The Linear Correspondence Axiom and Generalized Ordering*

Keeseok Cho

(Hankuk University of Foreign Studies)

Cho, Keeseok. 2003. The Linear Correspondence Axiom and Generalized Ordering. *The Linguistic Association of Korea Journal, 11*(1), 159-190. This article carries out four tasks. One is to discuss the Linear correspondence Axiom (LCA) and point out its problems on the basis of the empirical application to Korean and English data. It will be shown that the LCA is problematic in three significant respects. Second, syntactic processes will be classified into substitution and adjunction operations, and the order of precedence between syntactic objects will be specified. Third, Generalized Ordering, which feeds on computationally relevant parameter values, will be offered as an alternative solution for word order. **(Hankuk University of Foreign Studies)**

Key Words: Linear Correspondence Axiom, Word order, Generalized Ordering

1. Introduction

The standard minimalist assumption with regard to word order is that there is no notion of order in the course of the syntactic derivation. In other words, the computational system proceeds in order-irrelevant ways so that ordering devices such as the Linear Correspondence Axiom (LCA) should apply to the output of the syntactic component to assign a linear order to syntactic objects.

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* This article is based on chapters Ⅱ, Ⅳ, and Ⅴ of my dissertation. I would like to thank two anonymous reviewers for their insightful comments and critiques.

The goal of this article is to point out the problems of the LCA on the basis of the empirical application to English and Korean data and offer an alternative solution. The LCA which is central to Kayne (1994) associates asymmetric c-command relations (ACC) and a linear ordering of terminal elements in such a way that the former imposes the latter. We will challenge this mechanism that takes the order of precedence between lexical items to be a reflex of the hierarchical structure.

The article is organized as follows: section 2 discusses the empirical problems of the LCA. Section 3 specifies the order of precedence between syntactic objects. Section 4 shows how the particular choice of the computationally relevant parameter values enters into fixing the word order of English. Section 5 draws conclusions.

2. Application of the LCA

2.1. Head-Complement and Head-Adjunct Structures

The LCA defines the order of precedence between lexical items (words) in terms of asymmetric c-command between the categorial projections of the lexical items. If a categorial projection (either a head X or a max XP) that dominates a lexical item α asymmetrically c-commands at least one categorial projection that dominates a lexical item β, and if no category that dominates α is asymmetrically c-commanded by any category that dominates β, then α precedes β.[1)]

(1) Linear Correspondence Axiom
d(A) is a linear ordering of T
(Kayne 1994: 6)

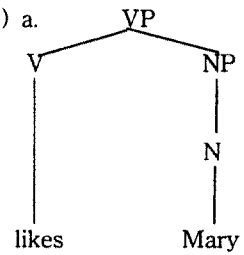
Let us state how the LCA operates more formally. According to Kayne (1994), the mechanism of the LCA is as follows. For a given phrase

1) X asymmetrically c-commands Y if and only if X c-commands Y and Y does not c-command X.

marker P, T is the set of the terminal elements. A is the maximal set of pairs of nonterminals such that the first asymmetrically c-commands the second. d is the nonterminal-to-terminal dominance relations: for a given nonterminal X, d(X) is the set of terminals that X dominates, and for a given pair of nonterminal <X, Y>, d<X, Y> is the set of the ordered pairs {<a, b>} such that a is a member of d(X) and b is a member of d(Y).

The order defined by the LCA is a linear order that is subject to transitivity, totality, and antisymmetry. Transitivity implies that if α precedes β, and β precedes γ, then it follows that α precedes γ(the reverse holds true); totality implies that every word has an order relation with every other word; and antisymmetry implies that two words cannot have identical order relations towards each other (e.g., α precedes β, and at the same time β precedes α). To see how the LCA works in practice let us begin with the head-complement and head-adjunct structures in English:

(2) a.



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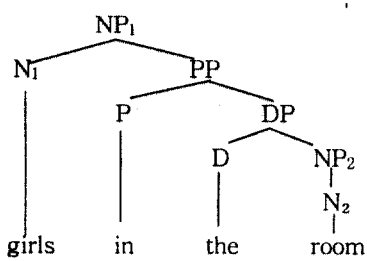


In Kayne's LCA only nonterminal elements such as a head X or a max XP can enter into c-command relation, which holds under the following conditions:

(3) X c-commands Y iff every category (regardless of branching or not) that dominates X dominates Y and X excludes Y in the sense that no segment of X dominates Y.

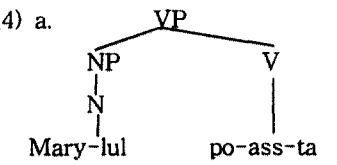
In the head-complement structure (2a), V asymmetrically c-commands N, so that the pair <V, N> constitutes the set *A* (of pairs such that the first nonterminal asymmetrically c-commands the second). This pair constitutes a linear ordering of the set of the terminal elements {likes, Mary}.

Similarly in the head-adjunct structure (2b), D asymmetrically c-commands N_2; P asymmetrically c-commands D, NP_2, and N_2; and N_1 asymmetrically c-commands P, DP, D, NP_2, and N_2. Therefore, the set A consists of <D, N_2>, <P, D>, <P, NP_2>, <P, N_2>, <N_1, P>, <N_1, DP>, <N_1, D>, <N_1, NP_2>, and <N_1, N_2> These pairs constitute a linear ordering of the set {*girls, in, the, room*}: <*the, room*>, <*in, the*>, <*in, room*>, <*girls, in*>, <*girls, the*>, and <*girls, room*>. In both (2a) and (2b) transitivity, totality, and antisymmetry are respected. In head-initial structures such as the head-complement and the head-adjunct the LCA derives the correct order of precedence.

2.2. Complement-Head and Adjunct-Head Structures

We will turn to head-final structures as in Korean. Let us consider the following complement-head and adjunct-head structures:

(4) a.



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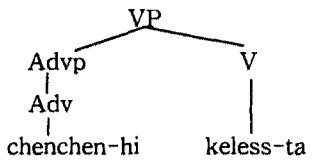


In the complement-head structure (4a), the set A consists of <V, N>, which constitutes a linear ordering of <*po-ass-ta, Mary-lul*>. In the adjunct-head (4b), the set A consists of <V, Adv>, which constitutes a linear ordering of <*keless-ta, chenchen-hi*>. In both (4a) and (4b) the LCA does not specify the correct order of precedence between the

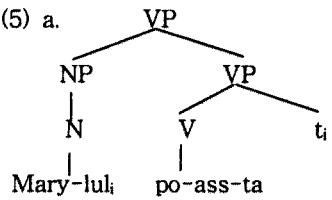
terminal elements. In (4a) it is not that *po-ass-ta* precedes *Mary-lul* but that *Mary-lul* precedes *po-ass-ta*. Likewise in (4b) *keless-ta* does not precede *chenchen-hi*. On the contrary *chenchen-hi* precedes *keless-ta*.

The reason why the LCA does not work in (4a) and (4b) is that in the head-final structures ACC is not matched to precedence relation but to subsequence relation.[2)]

The assumption that head-final structures are underlyingly head-initial but they appear head-final because the complement and the adjunct that follow the head undergo obligatory leftward raising across the head can be a solution for the inapplicability of the LCA in the head-final structures.

Suppose that the head-final structures are underlyingly head-initial but they appear head-final because the complement and the adjunct undergo leftward raising:

(5) a.



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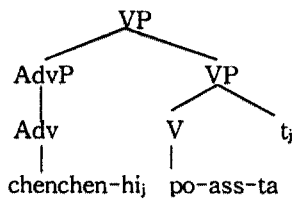

This LCA particular stipulation, however, allows the other way round stipulation: head-intial structures are underlyingly head-final but they appear head-initial because the complement and the adjunct undergo rightward raising:

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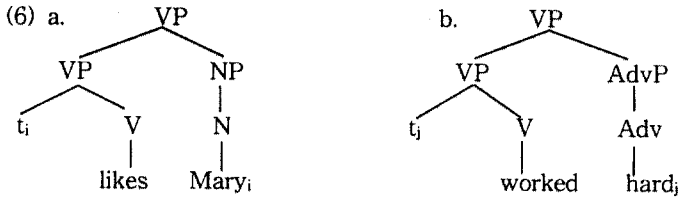
2) A word α stands in a precedence relation to a word β which it precedes, and stands in a subsequence relation to a word γ which it follows.



In addition, this solution implies that every language is head-initial (underlyingly SVO) and that head movement is always leftward.[3] This may be too strong a stipulation to accept.[4] Rather, we should modify the LCA such that can satisfactorily explain both head-final as well as head-initial structures: ACC derives precedence relation in the head-initial structures and derives subsequence relation in the head-final structures. Whichever solution we opt for, we have to admit that ACC can be mapped to linear precedence only in the head-initial structures.

2.3. A Head-Complement-Adjunct Structure

In the head-complement and head-adjunct structures the LCA was able to define the order of precedence between the head and complement and between the head and adjunct without structural implausibility. However, if the application of the LCA extends to complex structures such as the head-complement-adjunct and head-multiple adjuncts, the LCA cannot work without postulating a structurally implausible structure. Let us first consider the head-complement-adjunct structure:

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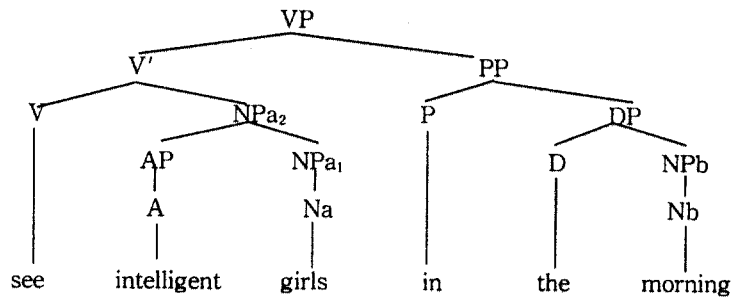
3) A head undergoes leftward raising in the head-initial structure and undergoes rightward raising in the head-final structure. So the stipulation that every language is head-initial implies that there is no rightward head movement.

5) Under the other way round stipulation, every language is head-final (underlyingly SOV) and head movement is always rightward. Neither stipulation has independent justification apart from the LCA.

(7)



In (7) the terminal elements dominated by V' (*see*, *intelligent*, and *girls*) are correctly ordered with respect to one another by virtue of the set *A* that comprises <V, AP>, <V, A>, <V, NPa_1>, <V, [NPa_1, NPa_2]>, <V, Na>, and <AP, Na>; and so are the terminal elements dominated by PP (*in*, *the*, and *morning*) by virtue of the set *A* that comprises <P, D>, <P, NPb>, <P, Nb>, and <D, Nb>.

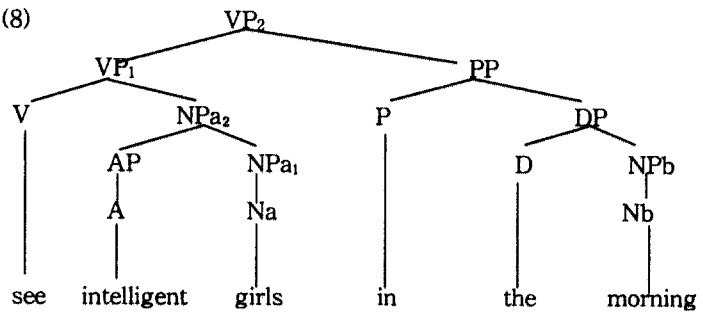
However, the order of precedence between the terminal elements dominated by V' and those dominated by PP cannot be specified correctly. Under the natural assumption that intermediate projections such as V' cannot enter into c-command relation, PP asymmetrically c-commands V, [NPa_2, NPa_1], NPa_1, Na, AP, and A without violating antisymmetry. Thus the LCA derives incorrect ordered pairs of terminal elements: <*in*, *see*>, <*in*, *intelligent*>, <*in*, *girls*>, <*the*, *see*>, <*the*, *intelligent*>, <*the*, *girls*>, <*morning*, *see*>, <*morning*, *intelligent*>, and <*morning*, *girls*>.

In addition, if we assume that intermediate projections as well can enter into c-command relation, the order of precedence between the terminal elements in the head-complement structure and the terminal elements in the adjunct structure cannot be specified because of the violation of antisymmetry: V' asymmetrically c-commands P, DP, D, NPb, and Nb, and at the same time PP asymmetrically c-commands V, [NPa_2, NPa_1], NPa_1, Na, AP, and A.

For a different approach, let us postulate the adjunction structure instead of the intermediate projection. We can either postadjoin the

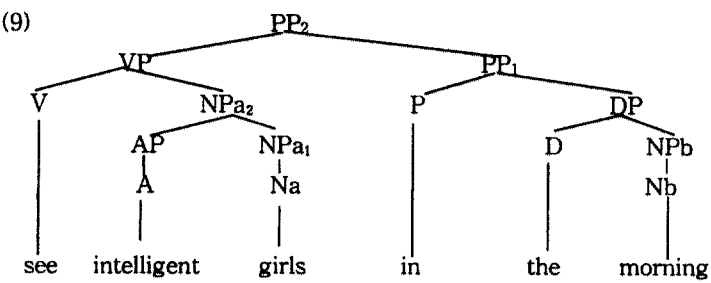
adjunct to the head-complement structure or preadjoin the head-complement structure to the adjunct. Let us first try the first option:

(8)



In the postadjunction structure (8), the terminal elements dominated by VP_1 are ordered in the same way as in (7), and so are the terminal elements dominated by PP. However, since ACC holds between PP and whatever nonterminal elements that dominate *see*, *intelligent*, and *girls* (V, VP_1, [VP_2, VP_1], A, AP, Na, NPa_1, [NPa_2, NPa_1]), it follows that all the terminal elements dominated by PP (*in*, *the*, *morning*) precede all the terminal elements dominated by VP_1 (*see*, *intelligent*, *girls*). So the postadjunction structure (8) has the same problematic situation as the substitution structure (7) (with the option of the bar level not entering into c-command). Let us turn to the second option:

(9)



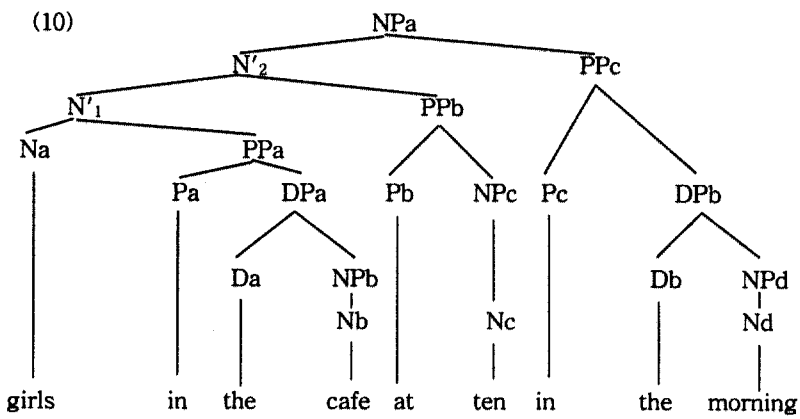
In the preadjunction structure (9) ACC holds between VP and whatever nonterminal elements that dominate *in*, *the*, and *morning* (P, PP_1, [PP_2, PP_1], D, DP, N, NP), and it thus follows that all the terminal elements dominated by VP precede all the terminal elements dominated by PP. All the terminal elements in the head-complement-adjunct structure (*see*, *intelligent*, *girls*, *in*, *the*, *morning*) are therefore correctly ordered with respect to one another.

We, however, have to ask if the structure (9) is structurally plausible. The LCA cannot avoid postulating such an adjunct phrase for the head-complement-adjunct structure. This is against the general mechanism of X-bar framework. The head that selects a complement and an adjunct must head the head-complement-adjunct structure. We have to admit that the LCA, which works only under certain limited structural configurations, is forced to postulate structurally implausible structure to operate.

2.4. A Head-Multiple Adjunct Structure

To see the structural implausibility of the LCA once again let us consider the following multiple adjunct structure, which has one locative adjunct and two temporal adjuncts:

(10)



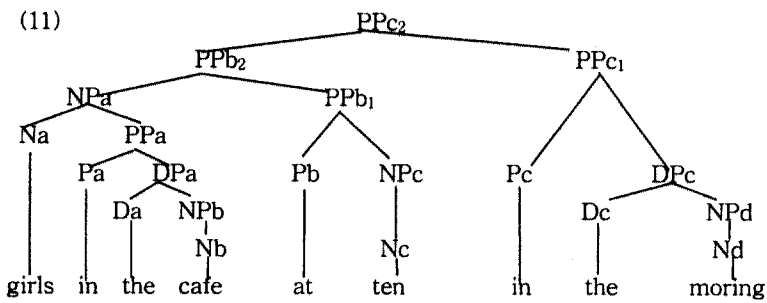
For reasons we are familiar with by now, the terminal elements dominated by N'_1(*girls, in, the, cafe*) are correctly ordered with respect to one another, and so are the terminal elements dominated by PPb (*at, ten*) and the terminal elements dominated by PPc (*in, the, morning*).

However, the order of precedence between the terminal elements dominated by N'_1 (*girls, in, the, cafe*) and PPb (*at, ten*), assuming that the bar level does not enter into c-command, cannot be specified correctly. ACC holds between PPb and whatever nonterminal elements that N'_1 dominates (Na, Pa, PPa, Da, DPa, Nb, NPa), deriving incorrect outcome such that all the terminal elements dominated by PPb precede all the terminal elements dominated by N'_1.

The same is true of the linear order between the terminal elements dominated by PPc (*in, the, morning*) and the terminal elements dominated by PPb (*at, ten*) and the linear order between the terminal elements dominated by PPc (*in, the, morning*) and the terminal elements dominated by N'_1(*girls, in, the, cafe*). And if we assume that the bar level as well can enter into c-command, because of the violation of antisymmetry the LCA cannot specify even such incorrect outcome.

To improve this problematic situation let us modify the structure. We can either postulate the preadjunction structure by adjoining N'_1 to PPb (in which case N'_1 is a max) and adjoining PPb in turn to PPc or postulate the postadjunction structure by adjoining PPb to N'_1 (in which case N'_1 is a max) and PPc to the structure to which PPb is adjoined. Since the LCA does not work in the postadjunction structure, we will try only the former option:

(11)



In (11) since ACC holds between NPa and whatever nonterminal elements that dominate *at* and *ten* (Pb, PPb_1, [PPb_2, PPb_1], Nc, NPc), all the terminal elements dominated by NPa (*girls*, *in*, *the*, *cafe*) precede all the terminal elements dominated by PPb_1 (*at*, *ten*).[5] Since ACC holds between NPa and whatever nonterminal elements that dominate *in*, *the*, and *morning* (Pc, PPc_1, [PPc_2, PPc_1], Dc, DPc, Nd, NPd), all the terminal elements dominated by NPa (*girls*, *in*, *the*, *cafe*) precede all the terminal elements dominated by PPc_1 (*in*, *the*, *morning*).[6] And since ACC holds between [PPb_2, PPb_1] and whatever nonterminal elements that dominate *in*, *the*, *morning* (Pc, PPc_1, [PPc_2, PPc_1], Dc, DPc, Nd, NPd), all the terminal elements dominated by PPb_1 (*at*, *ten*) precede all the terminal elements dominated by PPc_1 (*in*, *the*, *morning*).[7] So all the terminal elements in the head-multiple adjunct structure are correctly ordered with respect to one another.

The preadjunction structure (11), which we have to depend on to operate the LCA, however, is structurally problematic. First, the locative adjunct (*in the cafe*) and temporal adjuncts (*at ten*, *in the morning*) merge with their target in different manners. The former merges by substitution while the latter merge by adjunction. Second, postulating an adjunct phrase for the head-multiple adjunct structure is against the general mechanism of X-bar framework. The head that selects an adjunct must head the head-multiple adjunct phrase. Thus we have to admit that Kayne's LCA has to depend on a structurally implausible phrase to operate.

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5) NPa which has no category to be dominated by is not subject to the first condition for c-command. It satisfies the second condition for c-command by not dominating any of the nonterminal elements that dominate the terminal elements *at* and *ten*.

6) NPa asymmetrically c-commands the nonterminal elements that dominate *in*, *the*, and *morning* in the same way it asymmetrically c-commands the nonterminal elements that dominate *at* and *ten*.

7) The two segment category [PPb_2, PPb_1] is not subject to the first condition for c-command for the same reason that NPa is not. It satisfies the second condition for c-command by not dominating any of the nonterminal elements that dominate *in*, *the*, and *morning* (Pc, PPc_1, [PPc_2, PPc_1], Dc, DPc, Nd, NPd).

3. The Order of Precedence between Syntactic Objects

In the previous section it turned out that the LCA is problematic in many significant respects. All these provide us with empirical reasons to believe that ACC and the linear precedence are two independent concepts.

This section will specify the order of precedence between syntactic objects, which will be the basis of Generalized Ordering. To carry out these tasks we will first classify the structure-building process into substitution and adjunction operations. The former operation creates the head-complement configuration, the head-adjunct configuration (the substituted modifier adjunct in the sense to be specified), and the spec-head configuration; and the latter operation creates the configurations of head-to-head adjunction and max-to-max adjunction. Second, we will specify the order of precedence between the syntactic objects in each of these five configurations.

3.1. The Substitution Operation

The substitution operation, which merges a max with a head or with the category that it heads, creates the head-complement configuration, the head-adjunct configuration, and the specifier-head configuration. Let us begin with the head-complement configuration.

The head-complement configuration that is a fundamental local relation can be headed either by a lexical category or by a functional category. Let us first consider the first case.

When the head is a lexical category, the complement is introduced to discharge the Case or the internal theta role of the lexical head. Suppose that the lexical head is a verb. Then the category of the complement which receives Case or internal theta role of the verb (or both) is DP, NP, PP, TP (defective TP such as ECM infinitive TP and raising infinitive TP), or CP.[8]

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8) (i) There arrived [$_{DP}$ a man]
(ii) John read [$_{DP}$ the book]

Suppose that the lexical head is an adjective. Then the adjective must be a predicational adjective that assigns theta roles since non-predicational adjectives do not select a complement. The complement of the predicational adjective which does not Case-assign its object cannot be a bare nominal. The category of the complement which receives an internal theta role from the predicational adjective is PP, TP (raising infinitive TP), or CP.[9)]

Suppose that the head is a noun. Then the noun must be a derived nominal since pure nominals do not select a complement. For the same reason that the predicational adjective cannot select a bare nominal the derived nominal also cannot select a bare nominal as its complement. The category of the complement of the derived nominal is either PP or CP.[10)]

Suppose that the lexical head is a preposition. Then the category of the complement will be NP, DP or PP.[11)]

(iii) John kissed [$_{NP}$ Mary]
(iv) John stayed [$_{PP}$ in the room]
(v) John believed [$_{TP}$ Mary to be intelligent]
(vi)There seems [$_{TP}$ to be a man behind me]
(vii) John thought [$_{CP}$ (that) Mary was intelligent]
(viii) John wanted [$_{CP}$ [$_{TP}$ PRO to marry Mary]]

9) (i) John is proud [$_{PP}$ of Mary]
(ii) John$_i$ is likely [$_{TP}$ t_i to succeed]
(iii) John is certain [$_{CP}$ that he will succeed]
(iv) John is willing [$_{CP}$ PRO to risk his life for Mary]

The general assumption that the inherent Case marker *of* is inserted at S-structure may not be tenable in our framework, which postulates only interface levels. We will assume that *proud* in (i) initially selects PP.

10) (i) his reply [$_{PP}$ to her letter]
(ii) the attack [$_{PP}$ on the enemy]
(iii) the suggestion [$_{CP}$ that John should marry Mary]
(iv) the attempt [$_{CP}$ PRO to climb the mountain]
(v) the demand [$_{CP}$ for her to leave]
(vi) the question [$_{CP}$ whether John is innocent of the crime]

11) (i) John was proud of [$_{NP}$ Mary]
(ii) John was envious of [$_{NP}$ Mary]
(iii) The leg of [$_{DP}$ a table]
(iv) The book of [$_{NP}$ children]
(v) A man appeared [$_{PP}$ from [$_{PP}$ behind [$_{DP}$ the curtain]]]

Suppose that the lexical head is an adverb. Then the adverb must be a derived adverb from a predicational adjective since pure adverbs do not take a complement. The category of the complement of the derived adverb is always PP.[12]

Let us turn to the second case in which the head-complement configuration is headed by a functional category. The complement of a functional head is introduced to satisfy the selectional property of the functional head. Suppose that the functional head is a determiner. Then the complement is an NP.[13]

Suppose that the functional head is v^*, which heads full argument structures or v, which heads partial argument structures.[14] The complement is a transitive VP in the case of the former and a nontransitive VP in the case of the latter.

Suppose that the functional head is T. Then the complement is either a v^*P, which is a full argument structure, or vP, which is a partial argument structure.

Suppose that the functional head is C. Then the complement is either a finite TP or a control infinitive TP.

In all these configurations in which a functional or lexical head merges with a functional or lexical complement phrase, the head precedes the complement in English. Before turning to the head-adjunct configuration, let us clarify the notion of adjunct.

The notion of adjunct is ambiguous. It is either a syntactic object adjoined to another syntactic object (a head adjoined to another head, or

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Since we assume the inherent Case marker *of* is initially present in the derivation, in (i) and (ii) as well as in (iii) and (iv) *of* selects NP or DP as its complement.

12) (i) [$_{ADVP}$ quite [$_{ADV'}$ independently [$_{PP}$ *of me*]]]

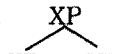
13) (i) [$_{DP}$ all [$_{D'}$ the [$_{NP}$ beautiful [$_{N'}$ intelligent [$_{N}$ ladies]]]]]

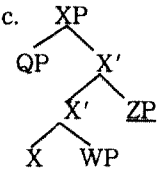
Since we assume that *the*-type determiners such as *the*, *this*, *these*, *that*, and *those* and indefinite determiners such as *a* and *an* head the noun phrase, (i) is a determiner phrase headed by *the*, which takes *beautiful intelligent ladies* as its complement and *all* as its specifier.

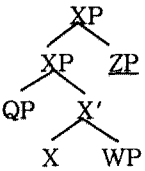
14) Partial in the sense that the argument structure does not contain both external and internal arguments.

a max adjoined to another max) or an optional clause element which functions as a modifier, which merges with its target (the modified syntactic object) by substitution or adjunction. The former is the definition in terms of the nature of the merger, and the latter is the definition in terms of the roles within a clause.

(12) a. 

b. 

c. 

d. 

The underlined elements in (12a) and (12b) are the adjuncts in the former sense. Y in (12a) is a mini adjunct, and YP in (12b) is a max adjunct. The modifier adjunct ZP in (12c), which merges with its target (the bottommost X′) by substitution as does the complement YP, is an adjunct in the latter sense. If the modifier adjunct ZP merges by adjunction such as in (12d), in which case the target is XP, it is an adjunct by either sense. Since the type of adjunct such as in (12b) (a max that is adjoined to another max by base generation) is, in fact, a modifier, it is identical to the type of adjunct such as in (12d): the modifier adjunct which merges with its target by adjunction. Then actually there are three types of adjuncts: a head that adjoins to another head such as in (12a); a modifier that merges with its target by base-generated substitution such as in (12c); and a modifier that merges with its target by base-generated adjunction such as in (12d).

The type of adjunct such as (12a) will be discussed later when we exploit the adjunction operation. Henceforth we restrict our attention to the modifier adjuncts such as (12c) and (12d), which will merge with their target by substitution or by adjunction depending on our assumption.[15]

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15) Since a modifier can occupy the specifier position, a distinction needs to be made between the specifier-modifier and the adjunct modifier. We assume

The adjuncts differ from the complements in that they are optional elements which occupy the position not forced by the Projection Principle. It is not a straightforward matter whether these adjuncts that do not receive theta roles will merge by substitution or adjunction. Let us consider the following sentences:

(13) John saw many girls [who were hit in the eye].
(14) John hit Mary [because she was late].
(15) [Because Mary was late] John hit her.
(16) John studied so hard [that he could pass the exam].
(17) John was so angry [that he hit her].
(18) John watched a movie [in the living room].
(19) [In the library] John and Mary were studying hard.
(20) The tall girls [on the sofa] are John's sisters.
(21) The woman [proud of her son] is Mary's friend.
(22) John saw a man [battered and bruised].
(23) John [often] kissed Mary.
(24) John will [also] major in linguistics.
(25) Mary studied English [very efficiently].
(26) John walked [very slowly].
(27) [Frankly] John hates Mary.

The category of modifier adjuncts is CP in (13)~(17), PP in (18)~(20), AP in (21)~(22), and AdvP in (23)~(27). With regard to the manner of the merger we will assume adjunction for the premodifier adjuncts (CP, PP, and AdvP that merge with a clause as in (15), (19), and (27) respectively and VP adverbs as in (23) and (24)), and we will assume substitution for the postmodifier adjuncts (CP that merges with a noun as in (13), CP that merges with a verb as in (14), CP that merges with an adverb as in (16), CP that merges with an adjective as in (17), PP

---

that the premodifiers are specifiers and the postmodifiers are adjuncts. The preverbal modifiers (*often, seldom, never, scarcely, also,* etc.) and the modifiers that merge with a clause (e.g., [*Frankly*] *it is a good proposal*; [*Because Mary was late*] *John hit her*; [*In the library*] *John was studying hard*) are the exceptions to this assumption. They are premodifier adjuncts.

that merges with a verb (verb phrase) as in (18), PP that merges with a noun as in (20), AP that merges with a noun as in (21) and (22), and AdvP that merges with a verb (verb phrase) as in (25) and (26)).[16]

Since we are discussing the substitution operation, we will consider only the modifier adjuncts which merge by substitution (in (13), (14), (16), (17), (18), (20), (21), (22), (25), and (26)), leaving the modifier adjuncts that merge by adjunction (in (15), (19), (23), (24), and (27)) until when we discuss the base-generated adjunction operation.

In general, head-initialness with respect to adjunct agrees with head-initialness with respect to complement. In other words, if the head precedes the adjunct, it also precedes the complement, which is the case with English. But this does not hold across languages. In Chinese, head is final with respect to adjunct but is initial with respect to complement. Head-initialness with respect to adjunct and head-initialness with respect to complement should be regarded as two independent parameters.

The syntactic object which the head can merge with other than the complement and the adjunct for the substitution operation is a specifier. The specifier-head configuration can be headed by a lexical category (a verb, an adjective, a noun, or a preposition) or by a functional category (T, Comp, Det, or v*/v) as the head-complement configuration is. Let us consider the first case.

If the specifier-head configuration is headed by a lexical category, the specifier is an argument which receives a theta role from the lexical head, or a modifier which modifies the lexical head. If the lexical head

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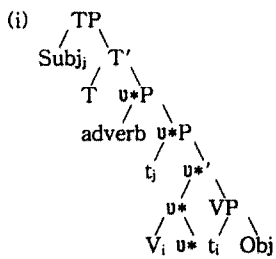
16) In the clausal structure we assume (Chomsky (1999)) the VP adverbs adjoin to v*P (or vP):

(i)


is a verb, then the specifier is an argument.[17]

If the lexical head is a predicational adjective, then the specifier is an argument which receives a theta role from the adjective or an adverb modifier that modifies the adjective.[18] If the lexical head is a nonpredicational adjective (e.g., descriptive adjectives such as *beautiful, tall*, etc.), then the specifier is an adverb modifier only.[19]

If the lexical head is a predicational preposition, then the specifier is an argument.[20] If the lexical head is a nonpredicational preposition, then the specifier is an adverb modifier.[21]

If the lexical head is an adverb, then the specifier is another adverb which modifies the adverb that heads the adverb phrase.[22]

If the lexical head is a predicational noun, then the specifier is an adjective modifier which modifies the noun or an argument which receives a theta role from the noun.[23]

If the lexical head is a nonpredicational noun, then the specifier is a modifier adjective or a possessor which has genitive morphological Case.[24]

---

17) (i) John [$_{v*P}$ put$_i$ [$_{VP}$ *the book* t_i on the table]]

(ii) The boat$_i$ [$_{vP}$ [$_{VP}$ t_i sank]]

Since we assume preverbal modifiers are adjuncts which adjoin to v*P/vP, the specifier of V is an argument only.

18) (i) I consider [$_{AP}$ John very intelligent]

very which is a premodifier is a specifier of *intelligent* (the inner spec). *John* which has to receive a theta role from *intelligent* occupies another spec (outer spec) of *intelligent*.

19) (i) [$_{DP}$ the [$_{NP}$ [$_{AP}$ very intelligent] ladies]]

the very intelligent ladies is a determiner phrase headed by *the*, which takes *very intelligent ladies* as its complement. The noun phrase *very intelligent ladies* is headed by *ladies*, which takes *very intelligent* as its specifier. The adjective phrase *very intelligent* is headed by *intelligent*, which takes *very* as its specifier.

20) John wants [$_{PP}$ Mary in his office]

21) John put the book [$_{PP}$ right [$_{P'}$ on [$_{DP}$ the table]]]

22) John walked [$_{ADVP}$ very [$_{ADV}$ quickly]]

23) (i) John considers [$_{NP}$ his students [$_{N'}$ real [$_{N}$ idiots]]]

24) (i) John likes [$_{DP}$ the [$_{NP}$ tall [$_{N'}$ intelligent [$_{N}$ ladies]]]]

Let us turn to the second case in which the specifier-head configuration is headed by a functional category, which may have the EPP property. Suppose that the functional head is Tense. In that case the specifier cannot be an argument since the argument must be base-generated at a theta position.[25] The specifier of T can be an expletive only.

If the functional head is Complementizer, then the specifier cannot be an argument for reasons already mentioned. The specifier cannot be an expletive either since the Complementizer does not allow its EPP to be satisfied by Merge of an expletive. The specifier of the Complementizer cannot be introduced by pure Merge.

If the functional head is v*, which heads transitive constructions, then the specifier is an external argument.[26]

If the functional head is v, which heads nontransitive constructions, then the specifier cannot be introduced since the nontransitive constructions do not contain an external argument.

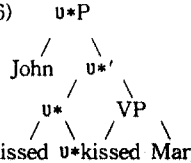
If the functional head is a determiner, then the specifier is a predeterminer.[27] In all these configurations in which a functional head or a lexical head merge with a lexical specifier phrase, the head follows the specifier in English.

Therefore the idiosyncratic order of precedence between the target and the nontarget in the base-generated substitution operation can be reduced to head-initialness with respect to complement, head-initialness with respect to adjunct, and head-initialness with respect to specifier.

(ii) John is interested in [$_{NP}$ Chomsky's [$_{N}$ theory]]

25) An argument can occupy SPEC-T by movement.

26)



27) (i) [$_{DP}$ all [$_{D'}$ the [$_{NP}$ intelligent students]]]
(ii) [$_{DP}$ both [$_{D'}$ the [$_{NP}$ beautiful ladies]]]
(iii) [$_{DP}$ half [$_{D'}$ the [$_{NP}$ mischievous children]]]

Their values in English can be schematically represented as follows:

(28)

The manner of the merge	Target	Nontarget	The value of target-initialness with respect to nontarget
Substitution	Head (or the category it heads)	Complement	Initial
		Adjunct	Initial
		Specifier	Final

3.2. The Adjunction Operation

3.2.1. Max-to-Max Adjunction

Unlike the substitution operation in which the target is a head (or its projection) and the nontarget is a max, the adjunction operation is carried out in such a way that the target and the nontarget are either both heads or both maximal projections.

The max objects which adjoin to other max objects by pure Merge are modifier adjuncts. In 3.1 we divided the modifier adjuncts into two subgroups: one that merges by substitution and the other that merges by adjunction. The order of precedence between the substituted modifier adjuncts and their target were already parameterized in terms of head-initialness with respect to adjunct. Since in English the head precedes the modifier adjunct which merges by substitution, the substituted adjuncts follow their target. But the opposite is the case with the modifier adjuncts which merge by adjunction, as we saw from (15), (19), (23), (24), and (27), repeated here as (29), (30), (31), (32), and (33).

(29) [Because Mary was late] John hit her.
(30) [In the library] John and Mary were studying hard.
(31) John [often] kissed Mary.
(32) John will [also] major in linguistics.

(33) [Frankly] John hates Mary.

Regardless of their category, the modifier adjuncts which merge by adjunction all precede their target. The CP *Because Mary was late* in (29), the PP *In the library* in (30), the AdvP *often* in (31), the AdvP *also* in (32), and the AdvP *frankly* in (33) are all preadjoined to their target (the CP *John hit her*, the CP *John and Mary were studying hard*, the v*P *kissed Mary*, the v*P *major in linguistics*, and the CP *John hates Mary* respectively). The base-generated operation which adjoins a max object to another max object is carried out in a target-final way.

3.2.2. Head-to-Head Adjunction

Pure Merge which adjoins a head to another head in the syntactic component of English is an inflectional morphological process. The target is Tense (Infl), and the nontarget is an auxiliary verb which is to bear tense and agreement features (*does*, *did*, *can*, *may*, etc.). Insofar as the root morpheme precedes the inflectional morpheme, the operation that adjoins an auxiliary verb to Tense must be carried out in a target-final way. That is, the nontarget head must be preadjoined to the target head so that the former which is a bare auxiliary verb (under conventional system) precedes the latter which is an inflectional affix morpheme.

Insofar as the root morpheme precedes the inflectional morpheme, the same would be true even if English were head-final with respect to complement.[28] The base-generated adjunction operation, regardless of

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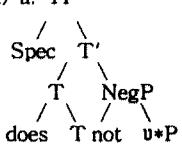
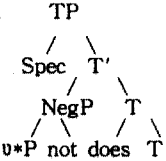
28) (i) a.



b.



the head-initialness with respect to complement, is carried out in a target-final way for heads as well as for maximal projections.

(34)

The manner of the merge	Target	Nontarget	Target-initialness with respect to nontarget
Adjunction	Head	Head	Final
	Max (modified syntactic object)	Max (modifier adjunct)	Final

4. Generalized Ordering

4.1. A Head-Complement-Adjunct Structure

This section will show how particular choice of parameter values enters into fixing the word of English. A step-by-step computational procedure will be illustrated which specifies the order value of each lexical item. We will designate this ordering process Generalized Ordering.

The LCA, which derives the order of precedence from the ACC relations, was proved to be problematic by the head-complement-adjunct *see intelligent girls in the morning* and the head-multiple adjuncts *girls in the cafe at ten in the morning*. Let us first consider the former in terms of Generalized Ordering.

The lexical array for *see intelligent girls in the morning* is LA = {(see, 1), (intelligent, 1), (girls, 1), (in, 1), (the, 1), (morning, 1)}.[29] The lexical array can be drawn into the derivation all at once or one by one.

---

29) I owe this style of lexical array to Chomsky (1995a). If a lexical array has a lexical item used more than once, it will be a numeration. Though Chomsky (1998) dispenses with indices by leaving lexical items in the lexical array even when accessed in computation, we will employ them for expository reasons.

We will choose the latter option (the cyclic approach to the lexical array) since the former option causes a burden to the computational system in the sense that the lexical items which do not partake in the operation have to wait until their turn.

As a first approximation, let us first select the predicate *see* out of the six lexical items given in the lexical array and introduce it into the derivation:

(35) Workspace 1
Stage 1

see

Since the predicate *see* merges with its complement before it merges with its adjunct (X-bar theory internal mechanism), the next operation selects and introduces the items which will make up the complement, leaving the rest of lexical items in the lexical array:[30]

(36) Workspace 1
Stage 2[31]

intelligent	
see	girls

In the present stage *see, intelligent,* and *girls* are three independent syntactic objects which have no order relation with one another as yet. In order to construct a more complex syntactic structure the operation Merge targets *girls* and substitutes *intelligent* to the left of the target *girls* in accordance with the head parameter with respect to specifier:

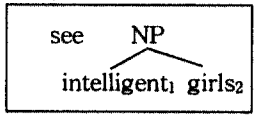
---

30) As far as I know, Bobaljik (1995) first introduced the notion of workspace. I also owe him the style of representing the workspace with a square.

31) LA = {(see, 0), (intelligent, 1), (girls, 1), (in, 1), (the, 1), (morning, 1)}
Select intelligent
Select girls

(37) Workspace 1

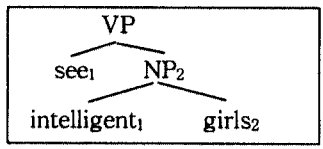
Stage 3



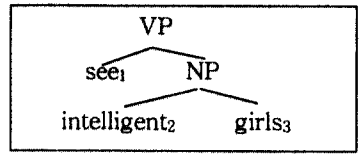
The subsequent operation targets *see* and substitutes the NP complement which contains one ordered pair of terminal elements (*intelligent, girls*) to the right of the target *see*. Then *see* which discharges an internal theta-role and determines the Case value (Accusative) precedes its complement NP, which receives the internal theta-role and the Case value:

(38) Workspace 1

a. Stage 4



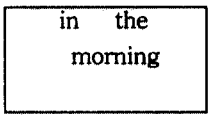
b. Stage 5



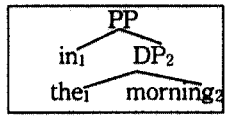
Since *see* which precedes its complement NP also precedes the terminal elements that the complement NP dominates (*intelligent, girls*), the order value of *intelligent* is modified to 2 and the order value of *girls* which follows *intelligent* in turn is modified to 3. Since the word order is a linear order which holds between the terminal elements, the order value of the complement NP is not necessary and is deleted after order adjustment (Stage 5).

(39) Workspace 2

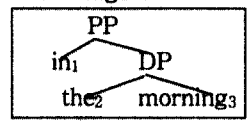
a. Stage 1



b. Stage 2



c. Stage 3[32)]



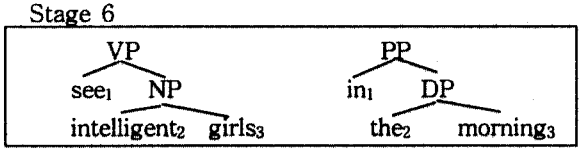
For the next operation to form an adjunct of *see* we select and introduce the remaining lexical items which will constitute the adjunct. For ease of work another workspace will be employed (Stage 1, Workspace 2). The operation Merge targets *the* and substitutes *morning* to the right of the target *the* in accordance with the value of the head-parameter with respect to complement (initial) and forms a complement DP, which in turn is merged to the right of *in* for the same reason (Stage 2).

Since *in* which precedes its complement DP also precedes the terminal elements the complement DP dominates (*the*, *morning*), Stage 2 undergoes a transition to Stage 3 by the application of the same order adjustment as in Stage 5 of Workspace 1.

Then we transfer the adjunct completed in Stage 3 of Workspace 2 to Stage 5 in Workspace 1 so that we can unify the two different workspaces:

(40) Workspace 1

Stage 6



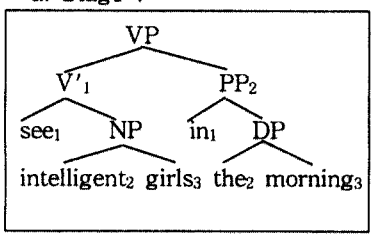
32) NU={(see, 0), (intelligent, 0), (girls, 0), (in, 1), (the, 1), (morning, 1)}
Select in
Select the
Select morning
Merge (the, morning)
Merge (in, DP)
Ordered pairs for PF = (in, (the, morning))

Though the final merger is an operation in which the predicate *see* takes its adjunct PP, *see* cannot be a target this time because it has already been a target for the previous operation that formed the head-complement structure by merging *see* and NP. Hence the next operation has to target VP, which is a projection of *see*.

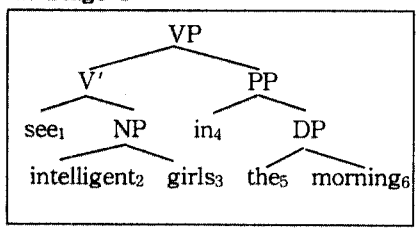
The operation Merge substitutes the adjunct PP not to the left but to the right of the target VP because of the value of the head-parameter with respect to the adjunct (initial), so that V′ (VP before the operation), which is an immediate projection of *see*, precedes PP:

(41) Workspace 1

a. Stage 7



b. Stage 8



Since V′ precedes PP, it naturally follows that *see*, *intelligent*, and *girls* which are the terminal elements dominated by V′ precede *in*, *the*, and *morning* which are the terminal elements dominated by PP. This entails that even *girls*, the last terminal element within V′, precedes *in*, the first element within PP.

To reflect this we modify the order value of *in* to 4, the order value of *the* that follows *in* to 5, and the order value of *morning* that follows both *in* and *the* to 6, and then delete the order values of V′ and PP that do not enter into word order relation, thereby developing Stage 7 into Stage 8, the final stage of the Generalized Ordering for the head-complement-adjunct structure. After being handed over to the phonological component the six terminal elements will receive phonetic interpretation in order of their order values: *see* > *intelligent* > *girls* > *in* > *the* > *morning*.

4.2. A Head-Multiple Adjunct Structure

Let us apply the Generalized Ordering to another counterexample of the LCA: *girls in the cafe at ten in the morning*. The numeration for the head-multiple adjunct structure *girls in the cafe at ten in the morning* is NU = {(girls, 1), (in, 2), (the, 2), (cafe, 1), (at, 1), (ten, 1), (morning, 1)}. We will first select *girls*, which is to be modified by one locative adjunct and temporal adjuncts.

(42) Workspace 1

Stage1

girls

Since the locative adjunct merges with its target before the temporal adjuncts do, the next operation selects the lexical items which will make up the locative adjunct and introduces them into the active memory, leaving the rest of lexical items in the numeration:[33]

(43) Workspace 1

Stage2

girls	in
the	cafe

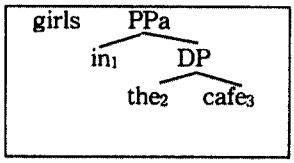
In accordance with the value of the head-parameter with respect to complement (initial), the operation Merge substitutes *cafe* to the right of *the* and forms a DP and substitutes the DP to the right of *in* for the same reason. Then there will be a PP adjunct which has three ordered pairs of terminal elements ((*the*, *cafe*), (*in*, *the*), (*in*, *cafe*)):

---

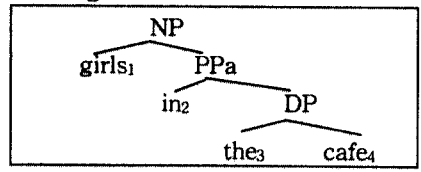
33) NU = {(girls, 0), (in, 2), (the, 2), (cafe, 1), (at, 1), (ten, 1), (morning, 1)}
Select in
Select the
Select cafe

(44) Workspace 1

a. Stage 3



b. Stage 4

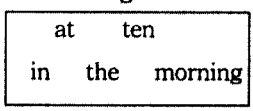


The next operation merges PPa to the right of *girls* in accordance with the value of head-parameter with respect to adjunct (initial), and thereby Stage 3, after we delete the order value of PPa and modify the order values of *in*, *the*, and *cafe*, develops into Stage 4.

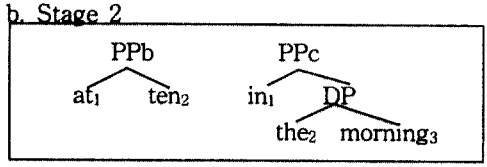
To feed the next operation we select the rest of lexical items and introduce them into another workspace:[34]

(45) Workspace 2

a. Stage 1



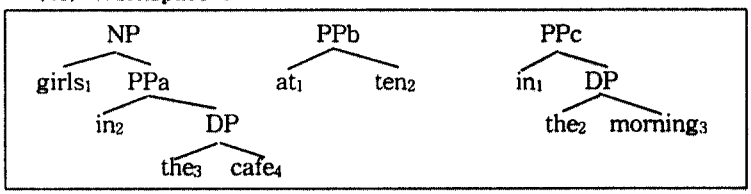
b. Stage 2



After the five syntactic objects in Stage 1 of Workspace 2 are transformed into two complete syntactic objects by the procedures which we are familiar with by now (Stage 2), we transfer them to Stage 4 in Workspace 1 so that we can unify the two different workspaces:

34) Select at
Select ten
Select in
Select the
Select morning

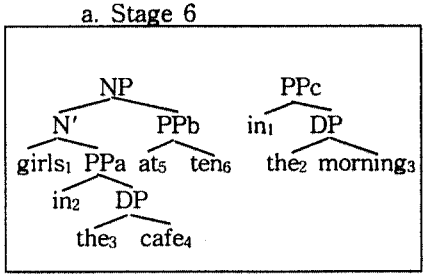
(46) Workspace 1



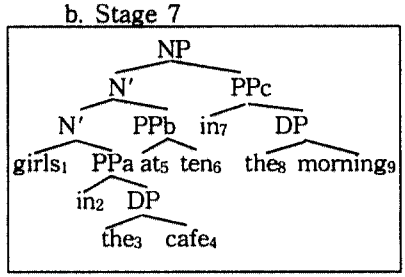
Since PPb which is a temporal adjunct with a narrower concept merges with its target before PPc which is a temporal adjunct with a broader concept, we first substitute PPb to the right of the target NP for the same reason we substituted PPa to the right of the target *girls*, and thereby develop Stage 5 into Stage 6, which will undergo a transition to Stage 7 by the final merger which is carried out in a target-final way as the previous operations were:

(47) Workspace 1

a. Stage 6



b. Stage 7



After being delivered to the phonological component the nine ordered terminal elements will undergo phonetic interpretation in order of *girls* > *in* > *the* > *cafe* > *at* > *ten* > *in* > *the* > *morning*.

5. Concluding Remarks

So far we have discussed the word order of English and provided different perspectives on the ordering process. We showed that the ordering and syntactic computation are not two different processes but

they proceed in parallel so that the former is always completed along with the latter. The ordering process therefore must be the intrinsic content of the computational system.

The LCA we discussed in section two was problematic in three significant respects. First, the application of the LCA was confined to preadjunction structures and some head-initial structures such as the head-complement and the head-adjunct. In postadjunction structures and head-final structures such as the complement-head and the adjunct-head ACC was not mapped to a linear precedence but to a linear subsequence.

Second, even in head-initial structures if the application extends to the head-complement-adjunct and head-multiple adjunct constructions, the LCA problematically had to depend on implausible structures.

Third, in the multiple specifier-modifier constructions, the LCA was not able to derive a correct order of precedence without violating the Extension Condition. All theses provide us with strong reasons to believe that ACC relations and precedence relations are two independent concepts.

Generalized Ordering, which feeds on computationally relevant parameter values, was shown to be able to specify the order relations without such problems as occurs in the LCA. I conclude this article by proposing that the Generalized Ordering be accepted as a genuine solution for word order.

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조기석
130-791 서울시 동대문구 이문동 270
한국외국어대학교 영어학부
전화: (02)916-6715
이메일: d9501001@hanmail.net

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