

Example (8'a) shows that the head noun of RC may appear just as Japanese RCs exemplified as in (9) below. Yet notice that the main difference between (8'a) and its Japanese equivalent in (9) is that the relative pronoun may stay in-situ in the subordinate clause in Hindi, while there is no explicit relative pronoun in Japanese.

(9) [Ramu-ga katta] hon-ga taihen
Ram Nom bought book Nom very
takakat-ta
expensive-past
"The book which Ram bought was very expensive."

It is unlikely to involve movement regardless of overt/covert displacement, in relativization in Japanese.

Thus, under the Copy theory of relativization, the relevant derivation of (9) would be illustrated in (10):

(10) [Ramu-ga rel-hon-o katta] hon-ga
Ram Nom REL-bought Acc bought book Nom
taihen takakat-ta
very expensive past

As we have observed earlier, there could exist three types of relative clauses in terms of the head (antecedent): they are head initial RCs and head final RCs which are both familiar in various languages in connection with fixing the value of the head parameter. The third one is a rather peculiar construction whose head is in the subordinate clause. As mentioned in the previous section, such RCs can be observed in various languages and we call them “internally headed” RCs, to which we will return in the next section. Among the consequences of Hindi relativization in addition to other languages such as Lakhota, Japanese, the internally headed RCs reveal the problematic case of the head parameter. The head parameter fails to account for the internally headed RC constructions simply by fixing the value of + or -, hence the parameter seems to be suspicious in its existence.

3. Diachronic Observation on Relativization

As has been assumed in the literature, Hindi relativization does not involve wh-type movement as is the case in English. Basically as has been observed in the previous section, Hindi relativization is constituted by the relative-correlative structure, i.e. the relative pronoun seemingly appears in RCs while correlative pronoun appears in the main clauses at the right edge of the RC. This strategy of relativization is not unique but is widely spread in languages across the language families. (Cf. Bianchi (1999) and references cited there for Mandingo, Latin, Sanskrit, Old English and Hindi, for which also see Imai (1981), (1989), and Williamson (1987) for Lakhota). Notice that the relative-correlative constructions are possible in Old English. Let us consider the following Old English examples:

(11) [$_{CP}$ [$_{DP}$ thone stan]$_i$ the tha wyrntan
the-ACC stoneACC that the workers
awurpon], [thes$_i$ is gewerdet on thaere
rejected, thatNOM is become on the
hyrnan heafod]
corner head (Bianchi 1999:36)
"The stone that the workers rejected has become the corner-stone."

(12) ure Drihten araerede [$_{DP}$ anes

our Lord raised an
ealdormannes [$_{NP}$ [$_{NP}$ dohtor] [$_{CP}$ seo
aldormanGEN daughterACC whoNOM
the laeg dead]]
that lay dead (Bianchi 1999: 37)

"Our Lord raised an aldorman's daughter who lay dead."

In (11)-(12), the relative element is in fact a determiner merging the NP head (antecedent). And the correlative element, which is anaphorically bound by the head NP merged with the relative morpheme/pronoun in the subordinate clause, appears in the main clause. Thus, the correlative structure version of relativization is actually an internally headed RC.

Following Kayne (1994), Bianchi (1999), we will assume that relativization involves in the raising operation of the head NP rather than the adjunction of CP to the head noun of RC.

Kayne (1994) proposes that relative pronouns are functionally considered to be determiners, which move with the associated NP. Thus, the underlying structure for the English relative clause is as follows:

(13) the [C^0 [he broke it [$_{PP}$ with which hammer]]]

PP "with which hammer" moves to SPEC,CP, yielding a structure as in (14):

(14) the [with which hammer [C^0 [he broke it [e]]]]

(Kayne 1994:(20))

In (14), the NP, “hammer” raises to SPEC, PP possibly via SPEC, which then, structure (15) would be derived:

(15) the [$_{CP}$ [$_{PP}$ hammer$_i$ [with which [e]$_i$]] C_0 ....

(Kayne 1994:(21))

An approach to English relative clauses in terms of the raising analysis may extend to relative clauses in determinerless languages. Let us consider the following Japanese examples:

(16)

a. [Taro-ga kat-ta]hon-ga nusuma-re-ta
   Taro NOM buy Past book NOM be-stolen Past
   “A book which Taro bought was stolen.”

b. [Taro-ga hon-o kat-ta] no-ga
   Taro NOM book ACC buy Past NO NOM
   nusuma-re-ta
   be-stolen Past

(16a) is a standard Japanese RC while (16b) is an

internally headed RC. Note that Japanese is head-final and lacks overt determiners unlike English, which is head-initial and has an overt determiner system. Though Japanese, a head-final language lacks any equivalent of English or French type determiners, as I have argued (Imai (1996)), (in)definiteness of a noun could be properly manifested in Japanese. Therefore, it is not so unnatural to assume that on one hand, a null relative pronoun-like element exists and on the other hand, a null/non-null correlative pronoun-like element is utilized in the grammar of a head-final covert determiner languages like Japanese. Thus, (16a-b) will have the representations (17a-b) respectively:

(17)

a. [Taro-ga ϕ kat-ta] hon-ga
Taro NOM Null rel pro buy Past book NOM
nusuma-re-ta
be-stolen Past
"A book which Taro bought was stolen."

b. [Taro-ga [ϕ hon-o]
Taro NOM Null rel pro book ACC
kat-ta] no-ga nusuma-re-ta
buy Past Correl NOM be-stolen Past

"A book which Taro bought was stolen."

(17a) is a similar construction as Hindi counterpart (8) in which the overt relative pronoun **jo** appears, repeated here as (18):

(18) [ra:m ne jo xari:di:] vah
Ram ag. rel bought correl
kita:b bahut mahangi: thi:
book very expensive was
"The book which Ram bought was very expensive."

(17b) corresponds to (7a), repeated here as (19):

(19)
[jo mera: bha:i: daftar se der se lauta:] vah
rel my brother office from late returned correl

kal ra:t bilkul nahi: soya:
last night at all not slept

"My brother who returned late from the office did not sleep at all last night."

4. Concluding Remarks

Summing up so far, what we have observed here is that the headed relative structures and correlative structures exist cross linguistically in terms of relativization. Considering the economy of derivation, wherever possible, the principle, "Avoid Pronoun" in Chomsky (1981) is viable in the minimalist program as a more universal principle, "Avoid Overt Element."

Note that the content of the present paper is an outcome of the research program now in progress and will possibly be improved and reformulated in a somewhat different form as the research progresses.

Notes

This chapter is an extensively revised version of "The Copy Theory and Economy of Derivation" in *The Tsuru University Graduate School Review* No. 5, 1-10, 2001.

1. For optimal considerations in physics, see Lemons (1997).

2. For Complexity, Complex Adaptive System, see Morowitz and Singer (1995), Gell-Mann (1994) among others, and for human language and Complex Adaptive System, see Hawkins and Gell-Mann (1992).

3. See Freidin (2001) for a somewhat detailed argument on the Copy

theory. In the current model of MP, the concept of displacement (movement) is subsumed in the operation, **Internal Merge**, and Chomsky argues that the Faculty of Human Language possesses "Merge", and its recursion is a human language trait distinct from other animal communication. Note also that traces are now visible up to Spell-Out. Thus, traces are described as "~~category"~~, which means a copy of the displaced (moved) item, instead of a conventional [e]. Here, we will use [e] for the sake of convenience.

4. It is proposed that traces are a bundle of features, and consequently, empty categories as a whole must be a set of features.

5. By LF, we mean a narrow LF in the MP model, and do not postulate the so-called LF movement (covert movement at LF). For wh-movement dispensed with LF movement, see Aoun and Li (1993a), (1993b), Chomsky (1995), Imai (1994), Li (1992), Ouhalla (1996), Shi (1994), Watanabe (1991), (1992), Yanagida (1995), (2005).

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2 Head Internal Relative Clauses and WH-Q

0. Introduction

The relative clause formation strategy varies from language to language in which we would capture some different similarities and some similar differences. In relativization, it is clear that there exists a relationship between the item in a subordinate clause and another item outside of the subordinate clause no matter how they manifest. Cartographic observation on relative clauses (which I use in a broad sense) identifies what kind of relativization strategy a language may use in terms of the relation between the elements in the matrix and subordinate clauses. There are two major kinds of relative clause constructions in typology. The one is a relative clause which the head noun either precedes or follows and either the gap or resumptive pronoun may appear in the subordinate clause. The other one is a relative clause whose head is inside and the head position is phonetically empty in usual cases. The former type is called the Head

External Relative Clause (HERC), and the latter one, the Head Internal Relative Clause (HIRC). There is yet another type that can be characterized as the Correlatives in which there is a relative pronoun in-situ which relates to its corresponding determiner like element in the matrix clause[1]. We should also pay attention to “aboutness” relative clauses (as van Riemsdijk (2003) called) in which there is no gap nor resunptive pronoun in subordinate clauses. In this paper, we will observe the Japanese HIRC constructions as to what kind of nominals may take as internal heads and examine the islandhood of HIRC in the case of Wh-interrogative involved. The organization of the paper is as follows: In section 1, we will consider the characteristics of HIRC in Japanese; section 2 considers the cases of various numeral phrases as internal heads; section 3 deals with Wh-phrases inside of HIRC. Section 4 concludes the paper.

1. Head Internal Relative Clauses

In recent years, Head Internal Relative Clauses (or Internally Headed Relative Clauses) are extensively attracted attention from the syntactic as well as semantic approaches. Hoshi (1996a, 1996b), Murasugi (1994), Shimoyama (1999), Watanabe (2004), Yoshida and Sano (2001) Imai (2012) among

others argue the function and mechanism of the Head Internal Relative Clauses from different perspectives. Grosu and Ladman (1998) extensively investigate different kinds of relative clauses besides the standard relative clauses. In this paper, we will investigate the peculiar HIRC construction in Japanese from the syntactic approach. Though semantic approach to HIRC should not be ignored, I will not get into semantic consideration here.

In the Head External Relative Clauses (henceforth, HERC), there are two types based on the selection of the head which a language may have in the way of the head initial or head final option. The HIRC construction has a head nominal element inside the relative clause and the head position is overtly or covertly a pronominal-like element. Consider the following structures:

(1) HERC

a. Head $[_{CP}$ X $[_{TP}$ ….. Y …..]]

b. $[_{CP}$ X $[_{TP}$ …. Y ….]] Head

HIRC

c. $[_{CP}$ $[_{TP}$ …. Y-Head ….] Z] X

In (1a-b), X is a relative pronoun and Y is its original position, usually a gap or in some cases, a resumptive pronoun. (1c) is an HIRC structure where Y is a head and X is normally a phonetically empty element. In

addition, there is Z which is an element of nominal marker or scope marker or a similar kind.

The diagnostics of Japanese relativization are shown as in (2):

(2) a. No relative pronoun
b. HERC in which the head noun follows a relative clause
c. Multiple relativization (stacking relative clauses), hence island-free
d. No distinction between restrictive and non-restrictive RCs
e. HIRC

Sentence (3) is an instance of HERC.

(3) Tom-wa [[Mary-ga [e] katte-kita] ringo]-o
Topic Nom buy-come Past apple(s) Acc tabeta.
eat Past
"Tom ate (an) apple(s) that Mary bought and brought home."

Note that [e] stands for the gap, possibly a small pro which corresponds to the head, ringo (apple)[2]. The sentence in (4) is a HIRC version of (3):

(4) Tom-wa [[Mary-ga ringo-o katte-kita] no]-o
Topic Nom apple(s) Acc buy-come Past NO Acc
tabeta.
eat Past
(NO= nominalizer, which we will use the upper case letters for abstract sense.)
"Tom ate (an) apple(s) that Mary bought and brought home."

It sounds more natural when the subject is topicalized in the matrix sentence. Thus, "Tom-ga (Nom)" is quite possible in the sense that Tom is focused. Here, "ringo (apple)" appears in the gap position in sentence (3). The embedded clause is followed by "no" , often analyzed as nominalizer. But the status of this element is problematic and it is homophonous with the Genitive Case marker and a pronominal, to which we will return. Murasugi (2000) and Watanabe (2004) for example consider it as complementizer. This element is in fact [+nominal] feature occupied in the C-head position. It seems superficially that the item is Case-marked as seen in (4), where Accusative Case is marked. It could be somewhat similar to English complementizer "that" since the sentential subject is possible as in (5):

(5) [that John stole something] is obvious.

In (5), Nominative Case is assigned to CP-Head of "that," which is a complementizer.

In the similar account, it is not so impossible to assume that null pronominal, say, a small pro appears after "no" which licenses the noun phrase in the embedded clause as its Head. Let us consider the following structure:

(6) $[_{DP}\ [_{CP}\ [_{TP}$ ….. Head ….] no] *pro*]
+Case

The question arises as to the overt Case which attached to pro, an empty pronominal. The case checking is done when the substantive nominal receives a Case, which is pronounced at PHON[3]. The Case of empty pronominal need not be pronounced at PHON. In Japanese the adjective phrase is followed by "no" to nominalize it as in (7):

(7) akai no
red pronominal =one
"red one"

It is also the case that when emphasized, i.e. focused on the head of HIRC, another "no" appears in the final

position in (6). Consider the structure (8):

(8) $[_{DP}$ $[_{CP}$ $[_{TP}$ ….. Head ….] no] **no**] +Case
[+stress]
focus

Thus, example (4) would become something like (9):

(9) Tom-wa [[Mary-ga ringo-o katte-kita] no]
Topic Nom apple(s) Acc buy-come Past NO
no]-o tabeta.
NOAcc eat Past
"Tom ate (an) APPLE(S) that Mary bought and brought home."

In (9), "no" in D-Head position is a pronominal, in fact it is not so impossible to assume that "no" in D-Head position is overt realization of D, which licenses the noun phrase as head in the embedded clause. Now, let us move on to see how example (4) is derived. The sequence "no no" is presumably reduced to a single occurrence of "no" by the process of haplology, which van Riemsdijk (2003) advocates in the sequence of "wo wo" in Swiss German (more specifically, Züritüütsch) relative clauses. The "wo" is an invariable complementizer in one hand, and it is also functioned

as locative “wo” on the other. When the “wo” is introduced in relative clauses, there is no wh movement and island free. The situation is similar to Japanese relative clauses. That is, “no” in C-Head is a complementizer, and “no” in D-Head is a pronominal and the former is deleted. Then, the structure for (4) is as follows:

(10) [$_{DP}$ [$_{CP}$ [$_{TP}$ ….. Head ….] ~~no~~] **no**] +Case
Haplology applies: *no* + *no* → **no**

Therefore, it is plausible to account for the Case assignment (checking) and the Case overtly appears (in other words, the Case is pronounced) at PHON. Note that the Case checking (Case assignment) is an operation at

What we have so far observed has a couple of consequences in that even though the determiner system such as an English type does not exist in Japanese, nouns are not really bare unlike the proposal of Fukui and Takano (2000), Fukui and Sakai (2003) on nonexistence of DP and consequently other Functional Categories. Yet we have to be careful with reaching a conclusion that Japanese lacks of most of the Functional Categories. As far as we have seen, Japanese nominal phrases seem to be DPs.

2. Numeral Phrases in HIRCs

In this section, we will consider nominal phrases as Head in HIRC. Shimoyama (1999) argues that not all of the nouns occupy the internal head position. There must be some indefiniteness restriction. As illustrated in the following set of examples, proper names and nouns with [+definite] feature cannot be the head in IHRCs[4].

(11)

a. [[Daidokoro-no mado-kara neko-ga haitte kita] no]-ga
kitchen Gen window-from cat Nom came in D Nom
sakana-o totte nigeta
fish Acc steal ran away
"A cat came in from the kitchen window and it stole a fish and ran away." (D= D-head with definite feature)

b. [[Daidokoro-no mado-kara siroi neko-ga haitte kita]
kitchen Gen window-from white cat Nom came in no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away
"A white cat came in from the kitchen window

and it stole a fish and ran away."

c. ?* [[Daidokoro-no mado-kara Lucky-ga haitte kita]
kitchen Gen window-from Lucky Nom came in
no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away

"Lucky came in from the kitchen window and it stole a fish and ran away." (from Shimoyama 1999)

d. ?/??[[Daidokoro-no mado-kara Tom no neko-ga haitte
kitchen Gen window-from Tom's cat Nom came in kita] no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away

"Tom's cat came in from the kitchen window and it stole a fish and ran away."

e. ??[[Daidokoro-no mado-kara neko no Dayan-ga haitte
kitchen Gen window-from cat Gen Dayan Nom came in kita] no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away

"Dayan the cat came in from the kitchen window and it stole a fish and ran away." (Neko (cat) no (Gen) Dayan Appositive)

Shimoyama (1999) mentions that the head in the object position in HIRC soften the restriction of nouns[5]. It seems that proper nouns and definite nouns would be better as compared with the examples in the subject position.

(12)

a. Taro-wa [Hanako-ga ringo-o katte kita] no]-o
Taro Top Hanako Nom apple Acc bought returned D sudeni tabeta
Acc already ate
"Taro has already eaten Fuji that Hanako bought and returned home."

b. ?Taro-wa [Hanako-ga Fuji-o katte kita] no]-o
Taro Top Hanako Nom name Acc bought returned D Acc
of the apples

sudeni tabeta
already ate
"Taro has already eaten Fuji that Hanako bought and returned home."

c. ?Taro-wa [Hanako-ga Tanaka no ringo-o

katte kita]
Taro Top Hanako Nom Tanaka Gen apple Acc bought
no]-o sudeni tabeta
returned D Acc already ate

"Taro has already eaten Tanaka's apples that Hanako bought and returned home."

Let us consider the cases of numeral phrases and partitive and pseudo-partitive constructions.

Following Kobuchi-Philip's (2003), classification of these numeral phrases, we have 6 possibilities.

(13)
a. [[Daidokoro-no mado-kara neko-ga 3 biki haitte kita]
kitchen Gen window-from cat Nom 3 Cl came in
no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away
(Cl= Classifier)
"Three cats came in from the kitchen window and they stole a fish and ran away."

b. [[Daidokoro-no mado-kara neko-ga [3 biki haitte

kitchen Gen window-from cat Nom 3 Cl came in kita]]no]-ga sakana-o totte nigeta
D NOM fish Acc steal ran away
(Cl= Classifier)
"Three cats came in from the kitchen window and they stole a fish and ran away." (Contrastive Focus goes to neko-ga.)

c. [[Daidokoro-no mado-kara 3 biki neko-ga haitte kita] no]-ga
kitchen Gen window-from 3 Cl cat Nom came in D Nom
sakana-o totte nigeta
fish Acc steal ran away (Cl= Classifier)
"Three cats came in from the kitchen window and they stole a fish and ran away." (Focus goes to 3 biki)

d. [[Daidokoro-no mado-kara 3 biki no neko-ga haitte kita]
kitchen Gen window-from 3 Cl Gen cat Nom came in no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away
(Cl= Classifier)
"Three cats came in from the kitchen window and they stole a fish and ran away." (There exist other animals.)

e. [[Daidokoro-no mado-kara neko 3 biki -ga haitte kita]
kitchen Gen window-from cat 3 Cl Nom came in
no]-ga sakana-o totte nigeta
D Nom fish Acc steal ran away
(Cl= Classifier)
"Three of cats (but not other animals) came in from the kitchen window and they stole a fish and ran away."

f. ?*[[Daidokoro-no mado-kara neko-no 3 biki ga
kitchen Gen window-from cat Gen 3 Cl Nom
haitte kita] no]-ga sakana-o totte nigeta
came in D Nom fish Acc steal ran away
(Cl= Classifier)
"Three of the cats came in from the kitchen window and they stole a fish and ran away."

There is not a sharp contrast in these cases, but (13f) sounds worse which is a partitive construction. Notice that a partitive construction has +definite feature.

Shimoyama (1999) concludes that proper nouns (names) become worse because "no" has a definite feature as D , which is a head of the relative clause , and it licenses the head of embedded clause.

Thus, the head of HIRC must be [-definite].

3. Wh-phrases in HIRCs

Let us consider the Wh-phrases as head of HIRC.

(14)
a. [[Daidokoro-no mado-kara neko-ga nan biki haitte
kitchen Gen window-from cat Nom what Cl came
kita] no]-ga sakana-o totte nigeta no (ka)?
in D Nom fish Acc steal ran away Q
(Cl= Classifier)

"How many cats came in from the kitchen window and they stole a fish and ran away?"

b. [[Daidokoro-no mado-kara neko-ga [nan biki haitte
kitchen Gen window-from c at Nom what Cl came kita]]no]-ga sakana-o totte nigeta no (ka)?
in D Nom fish Acc steal ran away Q
(Cl= Classifier)
"How many cats came in from the kitchen window and they stole a fish and ran away?"

c. [[Daidokoro-no mado-kara nan biki neko-ga haitte kita]
kitchen Gen window-from what Cl cat Nom came in no]-ga sakana-o totte nigeta no (ka)?
D Nom fish Acc steal ran away Q
(Cl= Classifier)
"How many cats came in from the kitchen window and they stole a fish and ran away?"

d. [[Daidokoro-no mado-kara nan biki no neko-ga haitte
kitchen Gen window-from what Cl Gen cat Nom
kita] no]-ga sakana-o totte nigeta no (ka)?
came in D Nom f ish Acc steal ran away Q
(Cl= Classifier)
"How many cats came in from the kitchen window and they stole a fish and ran away?" (There exist other animals.)

e. [[Daidokoro-no mado-kara neko nan biki -ga haitte kita]
kitchen Gen window-from cat what Cl Nom came
no]-ga sakana-o totte nigeta no (ka)

in D Nom fish Acc steal ran away Q
(Cl= Classifier)
"How many of cats (but not other animals) came in from the kitchen window and they stole a fish and ran away?"

f. ?[[Daidokoro-no mado-kara neko-no nan biki ga
kitchen Gen window-from cat Gen what Cl Nom haitte kita] no]-ga sakana-o totte nigeta no (ka)?
came in D Nom fish Acc steal ran away Q
(Cl= Classifier)
"How many of the cats came in from the kitchen window and they stole a fish and ran away?"

All the examples seem to be fine, vaying degree of acceptability though. As is predicted in section 3, "no," D licenses the head of embedded clause as [-definite], since Wh must be [-definite], hence indefinite.

4. Concluding Remarks

Here are the points that we have so far observed.
1. HIRC has a pronominal element as D. This would be an overt realization of D.
2. Japanese has an impoverished DP but in a different

system from languages as English.

3. Since the pronominal “no” in D has a [+definite] feature and it licenses the head noun in the embedded clause, the head should be [-definite], i.e. indefinite.
4. The partitive construction has a [+definite] feature, which conflicts with the pronominal “no” in D.
5. For further problem to be solved: It is not confirmed that DP is a Phase. Chomsky (2004) considers vP and CP are Phases, but DP may not be. It might be the case that DP would be a weak Phase, which we will observe in the future research.

Notes

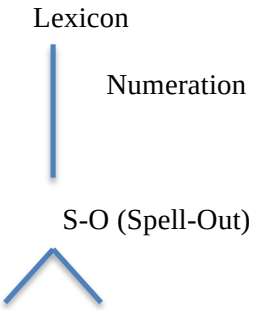
This chapter is a revised version of “Head Internal Relative Clauses and WH-Q,” in *Tsuru University Graduate School*, No. 17, 35-45, 2013. An earlier version of this paper was written while I was on sabbatical and affiliated as a visiting scholar with Universiteit van Tilburg, the Netherlands in 2003-04. Many thanks go to Henk van Riemsdijk, Hans Broekhuis and Laszlo Molnarfi for valuable comments. Remaining errors are mine.

1. Many languages take a relative-corelative option. Take Hindi for example. See Imai (1991).

2. No subjacency effect is observed in HIRCs in Japanese. Thus,

displacement is not likely to be involved in HIRCs.

3. The minimalist model is illustrated as follows:



(Sensori-motor System) (Intensional-Conceptual System)
Cf. Chomsky (1995) among others.

4. Definiteness effects can distinguish the definite nominals from indefinite ones even in languages without determiners like Japaense. See Imai (1996).

5. This could imply the fact that there is an asymmetry of Subject and Object, similar to the extraction asymmetry of Wh from the Subject position and Wh from the Object position.

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3 Some Thoughts on the Biolinguistic Program

0. Introduction

The nature of human language has profoundly been investigated since the advent of generative tradition by Noam Chomsky in 1950's. The linguistic research program initially called Generative Grammar, as Chomsky claims that linguistics is part of (human) biology in 1960's, has been well developed to be a super interdisciplinary field of sciences now called biolinguistics.

We will consider some issues here on the Faculty of Language (FL) in biolinguistics. We will observe what FL is and its relation to the outside of human brain in section 1. Then, we will argue in section 2 that there exists a unique operation, Merge which has three sub-operations in FL. We will observe what was proposed in Imai (2000). In section 3, we will propose that tree diagrams are not really flat 2D, but 3D along the line of Klosek (2011) to account for language diversity, which seems to be superficial.

Rather, languages in the world are trivially uniform in FLN (Faculty of Language in Narrow Sense). Section 4 concludes the present chapter.

1. Biolinguistics: Linguistics as Natural Science

Chomsky asserts that linguistics is part of (human) biology[1]. Thus, FL constitutes an organic system in the brain neural cells. Since we understand that FL is biologically endowed, linguistic operations and expressions involved in syntactic, semantic and phonological processes among others would be similar or paralleled to other biological processes in human body.

Interdisciplinary approach to FL may reveal some unexpected outcomes as the discovery of spiral structures of DNA by biologist Watson and physicist Click in 1950's showed us an excellent example. The same thing is said for the Science of Language. There exist many questions and mysteries to be solved as to the origin and evolution of human language. Without cooperation with various fields of biology it is impossible for biolinguists to find answers to those questions and mysteries.

The ancestors of Homo Sapiens emerged in Africa some 2 million years ago, then according to Chomsky (2012a), probably some 60,000 years ago language was there though a complex symbolic system

was there before 60,000---100,000 years ago. In the course of human evolution, the Faculty of Language was acquired in the sense of the Great Leap Forward, but not of gradual acquisition by Darwinian natural selection. At the time of FL acquisition, that language was uniquely one is obvious, let's call, the protolanguage. Then, a question arises. Why didn't language remain unique but rather it has proliferated in diversity? In the process of evolution and development (evo-devo), variations occurred across languages such as word order and speech sounds. Notice however that these variations would be found at Sensory-motor systems, just in the outside of human brain/mind, i.e. the Faculty of Language in Narrow Sense (FLN)[2]. The investigation of FLN would shed light on the nature of human language, i.e. I-Language.

In the Biolinguistic Minimalist Program (BMP)[3], the goals of the linguistic theory would be eventually the goals of the scientific inquiry, which constitute the investigation of optimal solutions to the organic systems. It is attested that the operations may produce maximal outcomes with the minimal effort conforming to the economy principle[4]. The system exists of any form consisting of various contents independently. These contents self-organize at the point when the system itself activates. The self

organization of the subsystems may form the higher and larger system.

Taking the biological foundation of language faculty in human beings for granted, the faculty of language (FL) constitutes part of the organic system in the brain neural cells. Assuming FL is biologically endowed, linguistic operations involved in syntactic, semantic, phonological processes among others would be similar to or parallel to other biological processes in human body.

Brown (1999) reports that Chinque and his research group investigated the biological characteristics of language faculty in such instances as word order, position of adverbs among others, which are invariant across languages in the result of word orders in languages.

The importance of considering natural scientific approaches to linguistics is crucial for the sake of the advancement of the linguistic science[5]. Uriagereka (1998) mentions that the mobile model of Kayne's (1994) antisymmetry. This implies the linguistic structure (syntactic, semantic and phonological ones) is three-dimensional. Baker (2001) also suggests that tree diagrams be three-dimensional. Klosek (2011) explicitly argues that by representing syntactic structure three-dimensionally, it will be possible to eliminate much of the complexity inherent in two-dimensional syntactic structures, and proposes

the potential for universal syntactic representation of synonymous propositions expressed in any language. The observation that the syntactic structure is three-dimensional seems to be quite on the right track since as Klosek argues, we live in the three dimensional world, and our brain is part of the same world. Unifying the preceding work by those linguists, we will propose that the linguistic structure could be explained if we set the basic unit as a three dimensional structure in which the head X is always in the z-axis in the sense of the conventional mathematical axes of x, y, and z. It is posited that fixing the viewpoint angle is parametrized. By fixing the viewpoint angle, the particular word order for a language is trivially derived. We will return to this in detail in section 3. We have important consequences in that the uniqueness of the default structure could be attributed to the left-handedness of the solar system[6]. The left-handedness could be a clue to explain why most of the movement operations are leftward and very few are rightward in classical generative grammar. This coincides that linguistic processing takes place from left to right, and is closely linked with the mental computation. The findings in physics and biology in a broad sense may well be useful for explanation in linguistics.

Note also that chemical structures, again three-dimensional ones, could be a good model for

associating linguistic structures. It follows that if the language processing in the brain is a case of molecular reaction at the cellular network in the brain, it is not so unnatural to assume that the linguistic structures could be somewhat similar to chemical structures. This could be important as to merging of categories and possibly the origin of word order variations.

2. Merger and Acquisition (M&A)

In this section, we will observe the unique operation in FL, *Merge* and its application for how categories created by Merge get a label. Note that labels are relevant only at interface, assuming bare phrase structures in FLN (Chomsky 1995, Boeckx 2008).

FL would operate with the economy and optimal principles, then, operation *Merge* enters into the computational system, C_{HL}. Imai (2000) argues that as is assumed by Chomsky, the most fundamental operation for language processing in broad language systems is the operation, *Merge*, which selects two syntactic objects ( ) and form K ( ) from them. Imai (2000) proposes that the relationship between the two elected objects (a merger and a mergee) can be specified as in (1):

(1) a. Suppose A is a merger and B is an mergee, then, A merges with B resulting in C in such a way that B is included in A. In this case, B is part of A retaining some characteristics of B. Hence, C is merger-oriented.
→ {C {A, B}}, C=A.

b. Suppose A is a merger and B is a mergee then, A merges with B resulting in C in such a way that A is included in B. in this case, A is a part of B retaining some characteristics of A. hence, C is mergee-oriented.
→ {C {A, B}},C=B

c. Suppose A is a merger and B is a mergee, then A merges with B resulting in C in such a way that A and B are indistinctly amalgamated. In this case, C is an entirely new entity consisting of A and B.
→ {C {A, B}}, C = (A, B).

d. Suppose A is a merger and B is a mergee, then, A merges with B resulting in C in such a way that A is not included in B and B is not included in A, either. In this case, C is neutral.
→ {C {A, B}}, C = Not (A, B).

The four types of *Merge* can be defined in terms of Acquisition.

(2) i. A acquires B and becomes C. (We call it the Progressive Merge.)

ii. B acquires A and becomes C. (We call it he Regressive Merge.)

iii. A and B acquire each other. The autonomy of each disappears. (We call it the Amalgamated Merge.)

iv. A does not acquire B and conversely B does not acquire A. The autonomy of each is respected. In other words, A and B are adjacent each other. (We call it the Neutralized Merge.)

The proposal mentioned above is a gist of Imai (2000).

It follows that the Operation, *Merge* is a universal operation with options mentioned above depending on a language to which the choice of items might be attributed. The consequence with (2) 1-2 is that we no longer need the head parameter any more.

Rizzi (2012) referring to Chomsky (2012), argues labeling of the category created by Merge. Chomsky (2012) argues how categories created by Merge get a label by postulating the labeling algorithm as follows:

(3) The Labeling Algorithm:

The category created by Merge inherits the label of the closest head.

(4) Nodes must have a label to be properly interpreted: the interpretive systems must know what kind of object they are interpreting.

(4) is different from the previous model in which labeling was thought to be prerequisite for further applications of Merge. The new view makes Merge apply to unlabeled structures. Labeling is necessary only at interface.

We have three cases to be considered as to Merge:

(5) a. Head - Head Merge
b. Head - Phrase Merge
c. Phrase - Phrase Merge

Rizzi defines the closeness of a head in terms of c-command as follows:

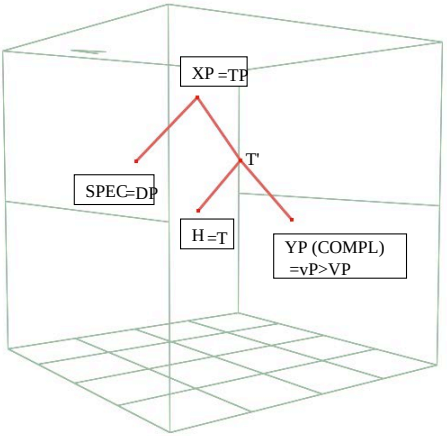
(6) H_1 is the closest head to α iff
i. α contains H_1, and
ii. there is no H_2 such that
i. α c-commands H_2 and
ii. H_2 c-commands H_1.

We apply (2iii) for (5a) to account for the root and functional category. (2i-ii) account for (5b), which is subject to a natural language. We apply (2iv) for (5c) to form an unlabeled structure. As (2iii) is mysterious and somewhat complicated, we will put it aside here.

3. Three Dimensional Diagrams

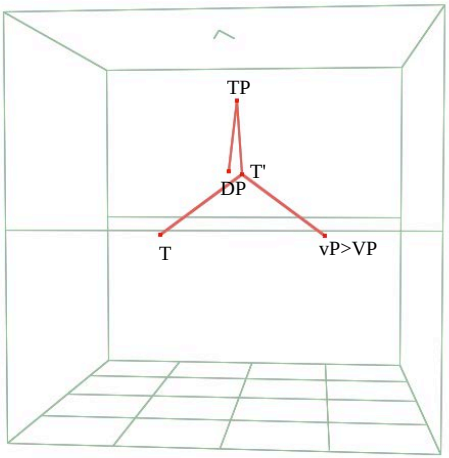
When it comes to syntactic structures, we will deal with 3D structures rather than 2D ones, since we live in 3D world and process to interpret the world three dimensionally following Uriagereka (1998), Baker (2001), Closek (2011) among others. We will propose the 3D tree diagrams at the level of Narrow Syntax. The syntactic structure is unspecified, but built by Merge. One cannot observe a firm structure until Spell-Out, but only can see the determined structure (i.e. word ordering) at SEM in a particular language, because one cannot pronounce words in a sentence simultaneously. This could be associated to Schrödinger's cat in Quantum Physics. We have six cases consisting of Subject, Object and Verb in terms of word ordering. Let us observe the following six cases of the outcome.

(7) a. SVO[8]



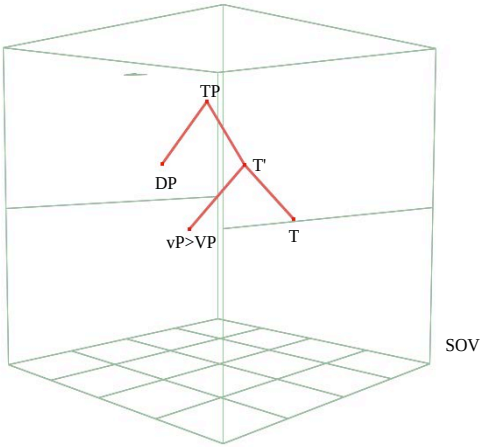
SVO

b. VSO

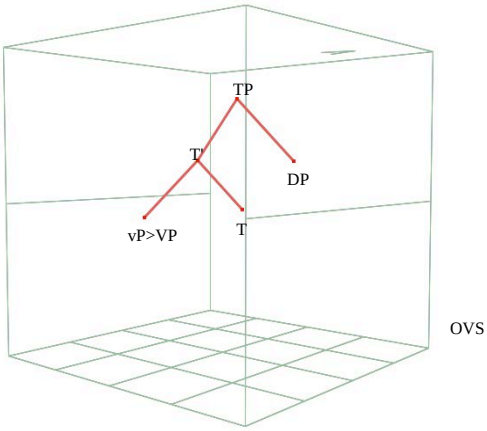


VSO

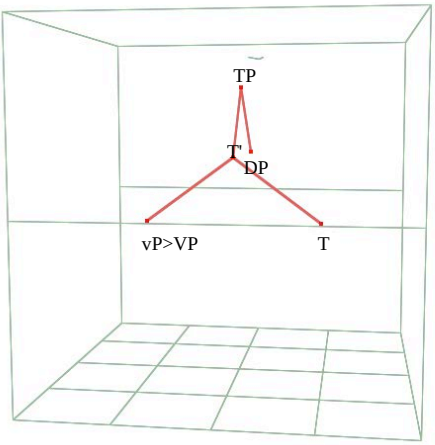
c. SOV



d. OVS



e. OSV



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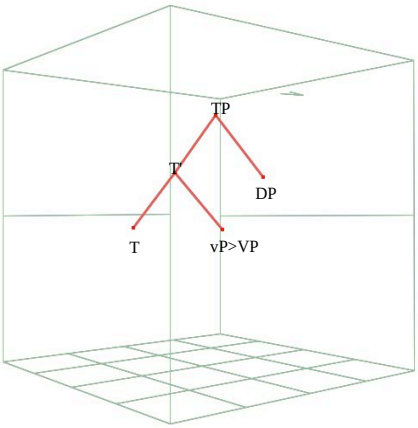
f. VOS



VOS

Up to the point of interface, the syntactic structure is underspecified, not determined. To rotate the viewpoint, we can fix the viewpoint to generate the syntactic structure of a specific language at the interface.

4. Concluding Remarks

What we have observed so far is that we stress the importance of correlation between linguistics and natural science. The concept of *Merge* is defined in the Merger and Mergee relation and three types of *Merge* are articulated in association with M&A. The 3 D trees are proposed to describe syntactic structures in FLN.

Notes

This chapter is a revised version of "Some Thoughts on the Biolinguistic Program," in *Tsuru Studies in English Linguistics and Literature*, No. 41, 1-12, 2013.

1. In the early generative grammar model, Chomsky asserted that linguistics is a subfield of cognitive psychology. In 1960's, Chomsky said that linguistics is part of human biology, influenced by Lenneberg. See Lenneberg (1968) in which "biolinguistics" was first mentioned.

2. FLN is restricted to human language, while the Faculty of Language in Broad Sense (FLB) includes communication in other species. See Hauser, Chomsky and Fitch (2002).

3. The BMP is an extension of the Minimalist Program, thus, it is a core of syntax.

4. See Lemons (1997) for further details.

5. See Fukui (2012) for arguing for the importance of grasping linguistics as natural science. Kuroda's article originally appeared in *Sophia Linguistica* in 2008 as an appendix to Fukui (2012) argues that mathematics is a useful tool for exploring mysteries of generative grammar (biolinguistics).

6. Gunter Blobel, a cellular and molecular biologist, won the 1999 Nobel Prize in medicine for discovering that proteins carry certain signals that may act as ZIP codes, assisting them find to move to their correct locations within the cell. See Heemel (1999). This resembles the Operation *Agree* under matching, which is a relation that holds a Probe P and a Goal G in MP. See Chomsky (1998b) for further details.

7. See Monroe, Meekhof, King, and Wineland (1996) for details.

8. For the sake of convenience, I use the conventional X-bar labeling, though bare phrase structures are assumed following Chomsky.

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4 Is A Graft the Third Kind of Merge?

0. Introduction

In a shift from the Minimalist Program (Chomsky 1995) to biolinguistics inspired by Jenkins (2000) and a seminal work by Hauser, Chomsky and Fitch (2002), and a series of much recent work by Chomsky (Cf. 2007a, 2007b, 2007c, 2010), Berwick and Chomsky (2011), much attention has been paid to the origin, evolution and development of the Faculty of Language in Narrow Sense (FLN) (Hauser, Chomsky and Fitch 2002). A research program of the Minimalist Program is now a subfield of biolinguistics as is termed the Biolinguistic Minimalism (BM) by Narita and Fujita (2010) to seek optimality and perfection in the linguistic system. In the BM, the Faculty of Language (UG) consists of only two operations, i.e. Merge and Recursion (with principles and parameters), which would be unique to human species. Linguistic structures are constructed by the recursive application of Merge, therefore, it is not really impossible to posit that ultimately there is a sole operation: (Recursive) Merge in the Faculty of (Human) Language.

In this chapter, we will consider the operation: Merge, which constitutes the External Merge and the Internal Merge, and argue that there exists the third kind of Merge making use of the Internal and External Merge called Graft advocated by Riemsdijk (1998, 2000, 2001, 2004, 2006). Then, we will concern with Head Internal Relative Clauses (HIRC) and argue that HIRCs turn out to be Grafts by observing HIRCs in Japanese in terms of the Graft analysis.

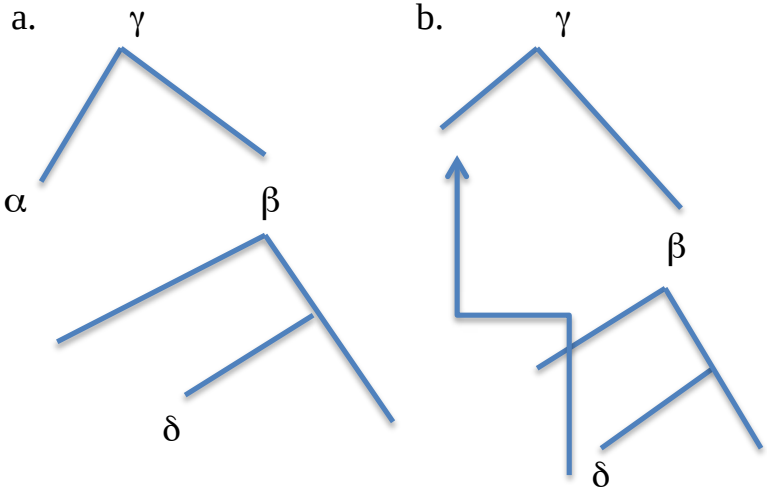
1. Grafts

Let us first overview the idea of Grafts.

Riemsdijk (2006) argues that the existence of Grafts follows directly from the two types of Merge, internal and external, as postulated in Chomsky (2000a,b,2004a,b, 2005). (Recursive) Merge is an outstanding property of the Faculty of Human Language.[1] The operation: Merge takes two elements, let us call them α and β, and combines them together. This manipulation is what Chomsky calls External Merge. Suppose that α is determined to be a Head, then, we have {α {α, β }}, a projection of α. On the other hand, if we take β to be a Head, then, we get {β {α, β }}, a projection of β. Note that the head initial vs. head final in word order follow from the choice of either α or β as a Head.[2] Merge recursively applies to

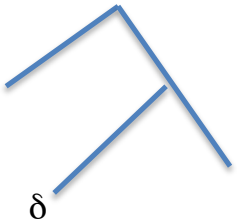
any two elements to form a larger unit. Another type of Merge would take an element in a syntactic tree formed by the previous Merge and a new element, and put them together. This is an instance of Internal Merge, whose operation constitutes displacement. The difference between Internal Merge and External Merge will be illustrated in (1).

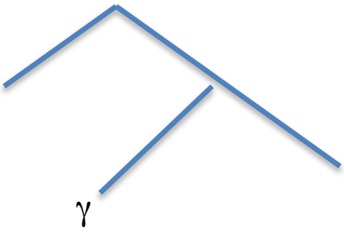
(1) a. b.



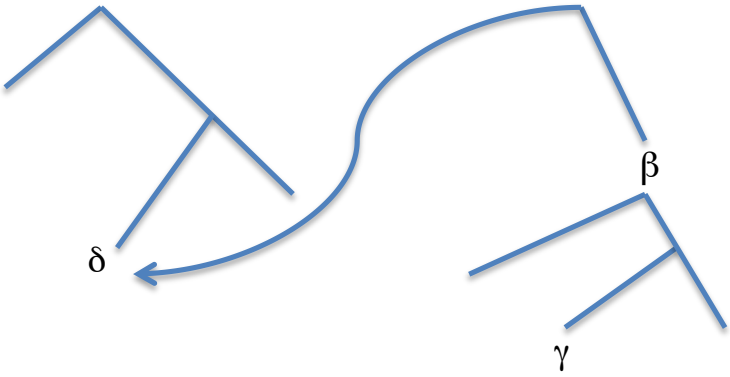
(1a) is an example of External Merge while (1b), an instance of Internal Merge. Let us now consider the following trees:

(2) a-i. α a-ii. β





b. α ε



Take δ and ε and put them together by Merge in (2a). As a result, we have (2b), which is what Riemsdijk calls a Graft. δ is the shared element in the tree ε. It is dominated by ε and is a sister of β. At the same time, δ maintains the structural relations it had in its own tree α. The operation as illustrated above is called Graft which possesses a dual nature of External Merge as well as Internal Merge.[3]

2. On the Graft Theory and the Head Internal Relative Clauses

In the previous section, we have considered the basic idea of Grafts. Here, we will consider Japanese relative clauses.

Let us first assume that Japanese relative clauses are TPs not CPs, then, it is a consequence of a matter of phases. In English RCs, CP follows the Head (the antecedent), then, CP is a phase and only the edge of CP is available for further operations. RC in Japanese, however, is best analyzed as TP following the head in numbers of reasons such as no overt wh pronouns, thus, no island violation such as a classical subjacency condition. The argument that the relative clauses in Japanese are TPs not CPs is taken up in the literature such as Kuroda (2005a,b), Murasugi (1994, 2000a, 2000b), and note also that structurally similar relative clauses in Korean are TPs not CPs argued in Jo (2002). Thus, we could say that relativization in natural languages is (minimally) parameterized in such a way that the head selects either CP or TP as its complement in relative clauses.

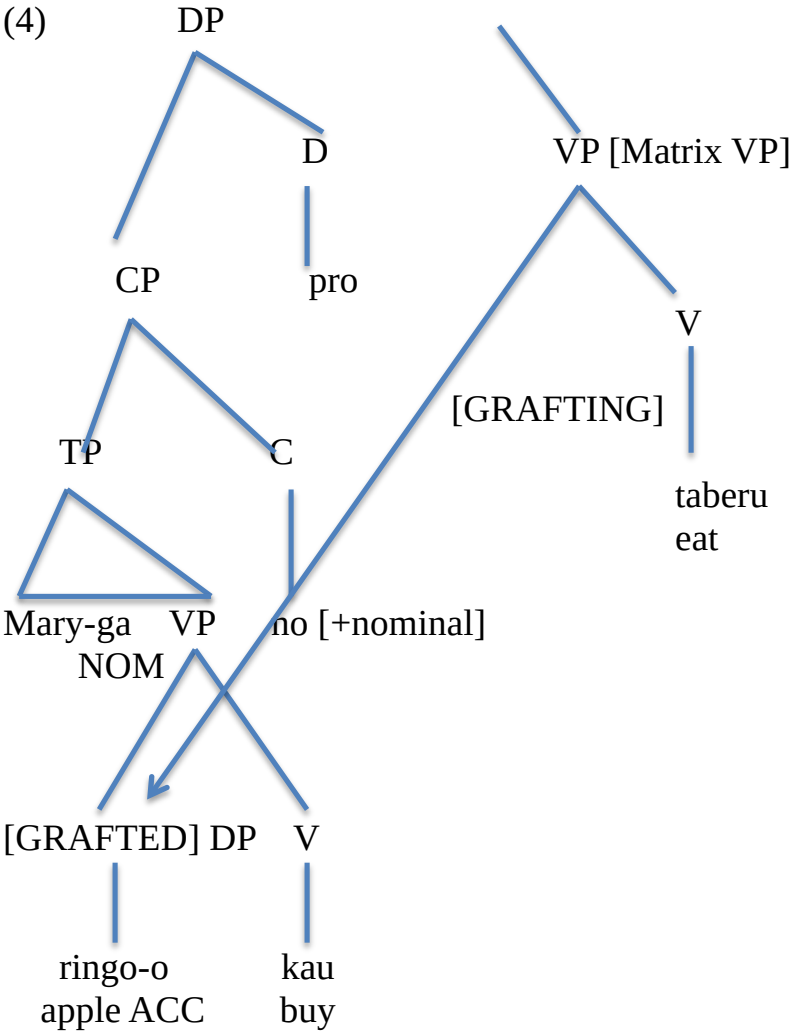
Noun Phrases in Japanese are problematic in some respects. It is proposed that Japanese lacks of the overt determiner system, thus, nominal projection may not include D^4. Note that NP in Japanese has an overt

Case marker, hence, it is proposed that a Functional Category, K whose maximal projection is KP. In other proposal, Japanese indeed has DP where Case is assigned to D of DP. We will not get into this argument here.
Let us consider the following example:

(3) Tom-ga [Mary-ga ringo-o katta] no]-o
Nom Nom apple Acc buy+Past NO Acc
tabeta
eat+Past

This sentence is a typical head internal relative clause (HIRC), which is one option for relativization in Japanese. The HIRC can be observed across languages widely.[5] Note that the unmarked option in Japanese is the instance of the Head External and Head Final relative clauses. However, HIRC is frequently used in both colloquial as well as written Japanese. Suppose that Japanese has DP and CP just like English, we will have a structure as in (4) for sentence (3).

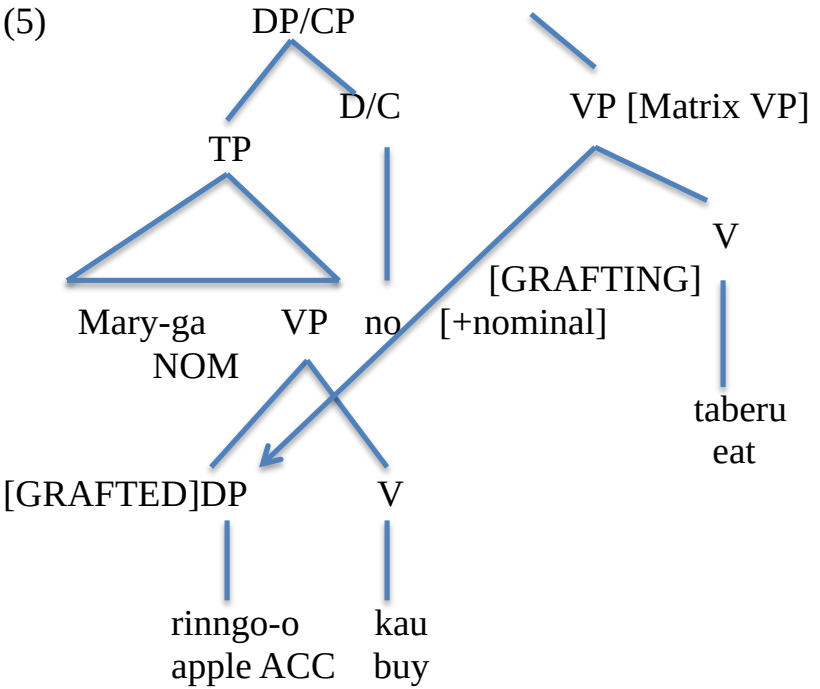
(4)



If we take a position of the proposal that Japanese relative clauses are TPs not CPs, and there are DPs, then, we will get the following Grafted tree. Note that

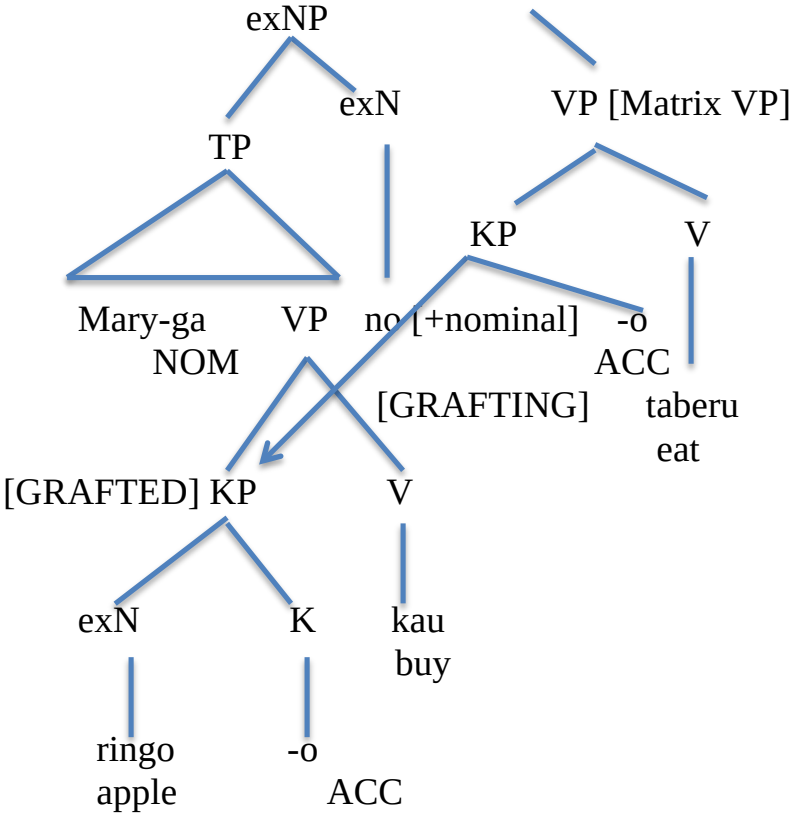
tree (5) follows from the idea discussed in Chapter 2 that haplology superimposes one projection on the other one.

(5)



Suppose that Japanese does not have DPs, but has a Functional category of KP, i.e. Case Phrase, which is overtly pronounced. Furthermore, noun phases are assumed to be extended NPs in Japanese,[6] we will have (6).

(6)



(exN, exNP= extended N, NP; K=case)

At this point, it is hard to determine which analysis is tenable for nominal expressions in Japanese, thus, we will leave open for a further discussion. We can only say that HIRC structures in Japanese can be explained

by Graft. So is assumed in other languages with HIRCs.

It is proposed that the Grafting structure is created in one dimension, while a structure including the Grafted category is created in another dimension. In other words, we can say that linguistic trees in mental computation are three-dimensional advocated by Riemsdijk. Note that Chomsky (2004a) in *the Generative Enterprise Revisited* posits that there are three-dimensional trees. Baker (2001), and recently Klosek (2011) also pursue the idea of tree-dimensional trees[7], for which we have supported in Chapter 3.

3. Concluding Remarks

What we have so far observed is that the peculiar structure of Head Internal Relative Clauses can be analyzed by Grafts advocated by Riemsdijk. Even though HIRCs look complicated structures, they can be constructed by making use of the operation: Merge. We have so far three kinds of operations of Merge, which are External Merge, Internal Merge and Graft (a dual nature of Internal and External Merge). By observing HIRCs in Japanese, we reached the conclusion that the rules of the Faculty of Language are so simple, but they manifest rich variations in human languages. We hope that we will find some clues in the mystery of nature, origins and evolution of

human language unique to human species in the biolinguistic program.

Notes

1. See Hauser, Chomsky and Fitch (2002).

2. The consequence of this fact leads us to dispensing with the head parameter, thought to determine the order of the head in languages. There are two kinds of languages, either head initial or head final languages.

3. Vries (2005) and Citko (2005) independently propose similar accounts as Riemsdijk's Graft. The former proposes interaboreal movement and multidominance, which Vries accounts for unifying two as External Remerge, and the latter advocates parallel Merge, combining the properties of External Merge and Internal Merge.

4. See Fukui and Takano (2000), Fukui and Sakai (2003), and Fukui (2006) on this view on non-DP in Japanese.

5. Head Internal Relative Clauses are observed in a wide variety of languages across different language families; Old and Modern Japanese, Korean, Tongus languages in the Atlantic family such as Udihe, Tibeto- Burman languages such as Meithei, Tenyidie, Austronesian languages such as Riau Indonesian, Tukang Besi, etc. (Hiraiwa 2003). See also Aldridge (2002, 2003), Grousu and Landman (1998), , Jo (2002), Keenan and Comrie (1977), Kim (2005). See Imai (2012), Kuroda (1992a,b), 2005a,b), Shimoyama (1999), Yoshida and Sano (2001), Watanabe (2004) for the HIRC in Japanese.

6. Treatment of Case is problematic in any model in the past generative grammar in that at which level of representation the Case is assigned. In a widely accepted view, the case assignment is executed

at S-structure in the Principles-and-Parameters model. In the Minimalist Program, Case is assumed to be assigns at Spell-Out.

7. Baker (2001) argues that concerning with the three-dimensional trees, tree diagrams are really Alexander Calder mobiles, with the lines made of strong wire and words made out of metal sheets. (p.76). If we paraphrase Baker's metaphor, it is realized that all languages have exactly the same design. The difference among languages is that every node swirls around in one language version relative to its position in another language sentence. Klosek (2011) proposes a radical view on three-dimensional tree diagrams. Klosek argues that by representing syntactic structures three-dimensionally, it will be possible to dispense with all movements, reduce complexity and make universal syntactic representation possible in languages. See Chapter 3.

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