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The Definiteness Principle and the Definite Article
Nancy Ackles

In recent years much productive research has been done on the structure of the noun phrase, leading to increased understanding of the phrase but not solving all the mysteries. Several of these mysteries center around determiners, words such as *this*, *that*, and *the*. These elements are usually classified as determiners and are sometimes analyzed as heads of determiner phrases (DP's), sometimes as specifiers of noun phrases (Spec of NP).

Some determiners (e.g. *this*, *that*) can appear alone in sentences:

1. a. This is a good example.
- b. I found an example of that.

Others (e.g. *the*) cannot:

2. a. *The is a good one.
- b. *I found one of the.

Abney 1987 labels determiners which do not stand alone "transitive" and those which do "intransitive". Giorgi and Longobardi 1991 make a similar move when they posit a feature *strong*. Determiners which are +strong must stand alone, those which are -strong cannot, and those which are \pm strong can appear in either environment. Others have suggested that some determiners can license an empty position and others cannot. The difficulty with these statements is that they are fundamentally descriptions of the data rather than explanatory principles.

The problem becomes even more severe when we look at the historical data. English has not always had determiners which cannot stand alone. In Old English there were only words like *this* and *that*. These forms (the *se* and *des* paradigms) could be used with or without a complement and were inflected for number, gender and case. The word *the* emerged with what is labeled Middle English at the same time as the collapse of the old system of morphological inflection. As Mossé states in his *Handbook of Middle English*, "a new form de...tended to become from a very early period the common invariable form of the article even in the South...and in East-Midland....The Northern dialect recognizes only this indeclinable form. The London dialect used it as early as the *Proclamation* of 1258." (p.60) While a plural form of the word (*da*) continued to be used occasionally, and some inflected forms appear in writings from the South and the West-Midland in the 13th century, the triumph of *the* was, as language changes go, remarkably swift and complete. Hewson 1972 argues that there is historically a correlation between the emergence of article systems and the loss of morphological case in the Indo-European languages. Perhaps this historical correlation can give us a clue to finding an appropriate analysis of the definite article in Modern English.

One possible approach is to apply a principle that Suzuki, working within the DP hypothesis, proposed in his 1987

dissertation while discussing genitives, the definiteness principle:

The Definiteness Principle

a. Definiteness Filter: a [+Definite] Determiner Phrase must have one [+Definite] element at S-structure.

b. Definiteness-raising: every [+Definite] phrase must be raised to [+Definite]DP at LF.

According to Suzuki's analysis, S-structures for *this picture of John* and *my picture of John* are as follows.

3.a. [DP[+Def] O [D this[NP O picture of John]]]

b. [DP[+Def]my_i[D O[NP_{t_i}picture of John]]]

(3a) satisfies the definiteness filter by the presence of the [+Def] head *this*, while the genitive DP *my* in (3b) must raise to Spec of DP in order to satisfy the filter. For a full discussion of the way the chain formed by this raising satisfies the Empty Category Principle, see Suzuki's dissertation.

Suzuki takes definiteness to be the relevant concept defining the principle, as does Belletti 1988 in her discussion of case and the definiteness effect. Enç 1991 argues that specificity is actually the notion involved in syntactic rules. The term definiteness will be used in this squib as the discussion is of the definite article, though further research may show that specificity is the better term.

Consider now some relevant facts from Tamil and Turkish. In these languages, definiteness can be marked by the presence of morphological case endings. Nouns can be used with or without morphological case marking; however, if morphological case inflection appears, the noun is interpreted as +definite. Enç (1991) gives the following Turkish data:

4.a. Ali bir kitabi-i aldi.

Ali one book-Acc bought.

A book is such that Ali bought it.

b. Ali bir kitabi aldi.

Ali bought some book or other.

This data appears to be an instance of the application of the Invisible Category Principle (Emonds 1985 p.227):

Invisible Category Principle: An obligatory closed category B (such as SP(X) or P) with a feature C may remain empty throughout a derivation if C is morphologically transparent in a phrasal sister of B.

The feature +definite is morphologically transparent on the noun, and no +definite element is required in D or Spec of D.

The data here is suggestive. Morphological case is capable of carrying the feature +definite. It is with the collapse of morphological case that the definite article arose in English (and also, according to Hewson, in other languages). Could *the* be an element inserted to carry the feature +definite in definite DP's which contain no other +definite element at D structure as a way of satisfying the Definiteness Principle? If so, *the* would be, in effect, a dummy element marking definiteness. If a +definite DP contains a +definite element, *the* is not added. If a +definite DP does not contain a +definite element either generated as D or raised to the Spec of D, *the* is inserted.

Such an analysis could account for the sudden rise of the definite article with the collapse of morphological case. It would, more importantly, explain why *the* appears to be an "intransitive" determiner. *The* would never be generated as the only overt element in a DP, because that would require inserting a dummy element into a totally null phrase; therefore, sentences such as (5) could never be generated.

5.a. **The* is an example of that.

b. *This sentence exemplifies *the*.

By this analysis there is also no possibility of generating such phrases as *the my book*, *my the book*. Phrases containing a +definite element such as *my* satisfy the Definiteness Principle without the insertion of a dummy element.

The suggestion of this squib, then, is that in the effort to replace descriptive statements about the nature of "transitive" and "intransitive" determiners, application of the Definiteness Principle can provide explanatory insight. The definite article *the* is inserted into a +definite DP which contains no other +definite element in order to satisfy the Definiteness Principle.

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NOTES ON WEAK CROSSOVER EFFECTS IN BASQUE AND THE DISTRIBUTION
OF RESUMPTIVE PRONOUNS

Xabier Artiagoitia

0. Introduction

Ortiz de Urbina (1989) has noted that in Basque both subject and object gaps in tensed relative clauses inside subject NPs produce weak crossover effects (WCO henceforth) if bound by an operator-like element that also binds a variable in the matrix clause. This configuration, according to him, is predicted to be ungrammatical by Koopman and Sportiche's (1982) Bijection Principle (BP hereafter)¹. This kind of WCO, Ortiz de Urbina claims, lends additional support to the idea that those gaps are indeed null pronominal elements (*pro*), licensed by a strong Infl (Eguzkitza 1986). The relevant data are reproduced in (1) and (2):

- (1) a. [[e₁] [e_j] maite zuen] neskak_j Jon₁ utzi egin zuen.
 love aux girl John leave aux
 The girl that (he) loved [e] left John
- b. *[[e₁] [e_j] maite zuen] neskak_j amorante bakoitza₁ utzi
 lover each
 egin zuen
 The girl that (s/he) loved [e] left each lover
- c. *[[e₁] [e_j] maite zuen neskak_j nor₁ utzi zuen?
 who
 Who did the girl that (s/he) [e] loved leave?
- d. *[s amorante bakoitza₁ [s [[e₁] [e_j] maite zuen
 neskak_j t₁ utzi zuen]] (LF representation of (1b))
- e. *[s nor₁ [s [[e₁] [e_j] maite zuen neskak_j t₁ utzi
 zuen]] (LF representation of (1c))
- (2) a. [[e₁] [e]_j maite zuen neskak₁ Jon_j utzi egin zuen
 The girl that loved him left John

¹ Bijection Principle

There is a bijective correspondence between variables and A'-positions. (Koopman & Sportiche (1982: 146))

- b. *[[e]_i [e]_j maite zuen] neska_{k1} amorante bakoitza_j utzi egiten zuen
The girl that loved (him/her) used to leave every lover
- c. *[aspalditik [e]_i [e]_j ezagutu zuen] neska_{k1} nor_j long time know aux who engainatu zuen?
deceive aux
Who did the girl that knew (him/her) for a long time deceive?
- d. *[s amorante bakoitza_j [s [[e]_i] [e]_j] maite zuen neska_{k1} t_j utzi zuen]] (LF representation of (2b))
- e. *[s nor_j [s [aspalditik [e]_i [e]_j ezagutu zuen] neska_{k1} t_j (LF representation of (2c))

Notably, the LF representations in (2d,e) and (3d,e) are consistent with Koopman & Sportiche's account of WCO.

Contreras (1989), on the other hand, has argued for a different approach to WCO phenomena, which he accounts for by means of the Antisubjacency Condition on Pronominal Variables (ASC hereafter):

(3) *Antisubjacency Condition On Pronominal Variables*

A [+pronominal] variable must be antisubjacent to its operator.

Thus, Contreras claims that standard WCO violations in sentences like (4) arise because the bound pronoun *his* is subjacent to the operator (i.e. "too close"), a result obtained if subject NPs are not barriers for subjacency:

(4) *Who_i does his_i mother like t_i?

Contreras predicts then that, if the offending pronoun is more deeply embedded and, therefore, becomes antisubjacent to the operator, a grammatical sentence should result, which seems indeed to be the case in (5a,b) according to him:

- (5) a. Which bridge_{t1} did the engineer who designed it_{t1} destroy
t₁?
- b. Which famous scientist_{t1} did the woman he_{t1} loved betray
t₁?²
- c. *Who_{t1} did the woman he_{t1} loved betray t₁?

(5c) is ruled out due to the constraint that variables not be more specific than their binders.

Examples (5a,b) mirror the Basque data in (1) and (2) yet the Basque data are ungrammatical. The ungrammaticality of the Basque examples does not arise from the variables' being more specific than the operators because they are never marked for gender. Thus the question arises as to what makes the Basque examples ungrammatical. If their ungrammaticality arises due to factors independent of the ASC or any of its alternatives (BP, or Safir's (1984, 1986) Parallelism Constraint on Operator Binding (PCOB hereafter))³, the ASC can be maintained as a principle of the grammar. If it cannot, it is either the case that the ASC does not hold of Basque, in which case some other explanation still has to be found, or else the ASC has to be abandoned as a principle of the grammar altogether.

In what follows in this squib, I explore the implications that the above mentioned contrast between English and Basque may have for the competing accounts of WCO phenomena.

² Contreras (1989) does not give any example of sentences yielding the same configurations as (5a,b) at LF. I assume those sentences are grammatical:

- i. The person that drinks it_{t1} loves every brand of beer_{t1}
- ii. The woman that painted it_{t1} liked every picture_{t1}

My informants, however, were reluctant to accept (i) or (ii).

³ The Parallelism Constraint on Operator Binding

If O is an operator and x is a variable bound by O, then for any y, y a variable bound by O, x and y are [apronominal]. (Safir (1986: 665))

1. Some Weak Crossover Phenomena in Basque

Ortiz de Urbina contends that sentences (2b,c) and (3b,c) are straight violations of the Bijection Principle because the following configuration obtains at the level of Logical Form (LF), after Quantifier Raising has applied:⁴

(6) [Wh_i/QP_i [... [...[pro]_i...] t_i...]]

Interestingly enough, if the wh-phrase moves in the syntax instead of remaining in situ like in (2c) and (3c), the sentence is still ungrammatical with the same S-S configuration as in (6):

(7) *[Zein mutil_i engainatu zuen_k [[aspalditik [e]_i [e]_j ezagutu
which boy deceive aux long time know
zuen neska_j] t_i t_j?]]
aux girl-E
Which boy did the girl (he) loved deceive?

Ortiz de Urbina (1989) argues extensively that focus in Basque also involves movement to the Specifier of C (with V-to-I head movement) at S-S, thus creating an operator-variable like configuration. If this is so, we also expect these cases to be ungrammatical if there is a bound pronoun inside the subject NP. The prediction is borne out by the data:

(8) *[MIKEL_i engainatu zuen_k [[aspalditik [e]_i [e]_j ezagutu
zuen neska_j] t_i t_j?]]
It was Michael that the girl (he) loved deceived

⁴ His analysis proceeds as though the wh-phrase in the (c) examples were in situ at S-S. Later in the book, Ortiz de Urbina shows that Basque wh-phrases (and focalized XPs) move to the Specifier position of Comp in the syntax (i.e. by S-S) and that any preceding element is a topic. Under the second analysis, we would have to find a mechanism for the wh-phrase nor to still c-command and have scope over the bound pronoun in the topicalized NP.

Indirectly, (1)-(2) and (7)-(8) constitute evidence for the existence of LF as a level of representation, because the configuration in (6), which is exactly the same as in (7)-(8), can only be achieved by applying move- α in the mapping of S-S onto LF.

Contreras's (1989) account for WCO phenomena seems to imply that (1 b,c), (2 b,c), (7) and (8) are ungrammatical because the bound pronoun is subjacent to its operator (i.e. functions very much like a resumptive pronoun). However, they occur inside a syntactic island (a relative clause). Making the deviance of the relevant examples follow from the ASC would be equivalent to saying that Basque does not obey the Complex Noun Phrase Constraint (in the case of nouns heading relative clauses) and that extraction out of Complex Noun Phrases should be possible, which has been shown not to be the case (de Rijk 1972):

(9) *Bost aldiz irakurri duen apaiz bat ezagutzen dedan
 five times read aux priest one know aux
 liburua irakurri nahi det nik ere (de Rijk (1972))
 book read want aux I too
 I, too, want to read the book that I know a priest who
 read five times

(10) *Nori_i galdu da_j [t_i eman diogun ardo botila] t_j?
 Who-D loose aux give aux wine bottle
 To whom did the bottle that we gave get lost?

(11) *AINHOAri_i galdu da_j [t_i eman diogun ardo botila] t_j
 It is to Ainhoa that the bottle that we gave got lost

If we have a quantifier phrase inside the Complex Noun Phrase, it cannot raise to the matrix clause to have scope over the relative clause it was extracted from. This provides striking confirmation of the existence of LF as a level of representation, as well as of the relevance of Subjacency to it:

(12) a. [lagun bakoitzari eman diogun ardo botila] galdu da
 friend each
 b. (LF) *[lagun bakoitzari_i [[t_i eman diogun botila]
 galdu da]]
 The bottle of wine that we gave to each friend got

lost

In other words, (12) does not have the interpretation where a different bottle of wine gets lost for each friend.

Another piece of evidence that the examples under consideration are not ungrammatical due to a violation of the ASC comes from the fact further embedding of the bound pronoun does not improve the grammaticality. We can achieve further embedding by checking sentences with the second type of Complex Noun Phrases, since they involve one additional maximal projection between the embedded sentence and the head noun it modifies (that introduced by the postposition *ko*). Note once again that QR produces at LF the same configuration as Wh-movement and focus at S-S⁵:

(13) *Nor_i alaitu zuen_j [[epaileak laster [e]_i askatuko
who make-happy aux judge soon free
zuelako zurrumurruak] t_i t_j?
aux-la-ko rumor
Who did the rumor that the judge would free (him/her)
make happy?

(14) *AINHOA_i alaitu zuen_j [[epaileak laster [e]_i askatuko
zuelako zurrumurruak] t_i t_j?
It is Ainhoa that the rumor that judge would free her
made happy

(15) a. Epaileak laster askatuko zuelako zurrumurruak preso
prisoner
bakoitza izugarri poztu zuen
each

b. (LF) *[preso bakoitza_i [[epaileak laster [e]_i askatuko
zuelako zurrumurruak] t_i t_j]]
The rumor that the judge would free (him/her) made
each prisoner happy

⁵ If the bound pronoun is even more embedded, we still get ungrammatical results:

i. *Nor_i alaitu zuen_j [Ainhoak [[e]_i opari bat egingo
geniola] entzun zuelako zurrumurruak] t_i t_j ?
Who did the rumor that Ainhoa heard that we would give
(him/her) a present make happy?

We thus have conclusive evidence that the ungrammaticality of (1b,c), (2b,c), and (7)-(15) does not arise from a violation of the ASC. The BP and PCOB, on the other hand, would seem to make the right predictions and rule out those examples. There is, however, one way in which Contreras's approach can rule out the Basque data. If the empty category inside the Complex Noun Phrase is identified as a true [-pronominal] variable in the relevant examples, their ungrammaticality can be thought of as a resulting from violations of the mirror image condition to the ASC, namely the Subjacency Condition:

(16) *Subjacency Condition on Non-pronominal Variables*

Non-pronominal variables must be subjacent to their A'-operators.

In other words, if the empty category inside the NP is identified as a non-pronominal variable, it turns out that this variable is non-subjacent to its binder even though the second one is subjacent to the A'-binder. Yet deriving the ungrammaticality of (7)-(15) from Subjacency seems forced by some inconsistency in defining the object gaps as either [+/-pronominal]. Besides, having two non-pronominal variables would force the formation of an A'-chain with two Case-marked positions, which in turn would also violate the condition on CHAINS which requires that they contain exactly one case-marked position. Just like in (17):

(17) **Who_i did you buy that CD player for t_i from t_i?

However, a violation of the type exemplified in (17) yields a more ungrammatical structure than those in (7)-(15). By the same token, a Subjacency account cannot be sustained without also yielding a violation similar to (17). This suggests then an alternative analysis of the WCO examples discussed here has to be considered.

2. WCO versus Antisubjacency

Artiagoitia (1990) argues that genitive phrases in Basque count as PPs. The main argument for that comes from the fact that true anaphors cannot occur inside NPs because the subject of the NP, being in the morphological genitive case, fails to c-command the anaphor. This has the effect of making genitive phrases inside subject NPs antisubjacent to an operator even if we adopt Contreras's reformulation of barriers⁶. However, Basque stills shows this kind of WCO:

(18) *Nor₁ maite du_j bera₁ren amak t₁ t_j ?
Who love aux s/he-gen mother
Who₁ does his/her₁ mother love t₁?

(19) *AINHOA₁ maite du_j bera₁ren amak t₁ t_j ?
It is Ainhoa₁ that her₁ mother loves t₁

(20) a. Bera₁-ren amak ume bakoitza₁ maite du.
kid each
His/her₁ mother likes each child₁

b. *[Ume bakoitza₁ [bera₁ren amak t₁ maite du]]

The fact that the (in this case overt) pronoun is antisubjacent makes the prediction that it can occur as a resumptive pronoun in syntactic islands. This is indeed the case (cf. Artiagoitia 1990):

(21) [OP₁ [bera₁ren txakurrak] aginkatu nauen] baserritarra
s/he gen dog bite aux farmer
The farmer₁ that his/her₁ dog bit me

⁶ Contreras (1989) rejects that notion that subjects are syntactic islands; and further assumes that subjects participate in θ -indexation (i.e. they are generally θ -marked). He defines blocking categories as follows:

i. τ is a BC for β iff τ is not θ -indexed and τ dominates β .

Barrierhood is as in Chomsky (1986). Hence, subject NPs are not barriers.

- (22) Gaur ikusi dut [Op₁ igaz *0/ bera₁-re-kin haserretu
 today see aux last year s/he 'with' get angry
 mutila₁ ⁷
 boy
 I saw today the boy₁ that we got angry with him₁ last year

Moreover, Basque resumptive pronouns are not necessarily restricted to syntactic islands but can also occur in questions in matrix sentences like in Irish and Swedish (see Safir (1986), who cites McCloskey and Sells):

- (23) Nor₁ oparitu dizu liburu bat bera₁-ren amak?
 who present aux book s/he-gen mother
 Who₁ did his/her₁ mother present you with a book?
- (24) Ze baserritari₁ aginkatu zaitu bera₁-ren txakurrak?
 which farmer bite aux s/he-gen dog
 which farmer₁ did his/her₁ dog bite you ?

This suggests that WCO in Basque is independent of Antisubjacency and, ultimately, of the distribution of resumptive pronouns⁸. In fact, some English data also seem to support this view:

⁷ Artiagoitia (1990) claims that the impossibility of relativizing PPs of the type [_{PP} [_{PP} NP P] P] follows from subjacency on the assumption that the two PPs constitute barriers for movement. Thus, simple PPs (= [_{PP} NP P]) allow relativization and resist resumptive pronouns. Complex PPs like the comitative (morphological) case exemplified in (22), on the other hand, resist relativization but allow for the presence of resumptive pronouns.

⁸ WCO effects also obtain in relative clauses for many speakers. The variation in judgement may have to do with the fact that Basque does not differentiate restrictive from non-restrictive relative clauses (de Rijk (1972), Eguzkitza (1986)). However, if a restrictive reading is forced, the sentence is out:

- i. ?? Beraren jabeak erre zuen etxea salgai dago
 s/he-gen owner burn aux house on sale is
 The house that its owner burned is on sale
- ii. Ze etxe dago salgai?
 Which house is on sale?

- (24) Do you remember that kid who_i his_i mother is always complaining to the principal? (Safir 1984: 607)

What is interesting about the Basque data with respect to the Antisubjacency Condition is that the latter seems to make the right predictions for the distribution of resumptive pronouns that cannot surface as empty categories, i.e. in positions where *pro* cannot be licensed. Thus, we need to check what goes on when the bound empty pronoun alternates with an overt lexical pronoun.

3. Covert and Overt Pronouns

We have determined that the ungrammaticality of (1b,c)-(2b,c), (7)-(8) -and (10)-(12)-, all of them cases of WCO, does not arise because Antisubjacency is violated since the bound covert pronouns occurring inside the NP are indeed not subjacent to their A'-operator. We also considered the possibility of treating these gaps as [-pronominal] and saw the inconsistency that such a position would lead us to. A natural step to take is to see what the results are if we replace the covert pronoun by a lexical one. If these gaps were antisubjacent to the operator, we might expect the sentences to be grammatical. This is not the case however:

- (25) *[berak_i [e]_j maite zuen] neskek_j amorante bakoitzak_i utzi
 s/he love aux girl lover each leave
 egin zuen (cf. (1b))
 aux

The girl that s/he loved left each lover

- (26) *[aspalditik [e]_i berak_j ezagutu zuen neskek_i] nor_j utzi
 zuen? (cf. (2c))
 Who did the girl that knew him/her leave?

- (27) *[zein mutil_i engainatu zuen berak_i [e]_j aspalditik
 ezagutu zuen neskek_j ? (cf. (7))
 Which boy did the girl that he knew for a long time

 *Beraren jabeak erre zuena
 The (one) that its owner burned

deceive?

As expected, the same grammaticality judgements obtain in the case of Complex Noun Phrases that do not involve relative clauses, whether movement takes place at S-S or LF. Therefore, we do not find any kind of complementary distribution between covert pronouns (or true variables, if the gaps are identified as [-pronominal]) and lexical pronouns. This, however, does not run counter the Antisubjacency Condition in any way but rather is expected in a null-subject (and null-object) language like Basque.

Luján (1985) has shown that lexical pronouns in null pronominal languages seem to be in complementary distribution with their null counterparts for the purposes of binding by a referential expression that they precede. She formulates this generalization as follows:

- (28) *Universal Precedence Constraint (UPC)*
Stressed Pronouns cannot precede their antecedents
(Luján 1985)

As Luján herself points out, this constraint seems to be related to Montalbetti's (1984) *Overt Pronoun Constraint* that states that overt pronouns cannot be bound to a quantifier if the alternation overt/empty obtains. The two constraints hold in Basque (cf. Ortiz de Urbina 1989). Thus, the ungrammaticality of (25)-(27) follows from the UPC (and maybe the OPC as well) on the assumption that traces of A'-movement are R-expressions. This makes a clear prediction: sentences (1a) and (2a), which contained an empty pronoun correferential with an R-expression in the matrix clause, should be ungrammatical with an overt/lexical pronoun. The prediction is confirmed by the data:

(29) ??[berak_i [e]_j maite zuen neskak_j] Jon_i utzi egin zuen
The girl that he loved left John

(30) ??[[e]_i berak_j maite zuen neskak_i] Jon_j utzi egin zuen
The girl that loved him left Jon

This constitutes evidence that the deviance (25)-(30) has little or nothing to do with any principle governing the distribution of resumptive pronouns but rather arises from the

conditions that govern the alternation between empty/lexical pronouns in a null pronominal language.

4. Summary

We have seen in this paper that WCO phenomena of the type illustrated in (1b,c) and (2b,c) in Basque cannot be accounted for by the ASC because the bound pronoun (*pro*) in those configurations is antisubjacent to its A'-operator. We saw, however, that the ASC correctly predicts the distribution of resumptive pronouns if covert/lexical pronouns do not alternate, that is to say, in positions where *pro* cannot be licensed in Basque. The generalization that we can make is the following: in a Null Pronominal language, the ASC predicts the distribution of resumptive pronouns and the ungrammaticality of WCO cases that do not involve null pronominals; in languages without null pronominals, on the other hand, the ASC seems to be the right principle governing the distribution of resumptive pronouns and ruling out all WCO cases. This predicts that the Spanish counterparts of (1b, c) and (13)-(15), which involve a null subject pronoun, should yield a WCO violation that the Antisubjacency Condition cannot rule out. This is (at least partially) confirmed by the data:

- (31) */?? ¿A quién/qué famoso-a dibujante_i decepcionó el
proyecto que pro_i había diseñado t_i?
Who/which famous painter did the project s/he designed
dissappoint?
- (32) * El periódico para el que pro_i trabaja explota a cada
periodista_i
The newspaper that s/he_i works for exploits every
journalist_i
- (33) ?/?? ¿A quién/ a qué preso-a alegró el rumor de que sería
puesto-a en libertad t_i?
Who/which prisoner did the rumor that s/he be freed
make happy?
- (34) * El rumor de que pro_i saldría pronto de la cárcel alegró
a cada preso-a_i
The rumor that que s/he leave prison soon made happy

every prisoner⁹

Consequently, the theory of grammar still seems to need a separate principle to rule out the cases of WCO that the ASC cannot account for. In the absence of any other alternative, we can assume that the Bijection Principle is this principle. The overlap between the Bijection Principle and the ASC in English would indicate that the latter condition is perhaps too strong as formulated in Contreras (1989), or that the Bijection Principle is somehow dependent on the Null Subject (pronominal) parameter .

⁹ Insofar as Spanish is not a null object language, WCO configurations where the bound pronoun corresponds to an object clitic pronoun should be grammatical. I have found that this is not always the case:

- i. * ¿Qué marca de cerveza₁ adora la persona que la₁ bebe t₁?
Which brand of beer does the person that drinks it adore?
- ii.* La persona que la₁ bebe adora cada marca de cerveza₁
The person that drinks it adores each brand of beer
- iii. ?/?? ¿A qué película₁ favoreció el (hecho de) que John Ford la₁ dirigiera ?
Which film did the fact that John Ford directed it favor?
- iv. *El rumor de que lo/la₁ liberarían pronto alegró a cada preso-a
The rumor that they would free him/her made happy every prisoner

This can be explained if object clitics license null pronouns in object position, i.e. if Spanish behaves in fact like a null object language.

every prisoner⁹

Consequently, the theory of grammar still seems to need a separate principle to rule out the cases of WCO that the ASC cannot account for. In the absence of any other alternative, we can assume that the Bijection Principle is this principle. The overlap between the Bijection Principle and the ASC in English would indicate that either the latter condition is perhaps too strong as formulated in Contreras (1989), or that the Bijection Principle is somehow dependent on the Null Subject (Pronominal) parameter .

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- i. * ¿Qué marca de cerveza₁ adora la persona que la₁ bebe t₁?
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On Blocking Categories*

Perry Mark Atterberry

1.0.0 INTRODUCTION

An important insight in Chomsky's Barriers monograph is that subjacency barriers may not be inherent qualities of certain maximal phrases, but instead may be relative concepts determined by specific structures within a sentence. Prior to 1986, the concept of a bounding node was thought to be an inherent property of a given node. In English, these nodes were thought to be NP and S. One of the problems with such an approach lies in the fact that it requires allowances for exceptions such as:

1. Who do [IPyou see [NPpictures of e_i ?]]

The above sentence crosses both an IP and a NP, but is still grammatical. The inherent barrier approach would require an ad hoc stipulation to deal with such sentences. Chomsky (1986b) showed that a barrierhood could be explained in terms of structural configuration in a way that would apprehend all the data explained by inherent barriers, plus the data that the inherent approach could only explain by stipulation. Unfortunately, the model pursued in the Barriers monograph also required the use of stipulated inherent barriers in order to explain certain subjacency facts. In subsequent investigations, Epstein (1987) and Browning (1986) showed that structures previously thought to be barred by the model were actually derivable within the Barriers framework.

In this paper I will review the model investigated in Chomsky (1986b). Once the framework has been laid out, I will examine those structures that required the introduction of inherent barriers and those structures that have been shown to be derivable within the model, though ungrammatical. In the second part of this paper I will suggest an alternative for determining structural barrierhood that takes advantage of the fact that maximal phrases may be sisters to three different elements: L-marking heads, non L-marking heads, and non-heads. The status of a maximal phrase as a blocking category will rely on this sisterhood relationship, as will the concept of a barrier. This model will account for the data apprehended in the 1986 model, plus offer a structural

* I would like to thank Heles Contreras and Michael Rochemont for their valuable comments and suggestions. All errors are my own.

explanation for the unacceptability of those strings for which the earlier model required inherent barriers or could not account for at all.

1.1.0 THE BARRIERS FRAMEWORK.

1.1.1 MOVEMENT

Chomsky formulates a theory of movement that includes two distinct types: substitution and adjunction. The general properties of substitution are:

2. a. There is no movement to the complement position.
- b. only x^0 can move to the head position.
- c. only a maximal projection can move to the specifier position.
- d. only the minimal and maximal projections are visible for the rule "move α "

For adjunction, Chomsky assumes the following:

3. Adjunction is possible only to a maximal projection that is a non-argument.

This formulation will rule out adjunction to CP, NP or IP, while allowing adjunction to VP, a notion that Chomsky crucially relies upon when analyzing subjacency facts. In support of (3), Chomsky cites Koopman and Sportiche (1982), who argue for adjunction to VP based on properties of quantifier raising at LF, and May (1985), who also suggests VP adjunction to explain scope properties in sentences such as:

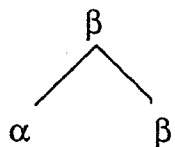
4. a. Who does everyone like?
- b. Who likes everyone?

Chomsky also adopts another assumption concerning adjoined structures: that when a structure α is adjoined to a structure β , α is not dominated by β :

5. α is dominated by β only if it is dominated by every segment of β

When α adjoins to β , β will consist of two segments, only one of which dominates the adjoined structure:

6.



1.1.2 SUBJACENCY

Subjacency is a condition on chains such that:

7. If (α_i, α_{i+1}) is a link of a chain, then α_{i+1} is subjacent to α_i .

The definition of Subjacency is formulated in terms of barriers:

8. β is n -subjacent to α iff there are fewer than $n+1$ barriers for β that exclude α^1 .

Previous to the Barriers monograph, a subjacency barrier was thought to be an inherent quality of a maximal projection. In English it was thought that NP and S were inherent barriers to subjacency. Rizzi (1982) argued that in Italian NP and S' were the subjacency barriers. Chomsky (1986) suggests that the idea of a barrier may be a relative concept in which any maximal projection may be a barrier if certain criteria are met. Chomsky relies on two concepts. The first of these is L-marking, which is a subcategory of Theta-government:

9. Where α is a lexical category, α L-marks β iff β agrees with the head of γ that is θ -governed by α .

10. α theta-governs β iff α is a zero level category that theta-marks β , and (α, β) are sisters.

Using the concept of L-marking, Chomsky defines a Blocking Category (BC):

11. γ is a BC for β iff γ is not L-marked and γ dominates β .

Once a BC is defined, a barrier is defined in terms of the BC.

¹ α excludes β iff no segment of α dominates β .

12. γ is a barrier for β iff (a) or (b):
 (a). γ immediately dominates δ , δ a BC for β^2
 (b). γ is a BC for β , $\gamma \neq IP$

Given this formulation of a barrier, a problem arises. Consider a case of extraction of an object:

13. Who_i did John see e_i?

We immediately encounter two barriers. VP, not being L-marked, constitutes a BC, hence a barrier. IP will then inherit barrierhood by virtue of immediately dominating a BC (see 12a above). Since e_i is 2-subjacent to who_i, theory would judge it to be deviant, which is incorrect. This leads Chomsky to the second crucial concept in his theory. Recall that he claims adjunction to any non-argument maximal projection is an option. Thus movement in (13) is first adjunction to the VP, then substitution to SP(CP), as in (14):

14. Who_i did John [_{VP} e'_i [_{VP} see e_i]]

Now in the first chain-link e_i is 0-subjacent to e'_i, since there is no intervening BC that excludes e'_i. In the second chain-link, e'_i is also 0-subjacent, as there is no BC intervening in this chain, either. VP cannot be a BC for e' because VP does not dominate e'_i. Since VP is not a BC, IP cannot inherit barrierhood. Therefore the sentence is judged to be well-formed by the theory.

1.2.0 PROBLEM STRUCTURES

1.2.1 EXCEPTIONAL CASE MARKING AND SMALL CLAUSES.

Under certain restricted conditions, the specifier of an L-marked category may itself be L-marked. This is accomplished by the Spec-head operation, which allow the head of a category and its specifier to share certain features. Under the Barriers model, only the specifier of a functional head (CP and IP) may be L-marked by the Spec-head agreement operation. SPec-head agreement accounts for the Spanish data from Torrego (1985),

² Immediate domination is a relationship between maximal phrases such that α immediately dominates β iff α is a maximal projection dominating β and there is no maximal projection γ that dominates β but does not dominate α .

in which he shows that an NP can be extracted from a wh-phrase in the specifier position of CP:

15. a. Este el autor [del que]_i no sabemos [CP[α que libros t_j] leer]
This is the author [by whom]_i we don't know [what books t_j to read

Given the definition of L-marking, the subject in (16a)³ and (16b) respectively are L-marked and so are not barriers to movement out of them. Taking (16a) as an example, the wh-element will pass through the NP and AP, adjoin to the VP, then move to the matrix CP with no subjacency violation:

16. a. *Who_i did you consider [IP[_{NP} pictures of e_i][A' attractive]]
b. *Who_i did you believe [IP[_{NP} pictures of e_i] to be on sale]
c. Who_i did you believe [IP e_i to be the best singer here?]
d. Who_i do you consider [_{AP} e_i [A' attractive?]]

Chomsky in fact discusses these structures, which have the structure (17) below (his (44)):

17. a. John V [_{α} NP α]
b. John V [IP NP to VP]

and concludes that the NP above should have essentially the status of an object of the matrix V with respect to extraction. However, the fact that (16 a- b) are ill-formed suggests that the NPs in (17) do in fact behave like subjects and do not allow extraction out of them.

A second problem with positing Spec-head agreement as a factor in subjacency concerns extraction of an NP in the specifier of CP. While this is allowable in Spanish, it must be barred in English:

18. *Whom_i do you believe [CP[PP to t_j]_j Sue wants to speak t_j?

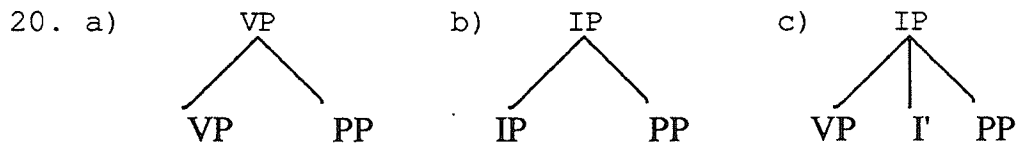
Therefore, we must assume that the role played by Spec-head agreement is parametric; It is barred from consideration in English, but does play a part in Spanish.

³ Chomsky suggests that these small clause structures are IP structures with null inflection.

1.2.2 ADJUNCT CONDITION

19. *Who did you go to the store[pp before talking to e_i]

Chomsky claims that the Adjunct Condition is directly accommodated under his approach. The Adjunct constitutes a BC, therefore a barrier, and IP inherits barrierhood from the adjunct. The facts, however, are not so clear. First, three different opinions concerning the structure of the adjunct must be examined: a) Adjunction to VP, where the VP node consists of two segments, b) Adjunction to IP, the IP also consisting of two segments, and c) , where the IP consists of only one segment, and the adjunct is a sister to the VP.



As Chomsky points out, there are constituency tests that point to adjunction to VP as the correct structure, though he explores only the second and third alternatives. In this paper I assume on the basis of VP preposing and VP elipsis that (21a) is the correct structure for these adjuncts, though for the sake of completeness, this paper will look at all three possibilities. As pointed out in Browning (1987) and Epstein (1987), adjunction to the PP is allowable within the framework of the theory, since it is a non-argument. In this case movement would first be adjunction to PP, then adjunction to VP, and finally substitution to SP(CP). This, according to the theory, should then be grammatical.

21. Who_i did you [_{VP} e_i [_{VP} [_{VP} go to the store] before talking to e_i]]

Even if it were the case that adjunction is barred to CP, IP, and PP as Chomsky suggests, the structure would still be problematic. If we assume that adjunction is a structure-creating operation, then the following configuration arises:



In such a configuration the VP does not directly dominate the PP, and so is not able to inherit barrierhood. In this case there is only one barrier in the configuration and the structure will be judged grammatical. If the

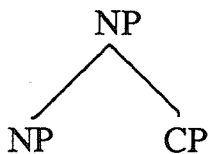
assumption of base-adjunction to IP is adopted, we still cannot obtain the required number of barriers to get a subjacency violation without barring adjunction to PP by stipulation. The IP node will contain two segments, only one of which dominates the PP. Therefore, the IP cannot inherit barrierhood. Only the PP will be a barrier, so the structure is acceptable within the theory. The third alternative, also adopted in Barriers, suffers from the same problem as the other two. The moved element will adjoin to the PP, which means that PP will not be a BC for that element. IP can only inherit if it dominates a BC, so it will not be a barrier, and movement will continue to SP(CP). Unlike the other two structures, this theory of adjunction will yield a subjacency violation if the stipulation of barring adjunction to PP is adopted.

It is clear that the Adjunct Condition cannot be explained in terms of the model explored in Barriers. If (20a) or (20b) is taken to be the correct adjunction structure, the maximal phrase cannot inherit barrierhood, since it will not directly dominate the adjunct. If the inheritance rule is altered to accomodate these structures, it is still possible to adjoin the moved element to the non-argument maximal phrase first, eliminating it as a blocking category. This requires that the adjunction to non-argument rule be altered to bar adjunction to non-arguments if they are PPs. If (20c) is taken to be the correct adjunction structure, this stipulation to the adjunction rule must be posited in order to derive the correct structure to form a barrier.

1.2.3 COMPLEX NOUN PHRASE CONSTRAINT (CNPC)

Under the CNPC we will look at two constructions: the relative clause and complex noun-phrase complements. Chomsky claims that there are two barriers in a relative clause:

23.



CP is not L-marked, so it is a BC and a barrier. NP, he claims, will then inherit barrierhood from the CP. Unfortunately, the NP does not meet the criteria for inheritance (as we have seen in other cases above). In order to inherit, the NP must dominate the CP. It is clear that it does not dominate the CP, but merely includes it. Therefore the structure will follow the same patterns discussed in section (1.3.2) and will be acceptable within the theory:

24. Which book_i did John meet [NP [NP a child] [CP who read e_i]]

Turning to noun complements, consider the following example:

25. *Which book_i did you hear [NP the rumor [CP that Liz read e_i]]

In this sentence it is clear that everything is L-marked, so once the moved wh-element adjoins to VP, it should be allowed to move to the SP(CP) position without causing a subjacency violation. What, then, causes this sentence to be ill formed? Chomsky suggests that a noun may assign oblique case and this might impose some kind of inherent barrier.

1.2.4 WH-ISLAND VIOLATIONS

Within the framework of relativized barriers, it is possible to extract from a Wh-island without violating subjacency:

26. a. *What do you wonder to whom John gave?
b. *To whom do you wonder what John gave?

Take for example (26a); 'to whom' will adjoin to the embedded VP, then move to the embedded SP(CP). 'What' will also adjoin to the embedded VP (unless multiple adjunction to the VP is barred by stipulation), then adjoin to the matrix VP, finally moving to the matrix SP(CP):

27. What_i did you [Vpe"i[Vp wonder[CP[to whom]_j][IP John
[Vpe'i[Vpe'j[Vp gave e_i e_j]]]]]]]]

Given this option of adjoining to the VP nodes, there are no barriers in the chain (to whom_j, e'_j), nor in (e'_j, e_j). The only place a barrier is encountered is in the chain-link (e"_i, e'_i). Only one barrier is encountered, so e'_i is 1-subjacent to e"_i. According to theory, this should be well-formed with respect to subjacency. To account for this, Chomsky introduces the following stipulation: He claims that the most deeply embedded tensed clause in a sentence is an inherent barrier. In English, this clause is an IP, in Italian it is a CP.

1.3.0 SUMMARY

As we have seen, a model which formulates barriers in terms of L-marking alone is inadequate on two fronts; first, it will incorrectly predict the possibility of extraction out of relative clauses and out of adjuncts, and it

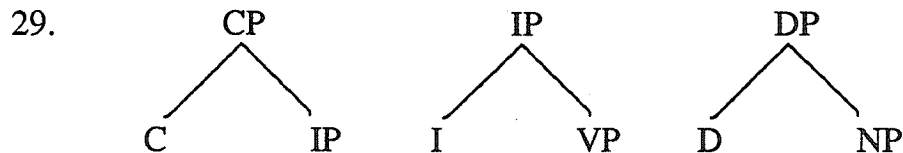
requires the addition of inherent barriers to correctly derive the unacceptability of CNPC extractions and Wh-islands, and the addition of the Spec-head agreement rule to account for small clause and ECM data. While this operation correctly predicts the Spanish data, it yields incorrect results for other languages, such as English. Therefore Spec-head agreement should be viewed as a parameter, and not central to the theory itself. The main problem with the theory is the rule of adjunction to non-argument maximal phrases. As we have seen, this rule must be tightly restricted in order to predict subjacency violations correctly. In fact, this rule may have to be so constrained so as to apply only to the VP node. This, however, is not the kind of rule that fits with the modern principles-and-parameters approach.

2.0.0 REFORMULATION: ASSUMPTIONS

As in Chomsky (1970), it will be assumed that the primitive vocabulary of the grammar includes the category features [+N, +V]. These features allow lexical items to be divided into four categories, the distribution of the features is as follows:

28. [+N,+V] = Adjective
 [+N,-V] = Noun
 [-N,+V] = Verb
 [-N,-V] = Preposition

Heads which bear the above features are lexical heads, while heads which do not bear these features are called functional heads. This category will contain the CP, IP, and DP heads. The possibility of a DP node was first developed in Brame (1981), and later assimilated into the GB framework by Abney (1986) and Fukui and Speas (1985), among others.



The theory of movement assumed in this paper disallows the possibility of adjunction to a non-argument as an option for wh-movement. Only movement by substitution will be an acceptable option.

I will also incorporate into the theory of movement the assumption that the specifier position of a determiner phrase is a possible landing site for movement, as in Fukui and Speas (1986), Fukui (1986), and Suzuki (1988).

As pointed out above, the notion of dominance is inadequate for the formulation of a barrier. In this framework dominance and immediate dominance will be replaced by simple inclusion:

30. INCLUSION: α includes β iff any segment of α dominates β .

It will be shown in section (3) how the notion of inclusion is applied to yield a definition of a barrier that will apprehend the subadjacency data more completely than the model pursued in Barriers.

As in the Barriers monograph, a barrier is assumed to be conditioned upon configurations of blocking categories (BCs). When determining which maximal phrases are BCs, it is important to note that maximal phrases may be in one of three configurations:

31.
 - a. Sister to a lexical head.
 - b. Sister to a functional head.
 - c. Sister to a non-head.

In Chomsky (1986), no distinction is made between (31b) and (31c) when determining whether or not a maximal phrase was a BC. This paper argues that such a distinction is crucial to the determination procedure. The difference between (31b) and (31c) will be argued to be one of two different types of blocking categories. A maximal projection that is a sister to a non L-marking head will be referred to as a Weak Blocking Category (BC), while a maximal projection that is a sister to a non-head will be called a Strong Blocking Category (BC²):

32.
 - a. If an XP is a sister to a lexical head, it is not a BC.
 - b. If an XP is a sister to a functional head, it is a BC.
 - c. If an XP is a sister to a non-head, it is a BC².

Section (3) will look at the relevant data with these definitions in mind.

The analysis will follow the following sequence:

1. Extraction of a subject.
2. Extraction from a subject.
3. Wh-islands.
4. Extraction of an adjunct and from an adjunct.
5. Exceptional Case Marking verbs and Small Clauses.
6. Extraction from prepositional phrases.
7. Extraction of objects and from objects.
8. Non-cyclic movement.

3.0.0 APPLICATION TO DATA

3.0.1 EXTRACTION OF SUBJECTS

The extraction of a subject yields an acceptable sentence:

33. a. Who_i e_i saw you ?
b. Who_i e_i went shopping yesterday?

In these examples we have the following structure:

34. Who_i [_{IP} e_i [_{VP} saw you]]

In the chain (who_i, e_i), only one BC is crossed, the IP. It is clear that one BC in a chain does not constitute a barrier.

3.0.2 EXTRACTION FROM A SUBJECT

In these cases of extraction, an unacceptable sentence does arise:

35. a. *Who_i did [a picture of e_i] fall on the floor?
b. *What_i was [a book about e_i] lying on the television?

In these sentences we find two chain-links:

36. Who_i did [_{IP} [_{DP} e'_i a picture [_{PP} of e_i]] fall on the floor]

In this structure the link (e'_i, e_i) contains one BC, which we have determined cannot constitute a barrier. Therefore the link (who_i, e_i) must contain the barrier. In this link there is one BC, the IP and one BC², the DP. We might claim, then, that the existence of a BC² in a chain constitutes a barrier for subjacency. Alternatively, we might say that a chain-link containing one BC and one BC² constitute a barrier. The former suggestion will be inadequate since as will be shown in the following analysis there are acceptable structures where the chain-link contains a BC². The latter is unacceptable because such a claim runs contrary to Chomsky's assertion that Universal Grammar should not contain counters. The formalization of a barrier that I will present here relies on an inheritance operation acting upon weak blocking categories.

37. XP is a BC^{α+1} for β iff:

- a. XP is a BC in the chain-link of β , and
- b. XP minimally includes γ , γ a BC^α in the chain-link of β .

Referring back to sentence (36), The IP node is a BC and includes a BC^2 , the DP node, so the IP will inherit to BC^3 . I will assume as a working hypothesis that any BC of a strength greater than a BC^2 will constitute a subjacency barrier.

38. a BC^α is a barrier iff $\alpha < 2$

The Barriers definition of subjacency runs afoul of the prohibition against counters in Universal Grammar. The definition of subjacency that I wish to propose is one that determines the degree of the violation based on the relative strength of the dominant BC in a chain link:

39. α is n-subjacent to β iff the most dominant BC in the chain-link (α , β) is of the degree n-2.

3.0.3 WH-ISLAND VIOLATIONS

Wh-islands pose a problem for the definition of a barrier as formulated in section (3.0.2):

- 40. a. *To whom_i did you wonder [what_j John gave e_j e_i]
- b. *What_j do you wonder [to whom_i John gave e_j e_i]

Taking (40a) as an example, the two chains (what_j, e_j) and (To whom_i, e_i) do not contain a BC", so the conditions by which a barrier is formed are not met. The chain of the element that lands at the embedded CP (what) contains two BCs. This cannot constitute a Barrier, since extraction of an object is acceptable (see section 3.0.7). that means that the chain of the element that moves directly to the matrix CP must contain the subjacency violation. This chain contains four BCs; the embedded VP and IP, and the matrix VP and IP. The embedded IP will become a BC^1 , an intermediate blocking category. The matrix VP will then inherit to a BC^2 , and the matrix IP will become a BC^3 , which will constitute a 1-subjacency violation.

Recall that the Barriers approach required the stipulation that a tensed IP is an inherent barrier in English. This is needed to account for sentences such as:

41. a. Which books don't you know where to find?
 b. *Which books don't you know where John found?

This stipulation can be accounted for structurally if a few assumptions about the IP are made. First, we adopt the proposal by Zagana (1982) that the subject of a sentence originates in VP and moves to the specifier of IP only when the IP has case to assign. This means that PRO will remain in the specifier position of VP, since a tenseless IP has no case to assign. We can then make the generalization that the specifier positions of all functional heads are available as intermediate landing sites for wh-movement. Given these assumptions, the structure of (45a) is taken to be the following:

42. Which books_i don't you know [_{CP} where_j [_{IP} e'_i to [_{VP} [_{VP} buy e_i] e_j]

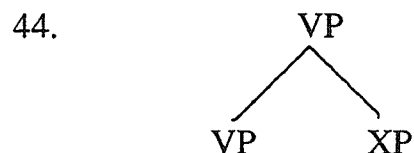
The chain-link (e'_i, e_j) contains only one blocking category, the VP. In the link (which books_i, e'_i) the matrix VP will inherit to BC¹ by virtue of including the embedded IP; The matrix IP will then become a BC², and no subjacency violation arises.

3.0.4 EXTRACTION OF ADJUNCTS AND OUT OF ADJUNCTS

Given the framework now developed, data concerning extraction of an adjunct and out of an adjunct can be explained in a straightforward manner for the three possible structures for base-adjunction that were discussed in section (1.2.2):

43. a. How_i did Liz fix the car e_j?
 b. *To whom_i did they leave [before Liz spoke e_j]?

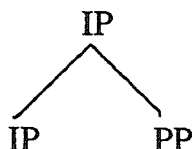
According to the assumptions concerning adjunction to VPs, we have the following structure:



In sentence (43a), movement must cross only two BCs; IP is a BC¹, but there is no BC which includes it, so there is no barrier in the chain (how_i, e_j). In sentence (43b) the chain (to whom_i, e_j) contains two BCs in the adjunct, the VP and the IP. The IP becomes a BC¹ via inheritance from the

VP. The PP⁴ itself is a BC². The matrix VP becomes BC³ via inheritance from the PP, and the IP a BC⁴, so the sentence is 2-subjacent. In cases of adjunction to IP, the maximal phrase of the adjunct will be a BC².

45.



IP, a BC, will be a barrier, making the sentence 1-subjacent. If the hypothesis that adjunction is a sister to VP is assumed (see(20c)), the maximal phrase of the adjunct is still a BC² and the IP will then become a barrier. Note that the three different assumptions concerning base generated adjunction yield different judgements on the unacceptability of the sentence involved. The two different types of IP adjunction yield a 1-subjacent violation, while adjunction to VP yields a 2-subjacent violation. This would seem to offer evidence that adjunction of how is to the VP, since violations of this type seem stronger than 1-subjacent.

3.0.5 ECM VERBS AND SMALL CLAUSES

46. a. Who_i do you consider [e_i intelligent?]
 b. Who_i do you believe [e_i to be responsible for this error?]
 c. *Who_i do you consider [_{AP}[e'_i books about e_i] interesting]?
 d. *Who_i do you believe [_{VP}[e'_i pictures of e_i] to be on sale]?

In cases of exceptional case marking verbs and small clauses there are two separate chain-links to consider; the first is the movement to the SP(DP) position. This moves the element across only one BC, the NP, which is acceptable movement. The second link is the movement from SP(DP) to the SP(CP) position. In this link the DP is a BC². AP is a sister to an L-marking head, so it is not a BC. The VP will become a BC³, since it includes the DP, and the IP will become a BC⁴, so the sentence is 2-subjacent.

⁴ This may not be a PP, but a CP with a prepositional head. The analysis will still predict a deviancy; CP is a BC², and VP and IP inheritance will cause a subjacency violation.

3.0.6 EXTRACTION FROM PREPOSITIONAL PHRASES

Johnson (1988) points out that in some cases in which a prepositional phrase is L-marked, extraction will still yield a subjacency violation:

47. a. *What_i did you put pictures [on e'_i books about e_i]?
b. *Who_i did you give a gift [to e'_i a friend of e_i]?
c. *Who_i were you bothered [about e'_i pictures of e_i]?
d. *Who_i was she angry [at e'_i books by e_i]?

The theory as it stands cannot account for the unacceptability of these structures. Movement to SP(DP) constitutes the chain-link (e'_i, e_i). Movement in this link is across only one BC, the NP, which is acceptable. In the second link, (who_i, e'_i), the DP is a sister to a preposition, and the PP is a sister to V, and so it is not a BC. The IP will then become a BC¹, but this is not enough for a subjacency violation.

Johnson accounts for this by removing prepositions from the category of possible L-markers. Only categories marked [+N] or [+V] are considered possible L-markers. He reformulates Subjacency accordingly:

48. ϕ , ϕ a maximal projection, is a blocking category for β , iff ϕ dominates β and ϕ is not θ -governed by σ , σ lexical.
 μ , μ a maximal projection is a barrier for β iff
a. μ immediately dominates a blocking category for β , or
b. μ is a blocking category for β .

Under this definition the NP dominated by the preposition is a blocking category and a barrier. The PP will then become a barrier via inheritance from the NP.

This idea can be incorporated into the framework presented in this paper in the following way. First, a formal definition of a blocking category will be set forth. Then we define the degree to be assigned to the the blocking category:

49. ϕ , ϕ a maximal projection, is not a blocking category for β iff ϕ is in the chain-link of β and ϕ is the sister to σ , σ lexical; otherwise is a blocking category.
 ϕ , ϕ a blocking category, is weak iff ϕ is the sister to σ , σ functional; otherwise it is strong.

The data in (47) will be explained in the following way: first, since DP is a sister to a preposition, and prepositions are not lexical, NP will be a blocking category. Second, since prepositions are not functional the DP is a BC². The VP will be a BC³ and the IP a BC⁴. The sentences in (47) will therefore be 2-subjacent.

3.0.7 EXTRACTION OF AN OBJECT AND FROM AN OBJECT

50. a. Who_i did you see e'_i a picture of e_j?
 b. *Which book_i did you hear e"_i the claim e'_i that Liz read e_j?
 c. Who_i did you call e_j after hearing the news?

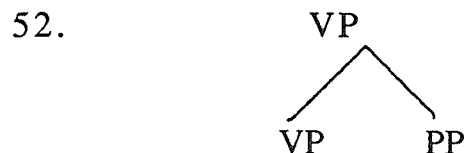
In (50a), the SP(DP) position is available to the moved element as an intermediate landing site, creating two different chain-links, neither of which contains a barrier.

Sentences (50b) poses a slight problem. If we assume that the CP is a complement to the noun, then none of the chain-links in sentence (50b) will contain the correct configuration that would give rise to a barrier. Subsequently, the theory will predict the structure to be acceptable with respect to subjacency, which is clearly wrong. We can predict the deviancy of these sentences if we assume the structure suggested by Stowell (1981), Aoun et al (1987), and Chomsky (1986), who suggest that this is actually an adjunct to the NP. In this case the link (e"_i, e'_i) will contain a barrier. The CP will be a BC², and the NP will be a barrier.

Note that the theory as formulated will make incorrect prediction concerning extraction of an object in sentences containing adjunction structures:

51. With whom did you speak [before leaving the room]?

Given the assumptions thus far, adjunction creates the following structure:



In (51) the first segment of the VP should constitute a BC², and the second node should then become a barrier. The fact that (51) is an acceptable sentence can be accounted for if we assume that in phrases that are comprised of more than one segment, only the highest segment is visible to

any operation. This means that in sentence (55) only the segment that contains the adjoined element will take part in subjacency considerations, and thus we would predict (51) to be acceptable.

3.0.8 NON-CYCLIC MOVEMENT

This section deals with data such as that discussed in Postal (1972). In that article Postal pointed out that prepositions optionally accompany NPs in Wh-movement.

53. a. To whom_i do you believe [_{CP} e'_i Mary wants to speak e_j]
b. Who_i do you believe [_{CP} Mary wants to speak to e_j]

He argues that if this movement is successively cyclic, then nothing bars the preposition from remaining in the specifier position of the embedded CP:

54. a. *Who/Whom_i do you believe [_{CP}[_{PP} to e_i]j Mary wants to speak e_j]
b. *Who/Whom_i do you believe Mary thinks [_{CP}[_{PP} to e_i]j Joan spoke e_j]

In Barriers Chomsky suggests that the specifier position of the CP is somehow marked as to the choice of categories it will accept and that this is what determines whether or not pied-piping occurs. This, however, cannot account for the structures in (54), since the embedded CP could select a PP, while the matrix CP selects a NP. The unacceptability of the structures can be accounted for given the subjacency framework assumed in this paper; the PP is a BC², so the VP will be a BC³ and the IP a BC⁴. The structures above are 2-subjacency violations.

4.0.0 SUMMARY

Given the framework I have suggested, the degree of deviancy caused by a subjacency violation can be deduced strictly in terms of blocking categories, thus there is no need to introduce inherent barriers. First, we determine whether or not a maximal phrase is a blocking category. Second, the degree of the blocking category is established. This is formalized as follows:

55. f , f a maximal projection, is not a blocking category for b iff f is in the chain-link of b and f is the sister to s , s lexical; otherwise is a blocking category.

f , f a blocking category, is weak iff f is the sister to s , s functional; otherwise it is strong.

Second, the relative strength of a blocking category is established relative to other blocking categories in the same chain. This is done in terms of an inheritance operation.

56. XP is a BC^{a+1} for b iff:

a. XP is a BC in the chain-link of b , and

b. XP minimally includes g , g a BC^a in the chain-link of b .

Finally, subjacency is determined based on the degree assigned to the dominant blocking category in each chain-link.

57. a is n -subjacent to b iff the most dominant BC in the chain-link (a, b) is of the degree $n-2$.

This paper has adopted the DP hypothesis, and assumed that the specifier position of any functional head is a possible escape hatch for movement.

Due to such evidence as VP elipsis and preposing, I assume that adjuncts are adjoined to the VP node, creating two segments. For purposes of subjacency, only the dominant segment of a maximal phrase plays a part in the determination of blocking categories and the inheritance operation. All functions associated with a maximal phrase are available to an element adjoined to that phrase.

This simple framework, along with the assumptions made concerning the VP adjunction and noun-complements, is able to account for a wide array of data.

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DIRECT OBJECT DEPENDENT GAPS IN GERMAN

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This paper examines the characteristics of a direct object dependent empty category in the following structure:

- (1) Er hat das Mädchen ohne { e } anzuschauen geküßt.
 { es}
He has the girl without { e } at/to/look kissed.
 { it}
He kissed the girl without looking at (e/her).

Structures like (1) occur in German and Dutch and exhibit the following general properties: the EC is contained in a prepositional adjunct (*ohne...zu*) and alternates with a pronoun. The content of both, the EC and the pronoun, is determined by the direct object (das Mädchen) of the matrix verb (küssen) which needs to precede the EC containing adjunct. Assuming standard X-Bar theory, these general characteristics lead in a first approximation to the following structure for the verb phrase under (1):

- (2) [vp [v, das Mädchen [pp ohne [IP PRO { e }
 { es }
 anzuschauen]] geküßt]]]

One way of dealing with this particular EC has been to interpret it as a parasitic gap (pg). Bennis/Hoekstra (1985) for Dutch and Felix (1985) for German suggest that the direct object (DO) moves from its basic position as sister of V^0 to a non-argument position. According to this approach, the moved DO thus heads an A-Bar chain which is capable of licensing a pg.

In the following discussion, I will show that a variable approach to DO-dependent gaps fails to account for their properties. I claim that ultimately the hypothesis that a DO-dependent null element is a variable lacks empirical justification. I will argue that licensing conditions for DO-dependent null elements cannot be decided by the fact that direct objects can occur in non-argument positions. We will see that DO-dependent gaps depend on verb-object relations. I claim that DO-dependent ECs are null objects which need to be formally licensed and sufficiently identified by case assignment through a verbal head.

This paper has greatly benefited from suggestions and comments by Heles Contreras, Joe Emonds, Michael Gamon and Karen Zagana. I am very grateful to all of them.

The discussion is organized as follows:

In section I, I look at the binding-theoretical status of the EC and discuss a null operator analysis of DO-dependent gaps.

Section II investigates the effect of verb movement and case requirements on the gap and its antecedent.

In section III, I discuss the implications of a *pro* account for DO-dependent gaps along the lines of Rizzi (1986) for Italian *pro_{arb}*. I argue that most of the characteristics of DO-dependent gaps can be accounted for if we take the null element as an instance of little *pro* licensed by a case assigning verbal head.

I. THE FORMAL STATUS OF DO-DEPENDENT GAPS

Structures which contain a DO-dependent gap such as (1) can be formalized as follows:

- (3) [IP NP_j...[VP..NP_i [VP [PP ohne [IP.PRO_j e_i V]
[v' V_{matrix}]]]]]

with NP_i being the antecedent object. In terms of the features [+/- pronominal] [+/- anaphor], it is immediately obvious that the EC cannot have the features [+anaphor, -pronominal]. Traces [+anaphor, -pronominal] need to have a possible antecedent within their governing domain. The governing domain for the dependent gap is the IP under PP. [IP,PP] does not contain a possible antecedent for the EC, excluding [+anaphor, -pronominal] as characterization for the DO-dependent gap. The feature combination [+anaphor, +pronominal], which gives us big PRO, also can be excluded because the dependent gap functions as the direct object of the embedded verb. The EC is therefore governed. Big PRO, however, by standard assumption, is ungoverned. Given these facts, we now know that the DO-dependent gap in (3) neither qualifies as trace nor as PRO. This leaves us with two possible subcases namely little pro [-anaphor, +pronoun] or variable [-anaphor, -pronoun]. In section III of this paper, I will discuss the option of little pro in object position. Here, we have to look at the possibility for the EC to be a variable. If the EC is a variable, it has to be bound by an operator. If so, we have to look at two possibilities. A: the EC can be bound by the direct object itself assuming that it has been moved into an A-Bar position (Bennis, H./Hoekstra, T. (1985), Felix, S. (1985)) or B: the EC is bound by a null operator within the adjunct clause which in turn is bound by the direct object in A-Bar position. Let me first look at the latter possibility.

In order for the EC to be locally bound by a null operator, the adjunct clause has to be a CP:

- (4) [pp [cp Op_i [IP PRO...ec_i...V]]]

Given that the adjunct clause in (4) is a CP, we can expect that wh-movement inside of the adjunct clause should be possible. This prediction is false, as (5) shows:

(5a) indicative:

Er hat den Brief [anstatt ihn dem Boten zu geben]
he has the letter[instead of it_{acc/masc} the_{dat/masc}
messenger to give]
weggeheftet.
awayfiled.
He filed the letter instead of giving it to the
messenger.

- (5b) question with wh word in situ
 Er hat den Brief [anstatt ihn wem zu geben]
 weggeheftet?
 he has the letter[instead it_{acc} who_{dat} to give]filed?
- (5c) question with the wh word in the CP of the adjunct
 *Er hat den Brief [anstatt wem_i ihn t_i zu geben]
 he has the letter[instead who_i it t_i to give]
 weggeheftet.
 filed.

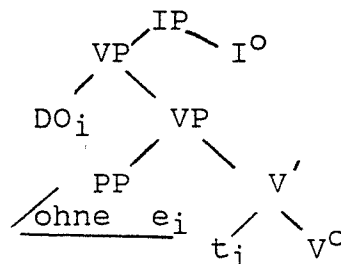
The difference between the grammatical (5b) and the ill-formed (5c) lies in the movement of the wh word. In (5c), the landing site of wem is SPEC of the embedded CP.

(5c) should be well formed if the embedded clause is a CP. If, however, the embedded clause is a bare IP, the ungrammaticality of (5c) is expected. With the embedded clause as bare IP, the adjunct does not contain a landing site to allow for internal wh-movement and PP internal movement will result in ungrammaticality.¹

In summary, the ill-formedness of (5c) leads me to conclude that the EC containing adjunct clause is a bare IP which excludes a null operator as a possible antecedent for the EC.

Nothing, however, prevents us from having the EC bound by the direct object directly, if we assume that the DO has been moved to a A-Bar position as shown in (6):

(6)



In proposing this structure, Bennis/Hoekstra (1985) and Felix (1985) have suggested that DO-gaps are regular parasitic gaps. The A-Bar chain created by DO movement binds the additional variable in the adjunct clause.

In the next section, I argue against this analysis. I will illustrate two properties of DO-dependent gaps which are not shared by parasitic gaps. The first property concerns effects of verb movement, and the second deals with case requirements on the null element and its antecedent.

II.1 EFFECTS OF VERB MOVEMENT

In this section, I will look at the effect of verb movement on the acceptability of the null element. Consider (7):

(7a) weil er das Mädchen[ohne { e } anzuschauen] küßt.
 { es }
 because he the girl[without { e } at/to/look]
 kissed.

(7b)* Er küßt_i das Mädchen_j[ohne { e } anzuschauen] t_j t_i.
 he kissed_i the girl_j[without { e } at/to/look] t_j t_i

Structures with the matrix verb moved to a higher head (7b) do not allow DO-dependent ECs. This effect does not occur with regular pgs. Consider (8):

(8) Wen_j küßt_i er[ohne { e } anzuschauen] t_j t_i.²
 {*sie }
 who_j kissed_i he[without { e } at/to/look] t_j t_i.
 { it }

In (8), we have two adjacent traces at the V'-level. T_j is the licensing variable for the pg in the ohne clause. V_i results from verb movement to C⁰. As (8) shows, verb movement does not interfere with wh-extraction, as verb movement in general does not interfere with empty NPs (Koopman, 1984). Going back to (7b), we therefore can be relatively certain that verb movement does not trigger any ECP-effect for the licensing trace t_j. (7b) also fulfills the requirements on pg-binding, as they have been discussed in section I. However, the EC in the prepositional adjunct is still not acceptable in a V2 structure, with two exceptions. V2 movement agrees with DO-dependent null elements if the matrix verb is separable. This means that only the verb stem will be raised by V2 movement, while its prefix will remain in situ. (9) illustrates this point:

(9a) Er schmeißt den Brief [ohne {e} zu lesen] weg.
 he throws the letter [without {e} to read]away.

(9b) * Er unterschreibt_j den Brief_i [ohne {e} vorher zu
 lesen] t_i t_j.
 he signs_j the letter_i[without {e} before to
 read] t_it_j.

Both sentences under (9) have V2 structure, what distinguishes the grammatical (9a) from the ill-formed (9b) is that the prefix weg left behind under the V-node precedes the verb trace in (9a).

Consider next the following contrast:

(10a)

* Er betrachtet_i das Paket_j ohne {e} zu öffnen t_j t_i.
 he looks at_i the packet_j without {e} to open t_j t_i

(10b)

Er stellt_i das Paket_j ohne {e} zu öffnen auf den
 Tisch t_j t_i.
 he puts_i the packet_j without {e} to open on the
 table t_j t_i

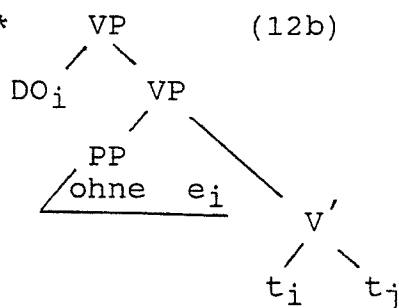
(10a) is a V2 structure and therefore disallows gaps in the adjunct. In (10b) the matrix verb subcategorizes not only for a direct object but also for the locative auf dem Tisch. With this locative intervening between the direct object and the matrix verb a DO-dependent gap is grammatical. More precisely, this effect will only occur if the intervening locative is an argument of the matrix verb. For example look at (11):

(11) * Er küßt das Mädchen[ohne {e} anzuschauen] in der
 he kissed the girl[without {e} at/to/look] in the
 Gartenlaube.
 arbour.

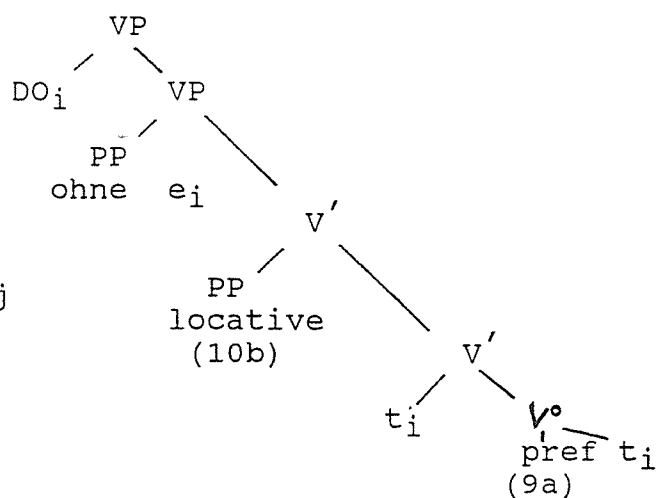
In (11), the verb küssen is in verb-second position and the locative in der Gartenlaube is a non-selected locative. This structure is ill-formed, showing that the material intervening between the DO, the adjunct and the verb trace needs to be a second argument of the matrix verb.³

In summary, the structural difference between (9a/b) and (10a/b) is the following:

(12a) *



(12b)



(corresponds to (9b)&(10a))

(corresponds to (9a)&(10b))

The generalization that emerges at this point is that object dependent ECs are grammatical only if the V-Bar is not totally empty. To make structures such as (12b)

grammatical, V-Bar needs to contain an argument of V^0 or parts of V^0 left behind by V2 movement.

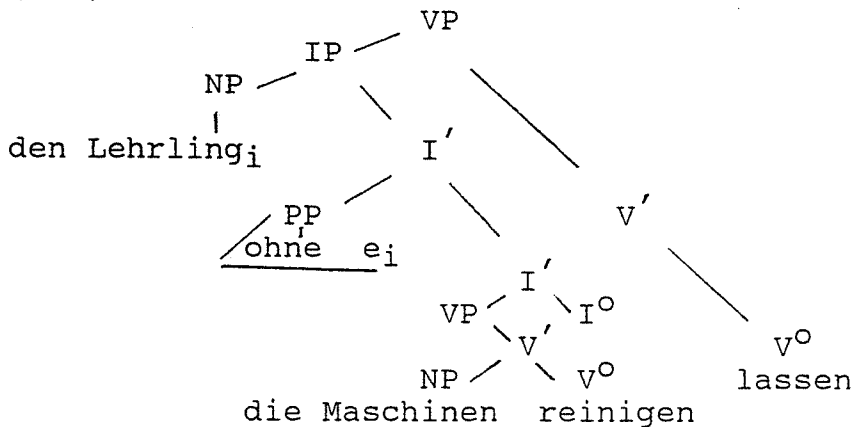
Finally in this section, we should look at null elements in causatives with the verb lassen. Interestingly enough, we will see that V2 movement is allowed if the EC containing adjunct is part of a causative structure. Consider (13):

(13a) Ich habe [_{IP} den Lehrling [_{pp} ohne {e} anzulernen] die Maschinen reparieren] lassen.
 I have [_{IP} the (masc/acc) apprentice [_{pp} without {e} to train] the machines] repair] let.

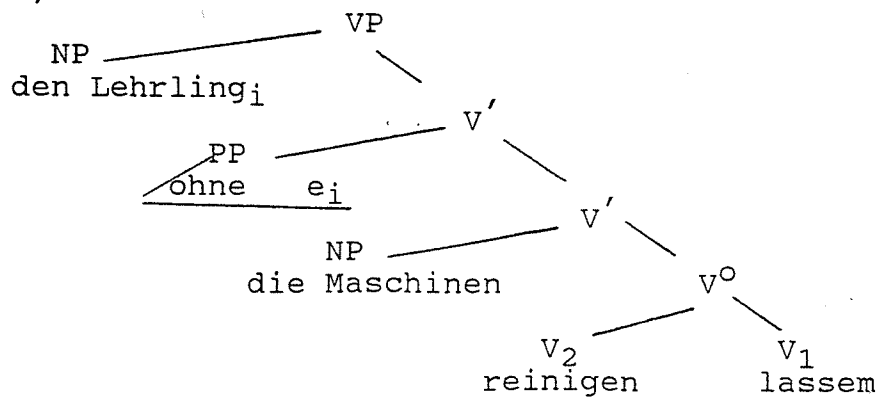
(13b) Ich lasse_j [den Lehrling [_{pp} ohne {e} anzulernen] die Maschinen reparieren] t_j.
 I let_j [the (masc/acc) apprentice [_{pp} without {e} to train] the machines] repair] t_j. 4

The noun phrase den Lehrling is the external argument of the verb reparieren in the embedded sentence. The matrix verb lassen assigns accusative to the external argument of the embedded clause. Of importance for the analysis here is that lassen subcategorizes for one internal object role which can only be given to an IP. For clarification of the verb phrase internal structure before and after reanalyses look at (14):⁵

(14a)



(14b)



Let us look at (14b). As generally assumed for German and Dutch causatives, (for reference see Stechow/Sternefeld (1988)) the embedded and the matrix verb form a verbal complex under V^0 . Given that (14b) reflects the structure of German causatives, matrix verb movement in causatives will not vacate the V^0 node since the embedded verb remains under the newly created compound V^0 .

We will come back to causative structures in section II 2 of this paper.

To sum up: While regular parasitic gaps are not affected by V2 movement, the DO-dependent gaps are sensitive to V2 movement. A parasitic gap account of DO-dependent null elements has nothing to say about this phenomenon. We saw that DO-dependent ECs can only occur in V2 structures, given two general conditions (a) the V-Bar node is not empty, but contains lexical material which needs either to be selected by or be part of the matrix verb or (b) the EC containing adjunct is part of a in causative structure. In this case, verb movement will not lead to an empty V^0 node.

In section III of this paper, we will see that after V-movement the licensing conditions on DO-dependent ECs as stated under (22) in section III are violated. The two possible cases of grammatical DO-dependent gaps in V2 structures, on the other hand, obey the conditions on null-object licensing as stated under (22).

II.2 CASE REQUIREMENTS

In this section, I look at the case requirements on the DO-antecedent and its anaphor. A wh-operator in regular pg-constructions as well as the DO-antecedent obey certain restrictions on the case they and their anaphor can be assigned.

In general, the antecedent and the dependent EC need to be assigned the same case. Consider (15)

- (15a) * Wen_i hat sie anstatt {e} zu glauben t_i angeklagt.
who/acc_i has she instead of {e/dat} to believe t_i
accused.
- (15b)* Er hat den Verletzten_i ohne {e} zu helfen t_i
liegenlassen
he has the injured_{acc/i} without {e/dat} to help t_i
left.

In (15a), the operator carries the morphological marker for accusative, which stands in conflict with the dative case assigned by the verb glauben to the dependent EC. The corresponding situation for DO-antecedents is shown in (15b). Here the morphological case of the structural object conflicts with the dative case assigned to the gap by the verb helfen. So neither the operator nor the object antecedent allow a case conflict between their own case and the case of their anaphor. The following fact is even more interesting. While wh-operators are not limited in the case they carry so long as this case agrees with the case assigned to their EC anaphor - object dependent ECs can only be dependent on objects marked for accusative. Look at the paradigms under (16) and (17):

- (16) Wem_i hat er anstatt {e} zu glauben t_i mißtraut.
who_{dat/i} has he instead of {e/dat} to believe t_i
mistrusted.
- (17a)* Sie hat dem Freund anstatt {e} zu mißtrauen
geholfen.
she has the_{masc/dat} friend instead of {e/masc/dat}
to mistrust helped.
- (17b) * Das Kind hat der Mutter ohne {e} zu glauben
gehört.
the child has the_{fem/dat} mother without {e/fem/dat}
to believe obeyed.

In (16), a parasitic gap construction, the wh-operator is marked for dative, and so is the variable in the adjunct. In both examples under (17), the object antecedent is marked for dative, and so is the null element but now the structure is unacceptable. What we see can be summarized as follows: PG structures in German are not restricted by whatever morphological case is carried by the operator so long as no case conflict is created between the case carried by the

operator and by the additional variable. Object dependent null elements however are only licensed by direct objects. Needless to say, this result is rather surprising if we take the DO-dependent gap as just another instance of a regular parasitic gap.

But there is more to it than we have just seen. Let us again look at causatives which contain null elements. For convenience, the causative under (13) is here repeated as (18)

- (18) Ich lasse_j[_{IP} den Lehrling[_{pp} ohne {e} anzulernen]
I let_j [_{pp} the_{masc/acc} apprentice [_{pp} without {e}
to train
die Maschinen reparieren] t_j
the machines repair] t_j

We saw that the null object antecedent in (18) is the external object of the embedded clause. Throughout the derivation, the case assigned to the null element by the verb in the adjunct is accusative. Therefore in deep structure the case of the antecedent noun phrase and the dependent null element conflict, a configuration which should lead to ill-formedness. At S-structure, however, the matrix verb assigns its internal object role to the deep structure external object, so that the structure under (18) does obey the case requirements, but only at S-structure. What (18) consequently helps us to see is that the case requirement for DO-dependent gaps needs to be formulated as follows: Only arguments which are assigned the internal object role at S-structure allow null elements to be dependent on them.

In conclusion, I would like to briefly recaptulate what has been said so far. I examined the proposal that DO-dependent gaps are structures in which an antecedent in A-BAR position binds an additional variable (parasitic gap). We saw that on the basis of a variable account for the null element, the influence of V2 movement would be totally unexpected. We further saw that a variable account predicts that every argument of the verb is able to license a parasitic element, so long as no case conflict is created. Contrary to this expectation, only arguments which are assigned the internal direct object role at S-structure have the capacity of licensing null elements in adjunct clauses.

My next step is to ask if DO-dependent gaps fulfill the licensing conditions for little pro. We have excluded PRO and trace as characterizations for the DO-dependent gap. I also have demonstrated that a standard variable account leaves us short of an explanation for the main characteristics of DO-dependent gaps. According to the theory of null elements, we are forced to say that the EC under investigation must be little pro in object position. Section III of this paper will evaluate this possibility.

III. LITTLE PRO IN OBJECT POSITION

Rizzi and others (Rizzi 1986, Farrell 1990) have argued that null pronouns may not only occur in subject position in pro-drop languages, but also in object position, where they need to be identified by features on a governing head (Identification Hypothesis). Rizzi considers it necessary to distinguish between formal licensing conditions on *pro* and the recoverability of its content. He proposes that *pro* needs to be formally licensed through case assignment by a head. The crucial difference from the licensing conditions as they are formulated in the ECP is the reference to case assignment.

Suppose now that the null element in German is little *pro*. The head immediately governing the EC is the embedded verb. It is a sufficient governor in terms of the ECP, but let us say that it does not guarantee recoverability of the content of little *pro*, and therefore does not suffice as a licensing governor of *pro*. Let us then assume that a null-object in German is only licensed iff (first approximation):

- a) it is contained in the governing domain of a verbal head

and, furthermore, that

- b) this verbal head needs to assign case to an overt object c-commanding the null-object.

On the basis of this proposal, we expect that the following conditions will lead to a violation of null-object licensing as just defined:

1. The null-object is outside of the governing domain of its licensing verbal head.
2. The null-object is dependent on a noun phrase which does not receive case directly from the verb

Indeed, it seems as if these possible violations of *pro* licensing can account for the data presented in section II of this paper. Let me first look at violation (2).

Violation (2) states that only arguments which receive their case directly from the verbal head will license null-objects in German. We saw in section II.2 that this is the case. Accusative is the only case which is assigned directly by the verbal head. Of the two major cases assigned inside the German verb phrase, it is only accusative which allows dependent null objects.

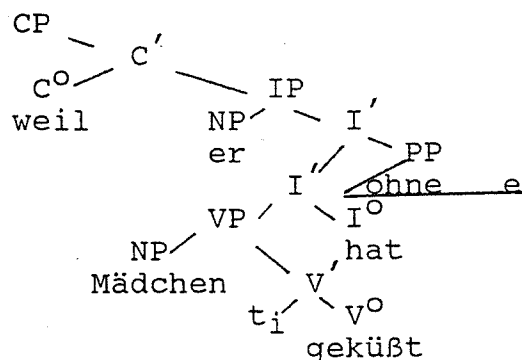
The insight we gained by looking at causatives is that it is not essential what case the argument carries in deep structure. What qualifies a noun phrase as null object antecedent is its case at S-structure, so that a noun phrase is a possible null object antecedent only if it is assigned accusative by its verbal head at S-structure.

Let us now look at the first possible violation of null object licensing under (1). (1) states that null-objects cannot occur outside the governing domain of the verbal head. Recall that null elements as the ones discussed in this paper occur in German and Dutch. Both languages are right headed so that the governing category of the verb is the VP internal domain to the left of the verbal head. The verbal head essential for licensing the EC in the adjunct is the matrix verb. If the EC occurs outside of the governing domain of the matrix verb, condition (a) of null-object licensing should be violated. This is indeed the case. Consider (19):

- (19a) weil er das Mädchen ohne {e} anzuschauen geküßt hat.
 because he the girl without {e} atlook kissed has.
- (19b)* weil er das Mädchen geküßt hat ohne {e} anzuschauen.
 because he the girl kissed has without {e} atlook

In the ungrammatical (19b), the EC containing adjunct appears to the right of the finite verb and therefore outside of the governing domain of the verbal head. Following our stipulations, the ungrammaticality of (19b) is based on a violation of null-object licensing. We need, however, to consider another possible source for the unacceptability of (19b). A constituent that appears to the right of the sentence-final verbal complex will be higher in the tree than the VP internal arguments. For structure look at (20):

(20)



(20) shows, that an adjunct which stands to the right of the verbal group will always be attached higher than a direct object that is part of the VP. It seems therefore as if the ungrammaticality of (19b) could be accounted for by loss of control between the DO-antecedent and the null-element in the adjunct. This is not the case. Consider (21):

- (21)* Das Mädchen hat er geküßt ohne {e} anzuschauen.
 The girl has he kissed without {e} atlook

In (21), the antecedent argument is topicalized and should by all means c-command the EC containing adjunct. (21) is,

however, ungrammatical. Given these facts, I like to conclude that c-command between the null element and its antecedent is not sufficient to license null objects in German. The null object needs to be controlled as well as it needs to be contained in the governing domain of its matrix verb.

More subtle is the case of verb movement. We know that case assignment takes place under government. We further saw that null elements can only be dependent on arguments which are direct objects at S-structure. Given these facts, what we need to say then is that the content of null elements is only recoverable when direct case assignment through the lexical verb holds at S-structure. Consequently, government also needs to hold at S-structure. This condition is violated after verb movement. The verb in C⁰ position governs its argument in deep structure but it does not govern it at S-structure, thus violating recoverability conditions on little pro. But if case assignment at S-structure is only guaranteed by the matrix verb remaining in situ how do we then account for cases of null objects in V2 structures? Recall that we saw two conditions under which V2 movement and null objects may occur in the same sentence. The first condition is that V-Bar is lexically filled at S-structure, and the second condition is that the empty object is contained in a causative structure. I will now look at these conditions successively.

We saw in section II.1 of this paper that empty objects are acceptable after V2 movement, if V-BAR contains an argument or a prefix of the moved verb. Non-selected material under V-BAR clearly does not suffice to guarantee grammaticality of null-objects in V2 structures. Given these facts, I tentatively suggest that the recoverability condition on null-objects can be satisfied in two ways:

- a) through a case assigning verbal head in situ which is given in verb final constructions or, for V2 structures,
- b) through a case assigning V-BAR node with the feature [+case].

I propose that V-BAR functions as a lexical governor and carries the feature [+case] at S-structure if it contains part of the case assigning head or a constituent marked for case by the verbal head.

The second condition under which null objects agree with moved verbal heads is fulfilled in causatives. Under standard assumption, causatives in German are derived through reanalyses. After reanalyses, the embedded and the matrix verb form a verbal complex. Movement of the matrix verb, consequently, will not result in an empty V^0 node and the null object will still be governed at S-structure.

We are now in a position to specify the licensing conditions on null-objects. Null objects of the kind discussed in this paper are only licensed as stated under (22):

- (22) An object dependent empty category in German is licensed iff
 - a) it is contained in the governing domain of a verbal head,
 - b) which assigns case directly to an overt object c-commanding the EC.
- a) and b) apply at S-structure.

CONCLUSIONS

In this paper, I have argued against a parasitic gap analysis. DO-dependent ECs in German crucially differ in their behavior from regular parasitic gaps in the following ways: they may not occur outside of the governing domain of the matrix verb, they are sensitive to verb movement, and obey case requirements distinct from those applying to parasitic gaps. I have proposed that DO-dependent gaps are instances of little pro, licensed only if they occur inside the governing domain of a matrix verb that assigns accusative to a overt noun phrase c-commanding the null object (recoverability condition). This paper shows that sensitivity of null-object structures to verb movement and the behavior of null-objects in causatives can be explained through violations of the recoverability condition on null-object licensing.

NOTES:

1. Another possible explanation for the ungrammaticality of (5c) is to say that the embedded adjunct is a CP.

Wh-movement is, however, not possible because the SPEC, CP is not specified for overt wh-operators. If so, the adjunct could still contain a null operator binding the gap. This is, however, not a tack I want to take.

2. The asterisk in front of sie indicates a weak-cross-over effect.

3. These results immediately raise the question whether other arguments selected in addition to the direct argument can cause the effect seen for the locative. Results are rather unclear:

(i) ? Das Gericht bezichtigte den Mann anstatt {e} freizusprechen des Betrugés.

The court accused the man instead of {e} to absolve of fraud.

Here the additional genitive des Betrugés seems to improve the structure somewhat. However, the effect is not the same as for selected locatives.

The different effect on the acceptability of DO-dependent gaps caused by different arguments of the matrix verb definitely needs more attention than it has been given in this paper.

4. As expected, it is also possible to make an EC containing adjunct dependent on the embedded internal argument and raise the matrix verb. This is a configuration which, outside of causatives, leads, as we have seen, to ungrammaticality:

(i) Ich lasse_j [die Maschinen [ohne {e} zu reinigen] reparieren] t_j.

I let_j [the (fem/pl/acc) machines [without {e} to clean] repair] t_j.

The explanation for the above phenomenon will be the same as the one given for the embedded external object.

5. For the structures of causatives, I have adopted the analyses of causatives presented by Stechow/Sternefeld in Bausteine syntaktischen Wissens (1988)

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A Syntactic Approach to Word Order in Italian

L. Casa

1. Introduction

In this paper I will argue that variations in the position of NPs observed in Italian result from specific restrictions on the category NP. This conclusion challenges previous work which identifies pragmatic considerations as the determining factor for the order of elements in a sentence. On the basis of my findings concerning NPs in Italian I reject the claim that pragmatic considerations drive the syntax or that sentential word order is determined by a comprehensive rule. Surface word order is instead, an epiphenomenon-- the end result of the sum total of requirements on specific syntactic categories.

My argument will be presented as follows. In section 2 I will give a list of sentences illustrating the variation in the distribution of NPs in Italian and indicate the structures relevant to this discussion. In section 3 I will discuss the arguments concerning word order from Antinucci and Cinque, 1977, and demonstrate the inadequacies of the analysis which relies on the pragmatic notion of 'new information' as the determining factor in the ordering of elements. In section 4 I will present my analysis of the distribution of subject NPs in Italian. I first identify a correlation between position and contrastiveness of subject and object NPs and then demonstrate that, in the case of subjects, this relationship is sensitive to the feature of definiteness. In my discussion of these points I will identify a number of conditions on contrast structures in Italian. Based on this combination of syntactic rules and contrast conditions we can predict the variation in word order and account for the ungrammaticality of non-existent forms. Section 5 will summarize the liabilities of the 'new information' approach and the advantages of the 'contrast position' proposal in understanding word order. Finally, I conclude that the results of this research provide evidence against the pragmatic approach, arguing instead for a syntactic explanation of word order in Italian.

2. NPs in Italian

The following are some possible structures involving NPs in Italian:

- (1) Marco mangia (la mela).

Marco eat 3sg the apple

S V O

La mela mangia Marco.

O V S

Mangia la mela Marco?

V O S

There exist other structures, examples of which are given below:

- (2) a. La mela, la mangia Marco.

O O clitic V S

- b. E' arrivato ieri, Marco.
be 3sg arrive(pp) yesterday S
- c. E' arrivato con i fiori in mano,
arrived 3sg with the flowers in hand
- d. ieri, Marco

I will not consider structures such as those given in 2.2 in this discussion. These sentences provide interesting data concerning syntactic restrictions on word order, but a full discussion of the issues raised by these examples goes beyond the range of this paper. I will limit my discussion to the data presented in 2.1. My intent is to consider these sentence types with reference to the surface word order and the relationship between grammaticality and semantic interpretation.

3. The Pragmatic Approach

3.1 The Given/New Information Analysis

Much previous work on word order relies on a distinction between 'given' and 'new' information. For decades linguists have appealed to this analysis as an explanation for variations observed in languages which are said to exhibit 'free' or 'flexible' word order. References to the given/new analysis continue to appear in work on a wide range of topics but the fundamental arguments for this analysis are rarely subjected to fresh scrutiny. For this reason I will examine in detail arguments in favor of the given/new analysis as presented in Antinucci and Cinque 1977 (henceforth A and C).

A and C first demonstrates the flexibility of word order in Italian and argues that any order of elements is possible given the proper context. Finding no identifiable syntactic principles to account for the data, the authors conclude that word order in Italian is determined not by the grammar, but by discourse considerations. A and C claim that elements in a sentence appear in groupings of all 'given information' followed by all 'new information' with only one point of transition between these groups: the two types of information are never interspersed. The authors further claim that sentences containing all 'new' information reveal the basic word order for Italian.

3.2 Limitations of the Given/New Analysis

This analysis is flawed because it cannot account for the full range of the data. The authors' claim concerning the flexibility of word order in Italian is accurate only for some sentences. It is based on data such as that given below. (A and C's 29 and 30)

- (1) a. Che fa Giovanni?
what does Giovanni?
What is Giovanni doing?
- b. Giovanni viene.
Giovanni comes.
- c. *Viene Giovanni.

(2) a. Chi sta correndo, adesso?

who is running now

b. Sta correndo Giorgio.

c. *Giorgio sta correndo.

Such examples are presented to demonstrate that the solicited, or 'new' information follows the assumed, or 'given' information. Thus, in asking the question Chi sta correndo, adesso? 'Who is running now?' the speaker presupposes that someone is running and in the answer this will appear as 'given' information. The identity of the runner is 'new' information. In this analysis the given/new distinction determines the order of elements in a sentence. While this approach can account for the simple sentences shown above, it fails to explain slightly more complex data:

(3) a. Chi mangia gli spaghetti col cucchiaio?

Who eats spaghetti with a spoon?

b. Franco mangia gli spaghetti col cucchiaio.

c. *Mangia gli spaghetti col cucchiaio Franco.

(4) a. Chi parla? Who is speaking?

b. Tutti parlano. Everyone is speaking.

c. Parla Marco. Marco is speaking.

(5) a. Come sei arrivata a Roma.

How did you get to Rome?

b. Sono arrivata a Roma in macchina

I got to Rome by car.

c. Ho guidato la macchina a Roma.

I drove (the car) to Rome.

d. *A Roma ho guidato la macchina.

In Rome I drove the car.

(6) a. Carlo prepara la cena, vero?

Carlo is making dinner, right?

b. No, Marco prepara la cena, Carlo lava i piatti.

No, Marco's making dinner Carlo's doing the dishes

(3) ought to be parallel to (2a) since both questions assert a particular activity and ask for the identity of the subject. In both cases the subject is the 'new' information yet the response in (3b) does not mirror that in (2b). Similarly, the answers to (4a) should follow the pattern seen in (2b) since the questions are parallel, yet the results are not the same. The given/new hypothesis cannot explain the difference between (4b) and (4c). In (5a) the question 'how did you get to Rome' is asked and (5b) and (5c) give potential answers. Note that only (5b) exhibits the expected given/new order even though (5c) is a pragmatically equivalent answer to the same question. Moreover, (5d) attempts to reorder the elements present in (5c) to conform with the given/new order and, though grammatical, (5d) is not a possible response to (5a). In (6a) the question asserts that a particular individual is performing a specified activity. Consider the answer in (6b). Which elements are given (G) and which new (N)?

(6) b'. No, Marco prepara la cena, Carlo lava i piatti.

N G G N

The answer not only violates the ordering of given information and new information, but also intersperses the two categories.

The data shown above demonstrate the failure of the given/new analysis to account for a number of facts. (3) reflects limitations on the postposing of subjects, (4) exhibits an asymmetry within subjects which must be accounted for, (5) demonstrates that information contained in certain types of grammatical structures cannot comply with the model and (6) raises the problem of isolating 'new' information. An analysis which relies on the distinction between given and new information cannot account for these sentences.

3.3 Exceptions to the New Information Rule

Sequences which violate the proposed order are far from rare. In Italian numerous structures have obligatory word order which does not follow the given/new pattern. While it is true that answers to simple questions exhibit the given/new ordering of elements, the questions themselves do not.

- | | |
|----------------------|-------------------------|
| i . Cosa fa Marco? | Marco studia. |
| What is M.doing? | Marco is studying. |
| ii. Dove vai? | Vado al cinema. |
| Where are you going? | I'm going to the movies |
| iii. Chi arriva? | Arriva Zampano'. |
| Who's coming? | Zampano'is coming. |

The imperative structure also violates the given/new order. In fact, non-finite structures involving clitics will routinely violate this order since the position of the clitic is strictly limited. Clitics must follow infinitives and imperatives but necessarily constitute given information:

(7) a. Che faccio con la mela?

What (should) I do with the apple

b. Mangia la mela!/Mangiala!

Eat the apple!/Eat it!

In (7) the new information is represented by the verb *mangia* yet it does not appear in the predicted position. Instead, a rule of syntax insures that the object, in the form of the full NP or the clitic, follow the imperative. Similar violations will occur within simple phrases since syntactic elements such as determiners, adverbs, adjectives and negative particles, as well as postposed subjects (cf 3c), are all restricted to particular positions by well known syntactic rules. The given/new distinction cannot, by itself, explain the range of data, nor can it accomodate the positioning of fundamental syntactic elements.

The number of exceptions to the proposed ordering rule raises additional problems. Specialized structures may be exempted from the rule but at a cost to the theory. Because there are no formal criteria for membership in this class these exceptions amount to a list of counterexamples. Consequently, the domain of the ordering principle can only be stated as that not given in the list of counterexamples. The danger is that the given/new 'rule' for word order (that all given information must precede all new information) will be said to apply just in case it works. It becomes, in essence, a default rule. This gives rise to a contradiction since the hypothesis also identifies an unmarked (in other words default) word order exhibited in utterances containing all new information (A and C 1977 p126). How can there be two contradictory default rules for word order?

Exceptions to the given/new analysis also create a theoretical difficulty. If the ordering mechanism is extra-grammatical, how can constraints on specific syntactic structures block its application? If the rules which determine word order are not expressed in syntactic terms how can we state the exceptions to these rules in terms of syntactic features and still claim that the rules are not syntactic? In addition to being observationally inadequate the given/new hypothesis is theoretically unsound.

4. The Syntactic Approach

4.1 Contrast Positions

An alternative approach to the problems discussed above is to discard entirely the notion of given/new information in favor of a syntax-based rule. Interestingly enough, the very studies which propose a pragmatic solution to word order contain observations which suggest just such an alternative.

As is commonly noted in the literature, the order of words in a sentence varies not independently, but in conjunction with variations in the discourse. This observation is the basis of the given/new hypothesis since the identification of 'new' information relies on the question to determine which elements are 'given'. The alternative hypothesis accepts the generalization that the form of the question anticipates the form of the answer, but rejects the idea that word order is determined by the question. Context may be used to demonstrate the infelicity of a sentence but it does not assign grammaticality. Consider the pairing of questions and 'appropriate' answers given in A and C:

(8) a. Che e' successo a Piero?

What happened to Piero?

b. Piero e' morto

c.*E' morto Piero.

(9) a. Chi ha mangiato la torta?

Who has eaten the cake

b. Ha mangiato la torta Antonio.

c.*Antonio ha mangiato la torta.

Antinucci and Cinque claim that in each case the 'new' information appears as the last element in the sentence. In each sentence the last element is identified as the single element which answers the question. Though this is true of some sentences, examples (3-6) show that it does not hold in all contexts. Nevertheless, this observation captures a wide range of data (see A and C for numerous examples) and must therefore be taken into consideration. I accept the generalization as correct for some of the data but reject the claim that the 'newness' of the information offers an explanation.

I propose that the significance of the data adduced in A and C is that, for certain syntactic elements, the final position denotes a kind of contrast and that this contrastiveness is important in the determination of word order in Italian. I further suggest that there exists a broader system based on this notion of contrast which determines the position of the various syntactic elements and ultimately the surface word order of sentences in Italian.

I use the denomination 'contrast' because the position of the relevant elements in the sentences above coincides with the position of the relevant elements in overt contrast structures discussed in the next section. The term is one of convenience and is used to underscore this parallel. The goal of this discussion is to formalize the correlation between syntactic elements and the positions in which they occur as a system of contrast. My argument is a structural one. The exact definition of 'contrast' will ultimately be derived from a generalization regarding all instances of a particular ordering of elements. This is not my concern here.

4.1.2 Overt Contrast

The syntactic status of contrast can be seen in sentences which state explicitly the elements which are said to be in contrast.

(10) a. Sono contenta che Giorgio canti stasera.

I'm glad that G. is singing tonight

b. Ma che? Non canta Giorgio, canta Paolo!

but what not is singing G. is singing P.

What? Giorgio's not singing, Paolo is.

c.*Ma che? Giorgio non canta, Paolo canta.

d. Ma che? Giorgio non canta, suona il piano.

is playing the piano

e.*Ma che? Non canta Giorgio, suona il piano.

When the subject is placed in overt contrast it must appear at the end of the sentence. In (10b) the subject NPs Giorgio and Paolo are placed in direct contrast and each appears after the verb *canta*, at the end of the phrase. (10d) is another version which contrasts the verbs *canta* (sings) and *suona* (plays). Again, the contrasted elements appear at the end of the phrase. Notice that this rule specifically targets the contrasted element and not the phrase which contains that element. (10c) and (10e) show that it is not sufficient to order the verb phrases so that the contrasted element appears in the final phrase. The targeted element, subject or verb, must appear in the final position. The result is that both SV and VS are possible sequences. The SV order is the propositional order while the reverse, VS, gives contrastive value to the subject.

We can now establish a formalization of the conditions on overt contrast where two lexical elements are involved:

Overt Contrast: Two lexical elements can be said to stand in overt contrast if

a) the two lexical elements are of the same category (by 10 c-e)

b) the elements involved in the contrast pair both appear in final position (by 10c and e)

If we return to the example in (6), repeated here as (11), we can now account for the results without difficulty:

(11) a. Carlo prepara la cena, vero?

Carlo's making dinner, right?

b. No, Marco prepara la cena, Carlo lava i piatti.

No, M's making dinner, C's washing the dishes.

Here the information 'washing the dishes' is given contrastive value in response to the assertion contained in the original question (that Carlo's making dinner). In compliance with the conditions on overt contrast 'washing the dishes' appears in the appropriate position as does the other member of the contrast pair 'making dinner'. A further conclusion can be drawn if we consider another possible answer to (11a), shown in (11c) below.

(11) c. No, Carlo lava i piatti.

Note that the order of elements in this version exactly matches the order of elements in the overt contrast in (11b). From this it can be concluded that the overt contrast position and the contrast position argued for in this analysis are one and the same. This supports the claim that the position itself is designated as contrastive and thus is able to convey the contrast independently of contextual information.

This analysis avoids the definitional problems of 'given' and 'new' and the difficulties involved in isolating the 'new' information. This is not simply a reformulation of the given/new proposal; it offers a better explanation for the data. The advantage of the contrast hypothesis is that it can be expressed as a syntactic correlation while the new information analysis is based on an ill-defined property of the discourse.

4.1.3 Other considerations

There are other facts which support the association of contrastive value and position. The data considered so far indicates that the post verbal position of subjects entails contrastiveness. This hypothesis receives support from data involving post verbal subjects. In Italian there are several modifiers which convey emphasis for example: *anche* ('also'), *neanche* ('neither') *esclusivamente* ('exclusively') *solo* ('only'), *sempre* ('always'). When these adverbs emphasize subjects there is a pattern of postposing:

(12) a. *Mia mamma lo fa sempre.*

my mother it does always

My mother always does (is always doing) that.

b. *Lo fa sempre mia mamma.*

My mother is always the one who does that.

(13) a. **Sempre io ci devo andare.*

always I there must go

b. *Ci devo andare sempre io.*

I'm the one who always has to go there.

(14) a. **Esclusivamente lei lo fa.*

exclusively she it does

b. *Lo fa esclusivamente lei.*

She's the only one who does it.

When the subject is emphasized it appears post-verbally in what has been identified as the contrast position for subject NPs. We can now state a more specific condition for contrast involving subjects:

Subject Contrast Condition (SCC, preliminary version)

The contrast position for a subject is postverbal.

In order to receive contrastive reading a subject must appear in this position.

4.2 Contrast position for objects

Another example given in Antinucci and Cinque shows that the identification of a contrastive position is possible not only for subjects, but also for object NPs:

(15) a. Giorgio ha comprato un'automobile.

G. bought a car

b. Un'automobile Giorgio ha comprato.

a car G. bought

Here the two sentences have the same truth value but (15b) is acceptable only if someone has claimed that Giorgio bought something other than a car. Antinucci and Cinque present this pair of sentences to support their claim that the unmarked order of constituents in Italian is SVO, as shown in (15a). The authors observe that the acceptability of (15b) is restricted to a specific context and this is taken as confirmation of the marked status of the OSV order. What is interesting about this example however, is that it contradicts the main point of the article. If (15b) is a correction of the incorrect presupposition that Giorgio has bought something other than a car, why doesn't un'automobile 'a car' appear in the 'new information' position at the end of the sentence? The given/new hypothesis has no explanation for this result.

Under the contrast position analysis this example poses no problem at all. The object is preposed precisely because the contrast position for objects is preverbal. That this is in fact the contrast position for object NPs can be seen in the following data:

(16) a.*I piatti devi lavare, non guardare la T.V.

the plates you must wash, not watch T.V.

b. I piatti devi lavare, non i bicchieri.

the glasses

c. Devi lavare i piatti non guardare la T.V.

d.*I piatti devi lavare, non mettere via.

Of the examples given above only (16b) and (16c) are acceptable. The reason for this becomes apparent when we consider the facts concerning contrastive sentences. Only sentences which place syntactically parallel elements in contrast are acceptable. Examples (11a-e) illustrated this point for subject NPs. (11b) contrasts the subject NPs and (11d) contrasts the VPs. The other versions mix the elements and the sentences are ungrammatical. In (16) the same principle is responsible for the results. If we place the object NP *i piatti* 'the plates' in the pre-verbal position the only grammatical sentence is one which offers another object NP as the alternative. The explicit contrast between *i piatti* and *i bicchieri* 'the glasses' can be expressed only as (16b). (16c) is also grammatical but it contrasts the entire VP (verb + object). The object NP in (16a) is contrasted with a VP consisting of a verb + object, and in (16d) with a verb. Both sentences result in ungrammaticality.

We can now formalize a statement regarding the contrast position for objects:

Object Contrast Condition (OCC, final version):

The Contrast Position for objects is preverbal.

The contrast position analysis accounts for the data by appealing to one principle: that contrast is conveyed by position. The difference seen in the position of contrastive subject NPs and contrastive object NPs further demonstrates that it is not the position, per se, that is contrastive but the collocation of a specific syntactic category and a particular position in the sentence. Contrast is not derived from the discourse but is encoded in the syntax. Sentences manifest the contrastive value of selected elements even without being preceded by questions or statements or being part of an overt contrast.

4.3 Restrictions on contrast

Further evidence for the existence of category specific contrast positions can be found in the following paradigms. The argument is based on the observation that only one element in a sentence can be in contrast. The set of sentences given below consists of variations of a single proposition which place the NPs in different positions:

(17) a. *Un'automobile ha comprato Giorgio.

a car has bought G.

b. Un'automobile Giorgio ha comprato.

c. Giorgio ha comprato un'automobile.

d. Ha comprato un'automobile Giorgio.

If we follow the scheme of contrast positions given above for subject and object NPs we obtain the following pattern of contrast elements (+C) for the NPs in the sentences in (17):

(17) a' *+C +C

b' +C -C

c' -C -C

d' -C +C

Notice that the only version which is ungrammatical is (17a) where two elements appear in the positions identified above as the contrast positions for subjects and objects, respectively. (17b) and (17d) show that the ungrammaticality of (17a) is not due to the inability of noun phrases to occur in the positions which they occupy. (17a) is ungrammatical because it violates a restriction on multiple contrast. This restriction can be stated as an additional condition on contrast:

Unique Contrast Condition (UCC)

Only one element can be contrasted (overtly or otherwise) in each sentence.

4.4 Indefinite contrast

There is a residual problem represented by the sentences shown above in (4):

- (4) a. Chi parla? Who's speaking?
- b. Parla Marco. Marco's speaking
- c. Tutti parlano. Everyone's speaking.

As stated the contrast analysis predicts the word order in (4b) but fails for (4c). However, an extension of the hypothesis can account neatly for these facts. It appears that the grammar of Italian is sensitive to NP features such as definiteness. Whereas the contrast position for definite subject NPs is post-verbal, that for indefinite subject NPs is pre-verbal. This can be illustrated in overt contrast sentences as shown in (18):

- (18) a.*Ha mangiato un uomo non due.
- b. Un uomo ha mangiato, non due.
- c.*Mangia uno ma gli altri no.
- d. Uno mangia ma gli altri no.

The sentences in (19) test the UCC following the method employed in (17) for definite subject NPs:

- (19) a.*Il libro un signore ha comprato.
- b. Il libro ha comprato un signore.
- c. Un signore ha comprato il libro.
- d. Ha comprato il libro un signore.

- (19) a' *+C +C
- b' +C -C
- c' +C -C
- d' -C -C

Once again, the only ungrammatical version results when both the object and the subject appear in what have been defined as Contrast Positions. A comparison of the data in (17) and that in (19) demonstrates the asymmetry between definite and indefinite NPs:

- (17) a.*Un'automobile ha comprato Giorgio.
- b. Un'automobile Giorgio ha comprato.
- (19) a.*Il libro un signore ha comprato.

b. Il libro ha comprato un signore.

We now have an explanation for the asymmetry presented in (4). In (4a) the subject is postverbal for the same reason that the subject in (4b) is preverbal. Both subjects appear in the Contrast Position. The asymmetry results precisely because the contrast position for definite subjects is the inverse of that for indefinite subjects:

SCC (Final Version)

1 The Contrast Position for definite subjects is postverbal.

2 The Contrast Position for indefinite subjects is preverbal.

To this we can add an amended version of the original conditions on overt contrast:

Conditions on Overt Contrast

a. The two elements said to be in contrast must be of the same category.

b. The first element of the pair said to be in contrast must appear in the appropriate contrast position as defined by the final versions of the OCC and SCC.

4.5 Further Predictions

Using the same reasoning we can also identify a contrast position for adjectives:

(20) a. Voglio uno e verde lo voglio.

want 1sg one and green it want 1sg

I want one and I want it to be green.

b. Voglio uno e lo voglio verde.

c. *Uno voglio e verde lo voglio.

d. Uno voglio e lo voglio verde.

(20) a' -C +C

b' -C -C

c' * +C +C

d' +C -C

By the UCC +C +C configuration results in ungrammaticality. Since, by the SCC a preverbal indefinite subject is +C and since (20c) is ungrammatical we can conclude that the preverbal position for adjectives is the Contrast Position. In fact, Italian has two types of adjectives: 1) those which generally follow the noun and 2) a smaller set which precede the noun. Lepschy and Lepschy (1988:192) discuss both types and note that 'emphasis' is obtained by reversing the order so that type 1 adjectives precede and type 2 adjectives follow the noun.

5. Conclusion

5.1 Summary

The Given/New (GN) approach and the Contrast Position (CP) approach are similar in two ways. Both are directed at explaining the position of the element which contains the information which is intuitively the most important information in the sentence. Both analyses permit only one locus of contrast.

But the two analyses differ in three important ways:

- 1 The GN analysis relies on the concept 'new information' which is not formalized and cannot be tested in independent structures. The CP analysis is based on a principle which can be stated in syntactic terms, isolated and tested.
- 2 The GN analysis claims to be extragrammatical but, in fact relies on syntactic considerations. The CP analysis presents no such inconsistencies since it is based on syntactic considerations.
- 3 The GN analysis is indifferent to well established distinctions of feature and category and fails to predict grammaticality in just these cases. The CP analysis is founded on these very distinctions and, in addition to accounting for all the data, the CP analysis uses the same principle to explain the different but parallel conditions on the various syntactic categories, thereby capturing the generalization that contrast is conveyed through the collocation of syntactic category and sentential position.

5.2 The Autonomy of Syntax

In light of the results presented in section 4, it seems necessary to acknowledge the primacy of syntactic restrictions. Given the differences in the distribution of subjects and objects, and the distinction between definite subjects and indefinite subjects, the pragmatic approach is untenable. There is no reason to believe that pragmatic considerations obtain at this level of analysis. The designation 'new information' is, by definition, extragrammatical and therefore unable to respond to syntactic categories or features. If these affect word order in any way the given/new information theory must be abandoned. The data demands a theory which has access to syntactic information. The Contrast Position analysis proposed in this paper provides the foundation for just such a theory.

The exact definition of the terms 'given' and 'new' vary with each discussion. While there is, admittedly, an intuitive basis to the terms there seems to be little agreement on a way of formalizing the concepts. The terms are used in opposition but it is not at all clear how they are related. Are the categories exhaustive so that every element in a sentence will receive one or the other designation? Do the labels refer to overt syntactic elements or to the semantic content of the discourse? What does the term 'new' really mean? It could refer to unknown or solicited information, elements absent in the previous discourse, or elements which receive emphasis. New information may be represented, not by the individual elements of a sentence but by the relationship between them. If this is the case it is not obvious how new information can be isolated for positioning in the designated slot. I will give proponents of the 'new information' approach the benefit of the doubt and accept these terms without further discussion. My arguments against this approach stand independently of the definitions employed.

I will discuss the possibility that the designation 'new' may apply to entire phrases below. The facts concerning restrictions on contrast structures indicate that this is not the case.

In discussions which assume the given/new hypothesis it is frequently claimed that utterances which present all new information manifest the unmarked word order. It is not clear why all new information should be assigned privileged status. It is just as plausible that utterances containing all given information reveal the unmarked word order. If there isn't a significant difference between the two categories of information it is hard to see how the distinction could be responsible for the ordering of elements in a sentence.

It may be that what I am labeling 'contrast position' amounts to a syntactic expression of emphasis. My goal here is to describe the characteristics of sentences which exhibit a particular word order. I will not present an exhaustive discussion of the semantic functions which the structure could carry out in discourse.

Note that if the verb appears at the 'end' with respect to the verb the net result is that the contrast position for the verb is the same as the non-contrast or propositional position of the verb. There may be many ways to interpret this observation but the simplest conclusion seems to me to be that in a sentence the finite verb is inherently contrastive. In fact, it may be possible to define 'propositional' in this way. There are no structures which have the effect of emphasizing or contrasting the verb in which the verb appears in another position.

Notice that the UCC does not limit the number of ways in which a single element can be marked for contrast. The sentences in 12 show clearly that both position and lexical material can mark the same element for contrast. In addition to these intonational emphasis can also occur.

The precise definition of 'contrast' for indefinite subjects is missing in this discussion. Since I am interested in establishing the structural correlations of position I will not present the full argument here though some explanation is in order. Semantically speaking an indefinite subject takes on a partitive reading when it is contrasted. This can be demonstrated in overt contrasts and in structures where the partitive clitic *ne* can be coreferenced with an indefinite NP. This and other facts indicate that the partitive reading assigned these subjects is not simply pragmatic-- there are observable syntactic results.

Note that by the OCC and SCC (2) the preverbal position is designated as the Contrast Position for two distinct elements. This will never pose a problem since, by the UCC, two elements will never appear in contrast in the same sentence.

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Lexical Selection of Temporal Properties in Infinitival Complements: A Tentative Argument in Favor of a Theory of Temporal Argument Structure¹

1. Introduction

The aim of this paper is to point out some facts concerning the temporal interpretation of infinitival complement clauses that are unexpected and lead to problems in a Reichenbachian model of tenses as proposed in Hornstein (1977, 1981, 1990). The facts pointed out in this paper indicate that there is lexical selection of temporal properties of infinitival complements by the matrix verb. I will try to argue that a temporal argument structure approach to tenses as proposed by Enç (1987) and Zagona (1988, 1989, in press, to appear) is in principle able to account for these facts, whereas a Reichenbachian model is not.

In section 2 the set of facts is presented and systematical differences between control-complements, naked infinitivals, and ECM complements as well as lexical selectional idiosyncrasies within these classes are described. I argue that a Reichenbachian model of tenses is incapable to deal with these idiosyncrasies. Section 3 sketches a possible analysis in terms of temporal argument structure. In section 4 a difficult residual problem with respect to infinitival subjects is pointed out.

In this paper, "-ing"- infinitival constructions have been ignored for the sake of simplicity and brevity.

Throughout this paper, I will assume that the reader is familiar with a Reichenbachian approach to tenses and with Hornstein's notational conventions.

¹ Thanks to Karen Zagona for comments on an earlier draft of this paper.

2. The Temporal Interpretation of Infinitival Complements as a Problem in a Reichenbachian Model

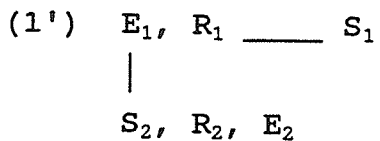
In this section I will point out several facts concerning the temporal interpretation of infinitival complements that are unexpected and problematic in a Reichenbachian approach to tenses. Section 2.1 will deal with control complements, section 2.2 with Naked Infinitivals and ECM complements.

2.1 Control Complements

The analysis of control complements in Hornstein (1990) is straightforward: Hornstein claims that infinitival clauses in general lack an S point, since S is tied to the tense morpheme. This delimits the possibilities of temporal interpretation. Hornstein's argument proceeds as follows: The "Principle of Full Interpretation" (PFI) requires basically that all S, R, and E points have to be interpreted; R and E through their relation to S and the latter either by denoting speech time or by being "anchored" through linking to a matrix E-point. Embedded finite sentences have two options to fulfill this requirement: They can either undergo the (optional) rule of "Sequence of Tense" (SOT) which links the embedded S-point to the matrix E-point, or they can undergo a default procedure that interprets the embedded speech time as coterminous with the matrix speech time. The first option yields a "shifted" reading, the second an "unshifted" one. Consider examples (1) and (2) (Hornstein (1990:126)):

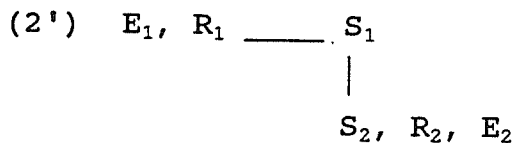
- (1) John heard that Mary was pregnant
- (2) John heard that Mary is pregnant

In sentence (1) the past morphology of the embedded sentence is considered a morphological reflex of the application of the SOT-rule, i.e. the "underlying" tense of the embedded clause is present tense. The tense structure of (1) is (1'), the linking of S_2 to E_1 is due to SOT:



The resulting interpretation is one in which Mary's pregnancy is coterminous with the event time of John's hearing about it.

In sentence (2) there is no morphological reflex of an application of SOT, therefore this rule cannot have applied. The temporal "anchoring" required by the PFI is achieved through the default procedure of speech time denotation of the embedded S-point:



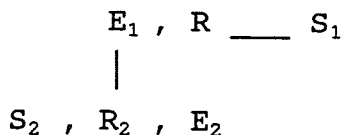
In this case, Mary's pregnancy is coterminous with the speech time of the utterance (or rather "overlapping").

It is now exactly this default mechanism which is unavailable for embedded infinitival clauses, for the simple reason that they lack an S-point. In other words: embedded infinitival clauses have to undergo SOT obligatorily. SOT in this case links R_2 to E_1 , this need not be stipulated, however, since linking of E_2 to E_1 would leave R_2 unanchored². This makes two important predictions:

² Why this is ruled out by PFI is not clear to me, given that R and E are associated. Hornstein's (1990, p.175f) explanation seems to work only for the case where SOT applies to a tensed clause. If in this case not S_2 but R_2 (or E_2) were linked to E_1 , S_2 has to be interpreted by giving it the default speech time denotation in order to fulfill PFI, leading to possible paradoxes (Hornstein (1990), p.175, his (19)):

- infinitival clauses can never (presumably universally) occur free, i.e. in non-embedded position as matrix clauses since their R and E point can only fulfill the PFI by being interpreted with respect to some S-point³
- the temporal interpretation of infinitival complement clauses is always dependent on the temporal interpretation of the matrix clause since only this matrix clause can provide the speech time S, with respect to which the R and E points of the infinitival sentence can receive their interpretation

Hornstein is able to correctly derive the temporal interpretation of the following sentences (Hornstein (1990:148))⁴:



Here R_2 is coterminous with speech time (S_2) and prior to speech time (S_1).

³ As Guy Modica has pointed out to me, there are seeming counterexamples to this claim as in (i) and (ii):

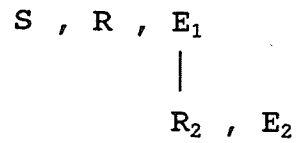
(i) To win the Lotto!

(ii) To have been born in the 17th century!

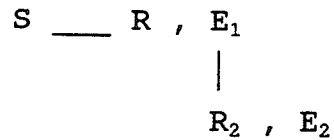
However, as Modica observes, these cases are rather elliptical in nature.

⁴ Although in this case it seems rather to be plausible that the complement has a subsequent interpretation, as is the case with volitional predicates in general. See below for a short discussion of a possible way out in Hornstein's model, involving only the direct determination of S-R and R-E relations.

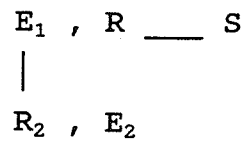
(3) John wants to leave



(4) John will want to leave



(5) John wanted to leave

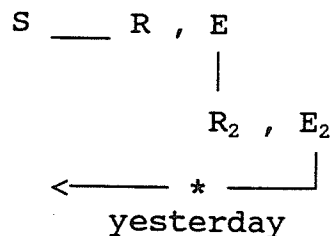


Ungrammatical sentences like (6) (Hornstein (1990:152))

(6a) *John will hope to win yesterday

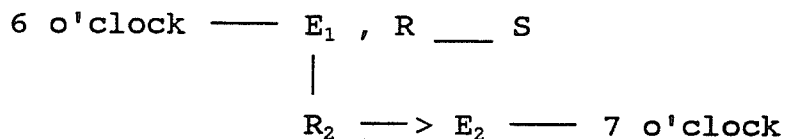
(6b) *John will expect to win yesterday

can be excluded:



On the other hand, shifting of the event time of the infinitival complement to the future is OK if triggered by the appropriate adverbs (Hornstein (1990:150 f.)):

(7) At 6 o'clock John remembered to take his medicine at 7 o'clock



In what follows, I will try to argue that this analysis runs into problems if confronted with a larger range of control verbs and the temporal interpretation of their respective infinitival complements.

First, I will claim that the temporal interpretation of the complement depends on selectional properties of the matrix verb. Second, I will argue that this is in principle not expressible in a Neo-Reichenbachian framework without unwarranted stipulations. Consider (8) through (19):

(8) John remembered to take his medicine

(9) John promised to do his work

(10) John tried to do his work

(11) At 6 o'clock, John remembered to take his medicine at 7 o'clock

(12) At 6 o'clock, John promised to take his medicine at 7 o'clock

(13) *At 6 o'clock John tried to take his medicine at 7 o'clock

(14) ?John remembered to have done his work⁵

(15) John promised to have done his work

⁵ The status of this sentence is less clear than that of the other examples, there is considerable variation in judgements. I will assume that (14) is indeed grammatical, although this is not crucial for the argument to be developed. It is interesting that the sentence becomes a lot better if the corresponding -ing form is used:

John remembered having done his work

(16) *John tried to have done his work

(17) *At 6 o'clock, John remembered to have done his work at 7 o'clock

(18) At 6 o'clock, John promised to have done his work at 7 o'clock

(19)*At 6 o'clock, John tried to have done his work at 7 o'clock

(8) through (19) indicate that there is an intricate pattern of temporal interpretation of control complements. (8) - (10) present the "basic interpretation" of the three verbs under consideration: in the case of "remember" and "promise" the event of the embedded clause follows the event of the matrix clause ($E_2 > E_1$), in the case of "try" the two events are cotemporaneous ($E_2 = E_1$).

(11) - (13) demonstrate that only "remember" and "promise" as opposed to "try" allow their complements to have a shifted (future) reading triggered by an adverb.

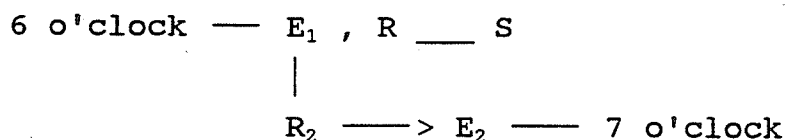
(14)-(16) illustrate the possibility of a perfective complement with "remember" and "promise" and its impossibility with "try". It is interesting that the interpretation of the perfective clause is different in (14) and (15): in (14) the completed action occurs before the event described by the matrix clause, in (15) it occurs after that event.

(17)-(19), finally, document the availability of a future perfective reading for "promise"-complements, as opposed to complements of "try" and "remember". Shown in a table the options are as follows (E_2 refers to the event time of the complement, E_1 to that of the matrix, "basic interpretation" refers to the interpretation of E_1 and E_2 without any modification by adverbs and without the presence of any perfective complex)

	basic interpretation	Future shift	perf. compl.	future interpret. of perf. compl.
remember	$E_2 > E_1$	+	+ ($E_2 < E_1$)	-
promise	$E_2 > E_1$	+	+ ($E_2 > E_1$)	+
try	$E_2 = E_1$	-	-	-

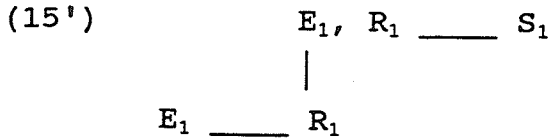
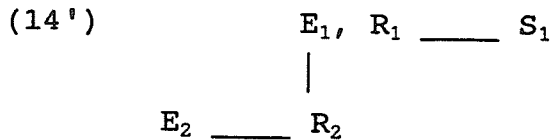
I thus conclude that temporal properties of infinitival complements can be lexically selected by the matrix verb.

The lexical differences illustrated above are unexpected in Hornstein's approach, since the temporal interpretation of the complement in his theory is only achieved and restricted by operations on S,R,E structures (triggered by tense morphology) and the relevant constraints on these operations. Consider the tense structures of (11) through (13):



The "future shift" of E_2 is legitimate under the application of an appropriate adverb (see (11)). It is, however, not clear why it should be blocked in (13). There is no reason to assume that the tense structure is different in this case in Hornstein's model.

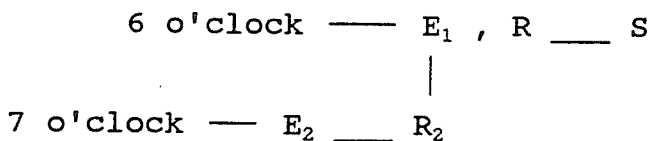
(14)-(16) also exhibit unexpected contrasts: in Hornstein's model, perfective complements should be licit with all control verbs. Since the effect of perfective "have" in his theory is only a dissociation of E to the left of R, a difference between a future perfective and a past perfective reading is impossible to capture. Consider the derived tense structures of (14) and (15):



There is no difference between these derived tense structures. The only way to account for different, or rather "vague" interpretations in structurally similar tense structures in Hornstein's version of a Reichenbachian theory is the following: what is determined in a tense structure are only S-R and R-E relations, there is no direct encoding of S-E relations. The latter can only - if at all - be determined indirectly, as e.g. in the case of past perfect: E__R__S. Here the S-R relation and the R-E relation are fixed by dissociation in a way that (by transitivity) fixes the S-E relation as well. In future perfect, on the other hand, which is represented as S__E__R, the relation of E to S is undetermined, hence the interpretation of the later is open to the influence of pragmatic factors.

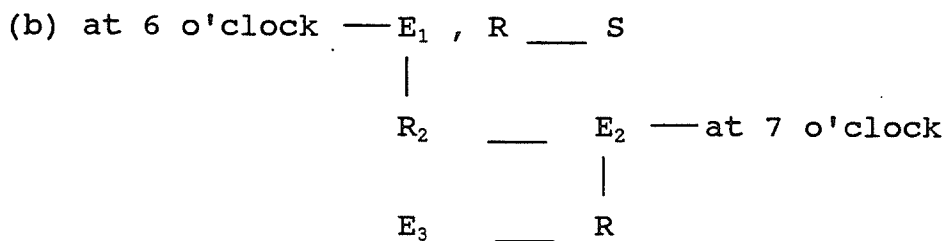
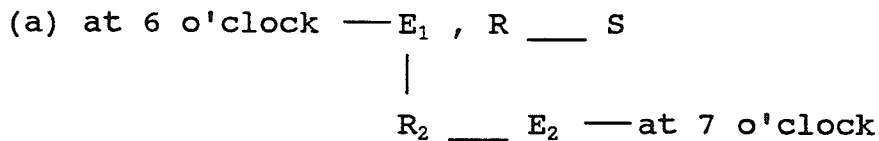
This proposal does not help with the problem presented by (14') and (15'), however: The relation E₁-S₁ is fixed by transitivity, the relation E₁-R₂ is fixed, and the relation R₂-E₂ is fixed - there is no indeterminacy of the relation between E₂ and S₁.

(17)-(19) constitute a more complicated problem. Again, the tense structures of all three examples should be as follows:



Removing the E-point to the left of its corresponding R-point

should be - under the application of the adverbs in (17) through (19) - ungrammatical, since E_2 is both interpreted as prior to E_1 (which takes place at 6 o'clock) and as posterior to E_1 (E_2 itself takes place at 7 o'clock), Nevertheless the sentence (18) is perfectly grammatical. In Hornstein's approach it is hard to find a tense structure for (18) at all:



(a) is illicit since perfective have is not interpreted. In fact, (a) is the tense structure of a sentence like (20):

(20) At 6 o'clock, John promised to do his work at 7 o'clock

(b) seems to be more appropriate, but additional tense structure had to be introduced. E_2 would correspond to the event of "completion" of E_3 , but it is unclear how exactly this could be spelled out in Hornstein's model.

The most important point, again, is that the temporal interpretation of the complement is governed by properties of the matrix verb⁶. This case of selection of temporal properties cannot

⁶ (8)-(19) contain subject-control verbs. It is interesting that object-control verbs seem to fall into the same pattern:

(i) At 6 o'clock John persuaded Mary to come at 7 o'clock

be accommodated within the S,R,E-model for the reason already mentioned above: In the S,R,E-model temporal interpretation is a matter of tense morphemes, S,R,E-structures, and operations on these structures, presumably constrained by central syntactic concepts like government. Since there seems to be no reason to treat the complements in (8) through (19) as structurally different, no resort to a difference in government relations can be made.

There is, however, a means to express exactly the dependencies on the matrix verb encountered above: lexical selectional properties of the verb govern the interpretation of the complement. This leads naturally to the assumption that tense is part of the argument structure of a clause. Note that it would be an awkward step in Hornstein's model to allow for lexical selection of S,R,E properties of the complement: this would introduce a completely new concept of selection, unrelated - contrary to all other cases of selection - to argument or categorial properties.

2.2 Reduced Infinitival Complements: Naked Infinitivals and ECM-Complements

Naked Infinitivals (NI) are treated by Hornstein as only containing an E-point in their tense structure. The Principle of Full Interpretation requires that these E-points must be anchored. Since only the E-point of the matrix clause is accessible to an E-point of the complement under Hornstein's definition of government and his assumption that anchoring is limited by a government requirement, the event-time of the complement and that of the

(ii) At 6 o'clock John persuaded Mary to have done her work at 7 o'clock

(iii)*At 6 o'clock John helped Mary to do her work at 7 o'clock

(iv) *At 6 o'clock John helped Mary to have done her work at 7 o'clock

(i) and (ii) pattern with promise, (iii) and (iv) with try.

matrix are coterminous (Hornstein (1990:154)):

(21) John saw Bill leave

Present perfective complements are excluded as they would require an R-point that is not available in the complement. Hornstein illustrates this generalization with the following example (Hornstein (1990:154)):

(22) *John saw Bill have left

Future shift is also excluded:

(23) *At 6:00 John saw Bill leave at 7:00

It should be noted, however, that ECM-verbs that select a "to"-infinitival complement pattern differently with respect to perfective complements:

(24) I believed John to have hit Bill

(25) Mary reported the man to have hit Bill

(26) *I considered John to have been stupid⁷

Shifted (future) reading is not available with any of these verbs:

(27) *At 6:00 I believed John to do his work at 7:00

(28) *At 6:00 Mary reported the man to hit Bill at 7:00

(29) *At 6:00 I considered John to be smart at 7:00

"Consider" is somewhat different from the other two verbs in that it only seems to allow for "states" as complements, which might be responsible for the impossibility of a future reading in (29). Future interpretation with perfective complements is consequently

⁷ K. Zagana has pointed out to me that a grammatical reading is available where "be stupid" is active rather than stative.

also out in all cases:

- (30) *At 6:00 I believed John to do his work at 7:00
- (31) *At 6:00 Mary reported the man to have hit Bill at 7:00
- (32) *At 6:00 I considered John to have been smart at 7:00

The basic interpretation in all cases is $E_2=E_1$ ⁸:

- (33) I believe John to hit Bill
- (34) Mary reports the man to hit Bill
- (35) I consider John to be smart

⁸ Which is rather a rough generalization. What seems to distinguish these sentences from e.g. the complement of "promise" is that there is no future reading that can allow for future adverbs if the matrix verb is in past tense. There is however a future reading with "believe"-complements that seems to arise from the general possibility of future construal of present tense in English and the general absence of a present moment interpretation. (I.e. if $E_2=E_1$, and E_1 as a general property of English cannot be construed as being anaphoric to speech time, then E_2 can inherit a future reading of E_1 without the complement clause itself contributing an independent future interpretation). Consider e.g.

I believe Mary to be leaving tomorrow

2.3 An overview of the data collected so far:

Summarizing the results of sections 2.1 and 2.2, the following pattern arises⁹ (the numbers in brackets refer to the corresponding examples)

	basic interpret.	future shift	perfective compl.	future shift + perf. compl.
control				
remember	$E_2 > E_1$ (8)	+ (11)	+ ($E_2 < E_1$) (14)	- (17)
promise	$E_2 > E_1$ (9)	+ (12)	+ ($E_2 > E_1$) (15)	+ (18)
try	$E_2 = E_1$ (10)	- (13)	- (16)	- (19)
NI				
see	$E_2 = E_1$	-	-	-
make	$E_2 = E_1$ (21)	- (23)	- (22)	-
watch	$E_2 = E_1$	-	-	-
ECM				
believe	$E_2 = E_1$	- (27)	+ (24)	-
report	$E_2 = E_1$	- (28)	+ (25)	-
consider	$E_2 = E_1$	- (29)	- (26)	-

There are obviously two dimensions with respect to which the data fall into a pattern: There is lexical variation and there are syntactically determined similarities within the three groups of complements.

Control complements show the biggest range of lexical variation, the basic interpretation is either that of E_2 being subsequent to E_1 or that of E_2 being cotemporaneous with E_1 . Future shift is subject to lexical variation, and so is the possibility of perfective complements. The combination of future shift and perfective complement, resulting in a future perfective reading is lexically limited to one of the examined verbs.

Naked Infinitivals, on the other hand, show no lexical variation at all: E_2 is always interpreted as being cotemporaneous with E_1 , there is no possible future shift, no perfective complement and -

⁹ Which of course might not be exhaustive.

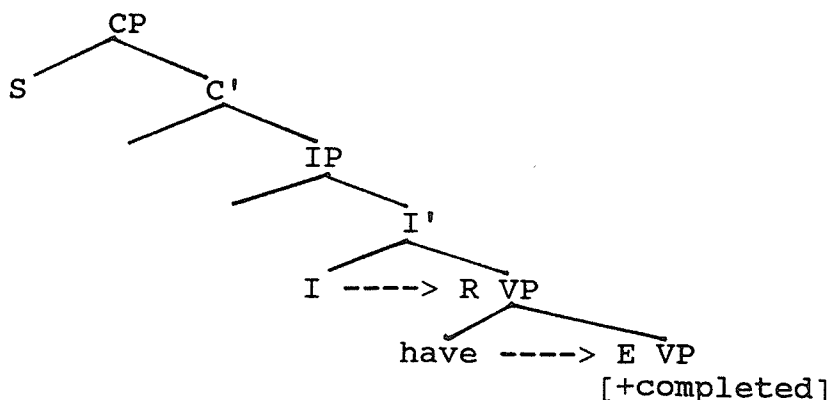
consequently - no future perfective reading.

ECM complements exhibit a limited variation of temporal construal due to lexical properties of the matrix verb: Whereas the basic interpretation is fixed in the same way as with Naked Infinitivals, there is variation in permissibility versus prohibition of perfective complements.

To account for the pattern shown in the table above, two things have to be explained: How the syntactic structure of the complements determines the range of possible lexical selection of temporal properties and how this lexical selection itself looks.

3. A Tentative Analysis of the Lexical Selection of Temporal Construal within a Framework of Temporal Argument Structure

In this section I will try to sketch a possible treatment of the phenomena discussed in section 2 in a framework as proposed by Zagona (1988, 1989, in press, to appear) where tense is taken to be part of the argument structure of a sentence, selected by [+/-tense] INFL (see Zagona (to appear, ch. 2)). A non-perfective finite sentence contains two temporal arguments, E (for event) and S (for speech time). E is the internal temporal role of INFL, hence is assigned to VP, which in turn is licensed by it. S, as the external argument of INFL is realized in the SpecCP position. A third temporal role R is present in perfective clauses, which are assumed to have the following structure:



Possible temporal associations of the temporal roles are restricted by Binding Theory. The features [+/- PAST] assigned by [+ tense] INFL receive a binding-theoretic interpretation:

[+PAST] = [-anaphoric, -pronominal]

[-PAST] = [+anaphoric, -pronominal], [-anaphoric, +pronominal]
or [-anaphoric, -pronominal]

The exact nature of [-PAST] is determined by Binding Theory: If there is no suitable antecedent within the relevant Binding domain, the element can only be pronominal, otherwise it can be either pronominal or anaphoric. If bound by a modal element in A'-position it qualifies as a variable (see Zagona (1989) and below).

The adopted version of Binding Theory is as follows (Zagona (in press, ch. 2.1):

Minimal Governing Category: the minimal XP containing α , a governor for α , and a subject, i.e. a Complete Functional complex (CFC).

Principle A: An anaphor must be bound in its MGC.

Principle B: A pronominal must be free in its MGC.

Principle C: An R-expression is free (in the domain of the head of its chain).

Bound: coindexed with a c-commanding A-position.

As an example, consider the construal of present tense in Spanish and English in simple sentences like (36) and (37):

(36) Juan canta
'Juan sings'

(37) John sings

(37) cannot obtain a "present moment reading", the only available reading is generic. The Spanish example (36), on the other hand, allows both for generic and present moment reading. This contrast can be reduced to the existence of verb-movement to INFL in Spanish and its absence in English: verb-movement in Spanish extends the

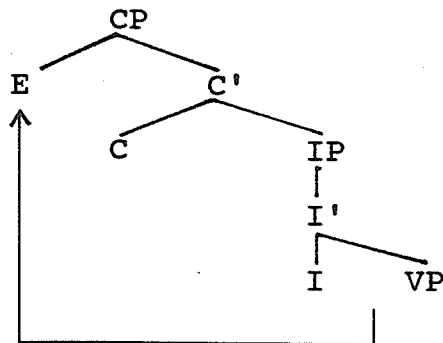
MGC of the event-role E to the matrix CP. Therefore, E has the option of being an anaphor, being bound by speech time S. This option is not available in English, since the MGC is not extended by verb-movement as to contain the speech time role S in SpecCP of the matrix, with the result that no suitable antecedent is available within the MGC¹⁰.

I will try to demonstrate that though the analysis proposed below is probably far from being adequate, there are ways to express selectional restrictions on the temporal interpretation of infinitival complements in a temporal-argument approach that are completely lacking in Hornstein's model and that are obviously needed to capture the data presented so far.

To start with, a very important and simple generalization concerning infinitival sentences has to be explained: they can only occur embedded, never free. It can be assumed that [-tense] acts as a defective theta-assigner that does not assign an external (=speech time) theta-role (K. Zagana, personal communication). If speech time has to be part of every temporal interpretation (as something like the ultimate anchoring point), the correct result follows: Only if a link to speech time can be made through construal with a finite sentence can an infinitival sentence be licit. This is much in the spirit of Hornstein's analysis, who claims the absence of S in infinitival sentences to be responsible for the general ban on free infinitivals.

¹⁰ It should be noted, however, that the Binding Theory employed here has some non-standard features. There is e.g. no complementary distribution of anaphoric and pronominal elements, i.e. in the Spanish example both (pronominal) generic, as well as (anaphoric) present moment interpretation are available. Furthermore, thematic and temporal CFCs have to be allowed to interact, so that in the English example the smallest CFC for E containing a subject and a governor is IP, though the subject in this case bears no temporal index, i.e. is a pure thematic subject.

If tenses are represented as argument structure, it could now be assumed that [-tense] behaves like a passivized verb: the external theta-role is absorbed and the internal role E can in principle move to its position¹¹. Thus, a possible analysis of infinitivals is:



If the E-role moves to SpecCP, it can be subject to selectional restrictions by a matrix verb selecting a full CP complement.

A second point to be accounted for is the general tendency of the E-role of infinitival complements to be dependent on the E-role of the matrix clause. It seems plausible to me to assume that the E-role in a [-tense] structure fails to be interpretable "on its own", hence comes close to having anaphoric properties.

Summarizing so far, a tentative first approach would include the following two stipulations:

- [-tense] does not assign an external theta-role, therefore the internal role (=E) can raise to SpecCP

¹¹ This proposal is of course not in complete analogy with the passive-movement case. In the latter, the object-NP moves to the subject position, i.e. it is not the θ -role itself which moves. I will not try to resolve this difference. In what follows, I will use the notion "movement" for the relation of a temporal role to a syntactic position higher in the tree, despite the problems associated with that metaphor.

- E assigned by [-tense] is [+anaphoric, -pronominal]

Regarding the Minimal Governing Category (MGC) for E under the definitions in Zagona (in press), the following two possibilities have to be distinguished:

- E is in-situ: the MGC is extended to the matrix, as only the latter contains a CFC¹²
- E moves to SpecCP: in this position E is governed by the matrix verb, therefore its MGC is extended to the IP of the matrix clause¹³, where it can be bound

Considering the availability of future interpretations, a proposal by Zagona (1989) to treat all future interpretations as cases of A'-bound E can be used here to provide an explanation for the fact that only control complements allow for future readings: Only control complements are full CPs, hence only in these constructions

¹² At this point, however, the stipulation that PRO - as opposed to overt NPs - does not count as a subject for the determination of temporal CFCs has to be made. Otherwise the MGC of the E role would be the embedded IP where no antecedent could be found.

¹³ This holds for languages without V-movement like English. In languages that exhibit verb-movement, the MGC is extended to the matrix CP, thus allowing for present moment readings as speech time in SpecCP can bind the anaphoric E-element in the complement, or - resulting in the same effect - the matrix E-element, which in turn binds E₂. This is supported by data from German:

- (i) Ich helfe Hans [PRO das Auto zu reparieren]
I help Hans [PRO the car to repair]
'I help Hans to repair the car'

German exhibits V-movement, and in (i) there is clearly a present moment reading available (i.e. both "helping" and "repairing the car" take place at the very moment of speech time).

is there a position for an empty (modal) operator.

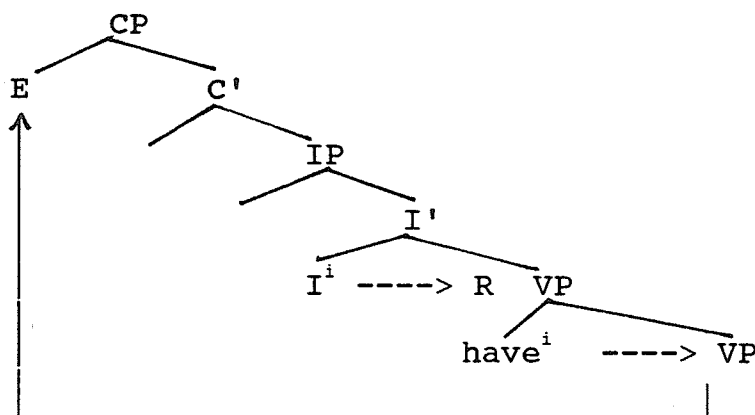
What still has to be accounted for at this point is the variation of future shift with perfective complements in the class of control complements as in examples (17) - (19), repeated here for convenience:

(17) *At 6 o'clock, John remembered to have done his work at 7 o'clock

(18) At 6 o'clock, John promised to have done his work at 7 o'clock

(19) *At 6 o'clock, John tried to have done his work at 7 o'clock

Perfective infinitivals can be argued to have the following structure:



where E is assigned an aspectual feature [+completed] by "have" (see Zagona (to appear)).

Since 'have', as a defective verb, and INFL undergo head-head-agreement as a requirement for licensing of defective verbs (Zagona (1988:158)), they might form a complex head with respect to processes like passivization (much like the case of prepositions reanalyzed with verbs in pseudo-passives). Therefore it is E that can move to SpecCP and not R.

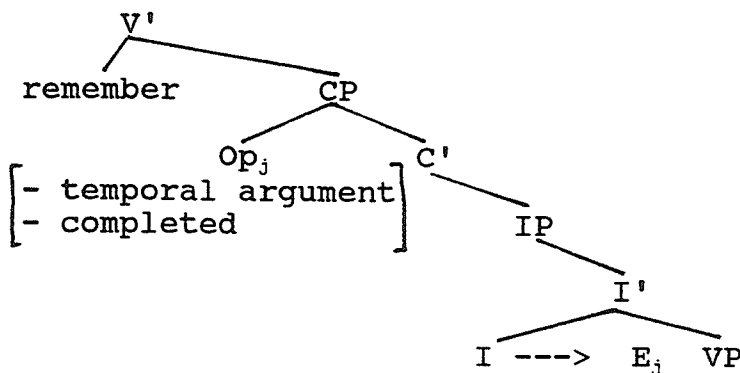
If the empty modal operator selected by some matrix control verbs

is endowed with [+/- completed] features, the variation of allowing for the binding of perfective versus nonperfective E-roles with 'remember' and 'promise' can be accounted for.

To distinguish selection of an empty modal operator in SpecCP (future reading) from selection of a temporal argument there, the feature [+/- temporal argument] might be used. The properties of the three control verbs under consideration and the corresponding derivations are thus:

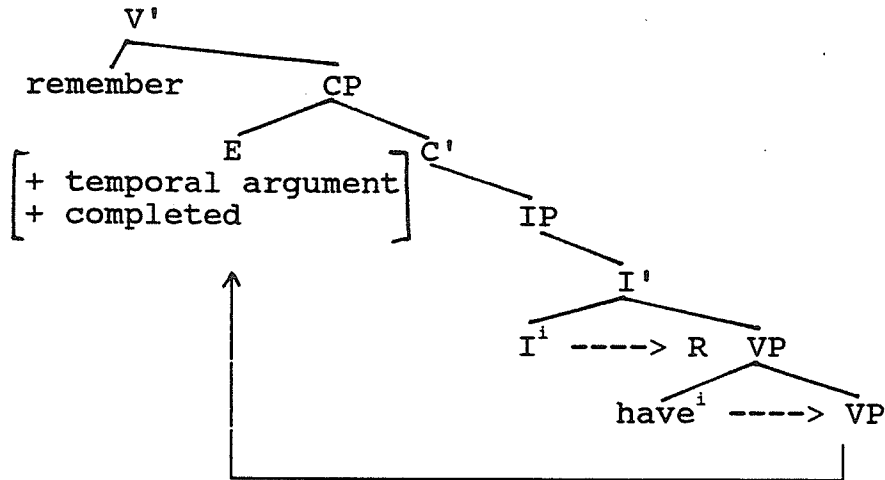
remember: selects [-temporal argument, -complete] or [+temporal argument, +complete]. In the first case (38), future reading is obligatory, but incompatible with a perfective E-role. In the second case (39), perfective E raises to SpecCP, yielding a "normal" perfective reading, i.e. completion of E₂ before occurrence of E₁¹⁴.

(38)



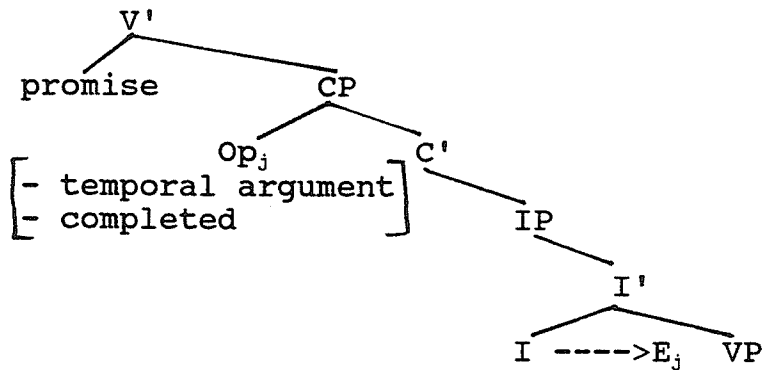
¹⁴ In this case binding of E₂ by E₁ does not result in coterminous interpretation, since E₂ bears the feature [+completed]; rather E₂ is interpreted as completed with respect to E₁.

(39)

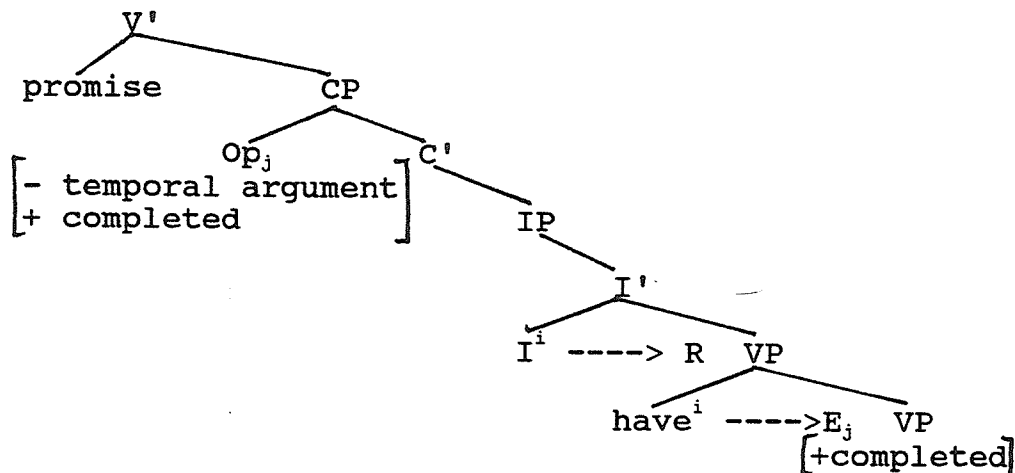


promise: selects [-temporal argument, -completed] (40), or [-temporal argument, +completed] (41) hence enforcing a future reading in all cases, allowing for future interpretation of perfective complements as well as simple future reading.

(40)

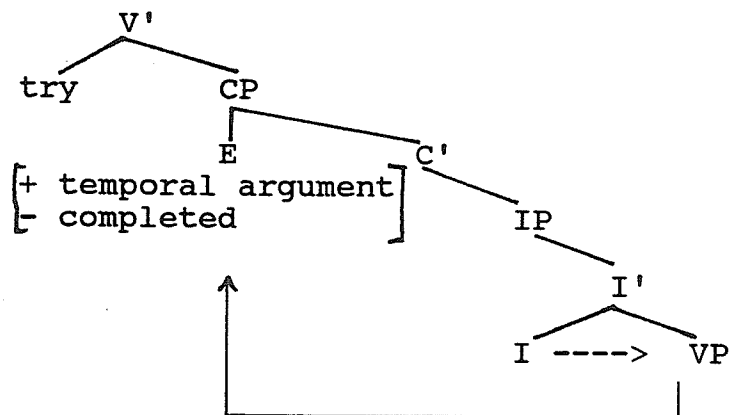


(41)



try: selects [+temporal argument, -completed] (42), no perfective complement and no future reading are possible.

(42)



What is problematic at this point is the fact that anaphoric E₂ can either be bound by a temporal argument or an empty modal operator, unlike the binding requirements for thematic anaphors. A possible way out would be to allow for some version of functional determination of the property of anaphoric E: if it is A-bound it can be [+anaphoric, -pronominal], if it is A'-bound it qualifies as a variable. How this could be made precise is, however, unclear to me.

K. Zagona has pointed out to me that there is an alternative to an analysis in terms of empty modal operators: the matrix verb selects a [+modal] E-role in SpecCP, which forms an A'-chain with its original position, thus rendering a future reading. If no [+modal] E-role in SpecCP is selected, E₂ can simply stay in situ, its MGC being the matrix IP. The pattern of future shifted perfective complements could then be explained by endowing [+modal] E with [+/- completed] features. One problem arises, however, with respect to possible/impossible perfective complements of control verbs: If E stays in situ, there is no way to exercise a selectional restriction on its [+/- completed] feature; hence - contrary to the facts - no lexical variation of licensing of perfective complements would be expected.

I thus conclude that the temporal properties of control complements with respect to lexical selection by the matrix verb can in principle be accounted for by a tense-model which employs a notion of temporal argument structure.

Consider now Naked Infinitivals: they lack part of the structure of a full-fledged control complement. There is no CP-projection, hence no future reading via A'-binding of E is possible because there is no position available for the respective operator or [+modal] element. The structure of an NI complement could even be a pure VP, with the subject in VP-internal position, thus accounting for the lack of the infinitival marker "to". In this case the matrix verb would have to be responsible for the licensing of the complement VP by assigning an anaphoric temporal theta-role E to it. Though this might seem awkward at first sight, it eliminates the independent need to express the generalization that complements of perception verbs can - if infinitival - only be NIs: if a verb selects an internal temporal argument, the latter can only be realized as a VP. In fact it has been argued by Gee (1977) that "NI-constructions have a particularly close relationship between the VP in the complement and the higher perception verb (an almost "direct

object"-like relationship)" (Gee (1977:477)¹⁵.

The nonavailability of perfective NI-complements is easy to tackle under these assumptions: if the defective verb 'have' can only be licensed by head-head-agreement with a governing head that bears the features [+/-tense] (Zagona (1988)), it cannot occur governed by a matrix verb, since the latter is not equipped with the necessary features. The MGC of E₂ would in this case be the matrix IP in English and the matrix CP in languages exhibiting V-movement (see fn.13).

ECM-complements, finally, share with NI-complements the general lack of future readings for the reasons discussed above, namely the non-availability of a SpecCP position. Perfective complements are - as opposed to the NI case - possible with some ECM verbs. This is not unexpected, however, as ECM complements seem to contain more structure than pure NIs. Assuming that they are TPs under a split-Infl analysis, for example, allows for selection of [+/- completed, +temporal argument] in the specifier of TP by the matrix verb. Perfective 'have' can be licensed without problems by head-head-agreement with the functional head T within the complement. The MGC of E₂ in SpecTP would be extended to the matrix clause as the matrix verb governs the specifier of TP.

Summarizing the results of this discussion, it seems that it can at least be claimed that temporal selectional restrictions are expressible in a theory of temporal argument structure, though the particular analysis sketched in this paper is speculative at this point.

¹⁵ Considering the range of syntactic data presented in Gee (1977) and Akmajian (1977) with respect to perception verb complements of the "-ing" or NI variety, it becomes clear that an analysis of NIs as bare VPs needs a lot more syntactic motivation, especially if the systematic differences between "-ing" and NI complements are taken into account.

5. Infinitival Sentential Subjects: Opening a Can of Worms

Infinitival sentential subjects seem to have two possible temporal relations to their matrix clause: either they are cotemporaneous as in (43)

(43) [to see the game] frightened John

or there is an (adverb-triggered) future shift:

(44) [to see the game at 7 o'clock] frightened John at 6 o'clock

Perfective have can be introduced:

(45) [to have seen the game at 6 o'clock] frightened John at 7 o'clock

The corresponding tense structures are:

(43') E₁ , R ___ S
 |
 R₂ , E₂

(44') at 6 o'clock -E₁ , R ___ S
 |
 R₂ —> E₂ —at 7 o'clock

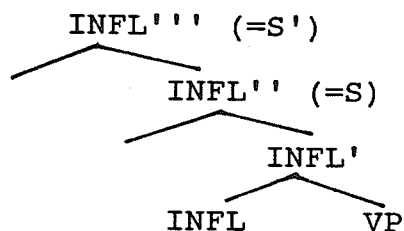
(45') at 7 o'clock -E₁ , R ___ S
 |
 at 6 o'clock -E₂ ___ R₂

So far, the options in (43)-(45) correspond to those of infinitival control complements with one crucial difference: the matrix verb cannot exercise selectional restrictions over its infinitival subject, a fact that is expected under an approach to tense in terms of argument structure.

Hornstein's theory, especially the assumptions in chapter 5 of Hornstein (1990) are not compatible with these facts. Hornstein claims that "the anchoring relation among elements in the tense system is mirrored in the government configuration of the representative morphemes." (Hornstein (1990:171)). This amounts to the claim that "structurally, A can anchor B if and only if A governs B. Two points in the tense system can interact just in case they are in a government relation." (Hornstein (1990:171)) where government is defined as

"A governs B iff_{def} all maximal projections that dominate A dominate B, and if A governs B then A governs the head of B." (Hornstein (1990:168))

The sentential structure assumed by Hornstein is as follows:

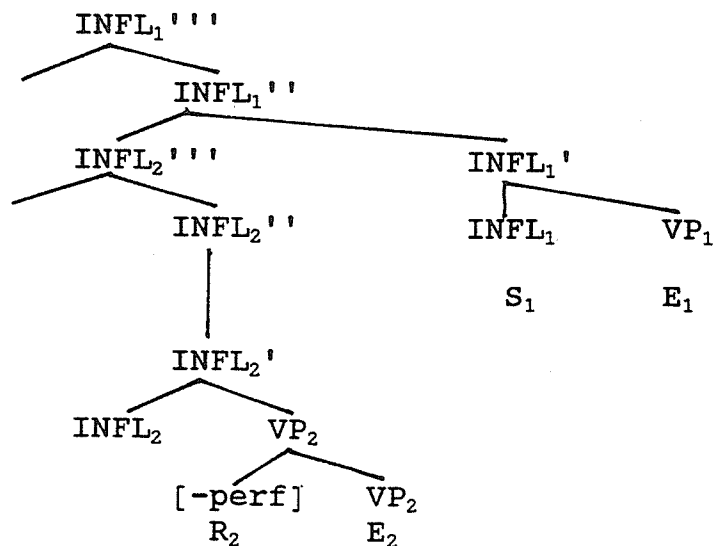


It is proposed that the TNS morpheme in INFL provides the S point, the predicate (=V) provides the E point and R is provided by an adverbial perfective morpheme which can be either [-perfective], in which case it is not phonologically realized and provides an associated R,E configuration or it can be [+perfective], realized as have providing an E__R structure.

This analysis allows to derive the fact that relative clauses do not undergo SOT, and hence only allow for the default speech time denotation of S₂: INFL₂''' is not governed by the matrix V, since

NP intervenes¹⁶ (see Enç (1987)).

But now infinitival sentential subjects pose a problem:



E₁ is inaccessible to R₂, being separated from it by the maximal projections VP₁¹⁷. Linking of R₂ to S₁ which is the only structurally legitimate possibility yields the wrong results:

(43) [to see the game] frightened John

(43') correct interpretation:

E₁ , R₁ — S₁
|
R₂ , E₂

¹⁶ Presupposing that the structure of an NP modifies by a relative clause is [NP DET N S'] as opposed to [NP NP S'] for noun-complement constructions that freely undergo SOT.

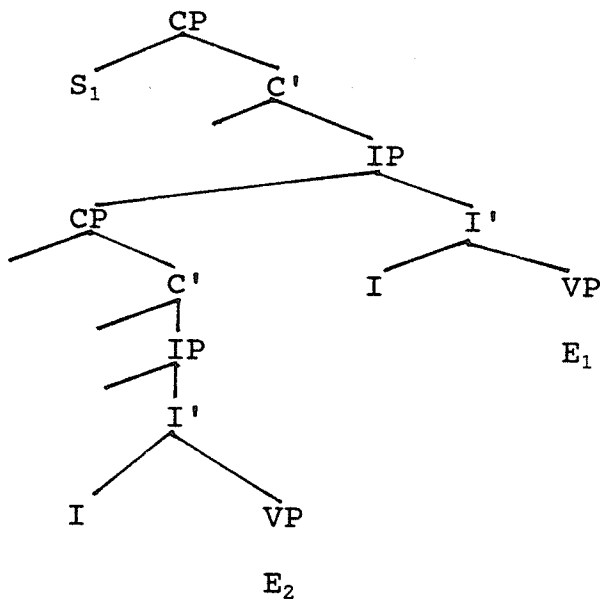
¹⁷ It seems that V-to-I movement could surpass this difficulty, but on the other hand English is standardly assumed to lack this movement process.

(43'') predicted interpretation:



This leads to the conclusion that Hornstein's approach is inadequate for the treatment of infinitival sentential subjects.

However, the analysis of infinitivals in terms of temporal argument structure sketched above also runs into immediate difficulties. The dependence of the temporal construal of the sentential subject on the event time of the matrix clause cannot be attributed to binding in the S-structure configuration as the matrix VP is not c-commanding the subject:



The situation with respect to the MGC of the anaphoric E-element in the sentential subject is as follows: (see above)

- E is in-situ: it is governed by I, but the next projection containing a Complete Functional Complex is the matrix CP, therefore the latter is its MGC
- E is in SpecCP: contrary to the case of complement CPs, E is ungoverned in this position, hence violates principle A

In other words: E has to stay in-situ in infinitival sentential subjects, the option of movement to SpecCP is - contrary to control complements - not available.

At this point it could be argued that E₂ is bound by the S-role of the matrix clause, but for some reason completely mysterious to me this must be excluded, as the wrong temporal interpretation would result. The clearest case to illustrate this point is a perfective infinitival clause in subject position:

(46) [to have been involved in these activities] frightened
John

In (46) the temporal construal can only result in completion of "involvement" before "frightening" took place¹⁸.

Considering now the possibility of binding of E₂ by E₁, one possible solution could be along the lines of Belletti/Rizzi (1988), who claim that the theme-argument of Psych-verbs is actually base-generated within VP and moves to a nonthematic subject position at S-Structure. The evidence presented consists of typical "derived subject" properties of the theme, as well as of binding-theoretic facts: anaphors contained within the theme can be bound by the experiencer, which would be completely unexpected if the theme were base-generated as an external argument since the c-command requirement for binding were violated. Under the assumption that principle A can (but need not) be already fulfilled at the level of Deep Structure, Belletti/Rizzi derive the relevant facts.

Infinitival sentential subjects, however, also occur with non-Psych constructions as in (47) resulting - to my judgement - in the same temporal properties:

¹⁸ In fact this sentence would be most natural in a context where John was involved in some activities that he considered perfectly harmless until somebody told him how dangerous they were.

(47) [to have been involved in these activities] was a pleasure for
John

Whether or not sentences like (47) could in principle be subsumed under a Belletti/Rizzi-type analysis or whether independent factors are responsible for the binding of E_2 by E_1 is not clear to me.

5. Conclusion

Though the analysis proposed in section 3 is sketchy, one claim can be maintained: expressing lexical selection of temporal interpretation of infinitival complement clauses is in principle not coverable in a Reichenbachian approach to tense, since the latter derives temporal construal directly from tense morphemes, and there is no way to express lexical selection for basic tense structures without introducing new and possibly much too powerful mechanisms of selection.

In a model employing temporal argument structure the situation is different: matrix verbs can select for specific elements (as e.g. Wh-operators) in the periphrastic positions of complement clauses, they can select finite versus infinitival complements etc. With these facts in mind it seems natural to account for differences in temporal interpretation of infinitival complements triggered by lexical properties of matrix verbs in basically the same way.

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Licensing Conditions and *ta* Affixation
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In this paper I will discuss some of the phonological changes in Japanese, those triggered by affixes such as *ta* (past tense morpheme).¹ When *ta* is attached to certain verbal stems, *ta* changes to *da*; some verbal stems undergo phonological changes also. I will explain these changes using the "licensing conditions" proposed by Itô and Mester (in lectures). There are language-specific licensing conditions, as well as universal conditions. To explain the /t-/d/ alternation, language-specific licensing conditions which apply to the native Japanese vocabulary (Yamato) are necessary.²

In section 1, I outline the changes that occur with *ta* affixation and consider some problems in McCawley's analysis. I focus on the /t-/d/ alternation, which has been explained as (Voicing) Assimilation (McCawley, 1968; Kuroda, 1965). I argue that Voicing Assimilation is not the only reason for the /t-/d/ alternation, based on Itô and Mester's (1989) analysis of Compound Voicing (Rendaku), which shows that sonorants are unspecified for the feature [voice].³

In section 2, I will present Itô and Mester's analysis for morphophonological changes, mainly the /t-/d/ alternation, in *ta* affixation. Their licensing conditions for Roots, which play a significant role in these changes, are presented also. In section 3, I will develop a refined analysis which makes use of syllable theory and feature geometry. Using the phonological restrictions that apply to the Yamato vocabulary, in addition to Underspecification theory,

¹ The other affixes are *te* (gerandive marker), *tari* (representative) and *tara* (conditional).

² The Japanese lexicon consists of four strata (Itô and Mester, 1991):

- i) Yamato: Mostly descendants of morphemes that were part of the Japanese vocabulary before the influx of Chinese loans.
- ii) Sino-Japanese: Mostly descendants of morphemes that entered Japanese in several waves of borrowings from Chinese that began about 400 AD.
- iii) Mimetic: Sound-symbolic morphemes, occurring almost exclusively in a class of manner adverbs.
- iv) Foreign: Recent borrowings.

A detailed analysis of Japanese lexicon is found in Shibatani (1991).

³ In Itô and Mester (1989) it is also argued that the feature [voice] is privative. That is, a segment is either specified for [voice] or unspecified for [voice]; there is no feature [-voice]. According to Goldsmith (1990), 'privative' is the term Turbetzkoy (1967) uses. Archangeli (1988) uses a term 'monovalent,' instead of 'privative.'

the diverse phonological changes in *ta* affixation can be better explained.

1. McCawley's (1968) analysis

The past tense marker *ta* alternates with *da* when verbal stems end in nasals (/n/, /m/) or voiced obstruents (/b/, /g/); vowels and other consonants (/r/, /s/, /t/) do not trigger the voicing of /t/.

(1) Verbal morphology:

a. /kag/ 'smell'	kai-da	f. /yor/ 'approach'	yot-ta
b. /yob/ 'call'	yon-da	g. /kas/ 'lend'	kasi-ta
c. /sin/ 'die'	sin-da	h. /kat/ 'win'	kat-ta
d. /yom/ 'read'	yon-da	i. /tabe/ 'eat'	tabe-ta
e. /kaw/ ⁴ 'buy'	kat-ta	j. /oti/ 'fall'	oti-ta

In addition, some of the stems above undergo phonological changes, such as assimilation to the place of articulation. I will return to these changes in section 2 and 3.

McCawley (1968) explains every case of the voicing of /t/ above as Voicing Assimilation (VA). This implies that he assumes that the feature [+voice] is present at the stage of VA. For example, his analysis of the changes in /yom+ta/ 'read+past' and /yor+ta/ 'approach+past' are as follows (PA= Place Assimilation):

(2)

a.		'read'	b.		'approach'
	underlying	yom + ta		underlying	yor + ta
	VA	yom + da		r->obst/ _obst	yod + ta
	PA	yon + da		VA II	yot +ta

Notice that VA in (2a) is progressive assimilation, while VA II in (2b) is regressive assimilation. VA II is stipulative, since it applies only to a case like (2b). That is, among C[+voice] C[-voice] clusters, only /dt/ undergoes VA II. Notice also that there is no appropriate order for the rules; if VA precedes VAII, /yor+ta/ changes to **yorda* due to VA; if VAII precedes VA, /yon+ta/ 'read+past' is changed to **yotta*, which is the wrong result.

In addition, the fact that vowels do not trigger Voicing Assimilation at all cannot be explained if the feature [voice] were underlyingly present.

⁴ In McCawley (1968), /kap/ is used instead of /kaw/. According to him, /p/ changes to /w/ through /h/, in the derivation of *kaw-anai* 'not buy.'

- (3) a. /tabe + ta/ 'eat+past' --> tabeta
 b. /oki + ta/ 'get up+past' --> okita

Thus, it seems to be wrong to posit the feature [voice] underlyingly.

Further evidence against the presence of [voice] underlyingly comes from the phenomena called Rendaku. Rendaku is a rule which voices the initial obstruent of the second element in a Yamato compound. This rule is blocked by voiced obstruents in the second element in a compound.⁵ For example, in (4a, b) /t/ does not change to /d/ because voiced obstruents are in the second elements, while in (4c) and (4d) /t/ undergoes Rendaku, because of the absence of voiced obstruents.

- (4) a. satu + taba --> satu-taba, *satu+daba 'a roll of bills'
 b. doku + tokage --> doku-tokage, *doku-dokage 'poisonous lizard'
 c. hosi + kaki --> hosi-gaki, *hosi-kaki 'a dried persimmon'
 d. yama + sato --> yama-zato, *yama-sato 'a mountain village'

Notice that the surface voicing of vowels, unlike the voicing of obstruents, does not block the application of Rendaku. The following examples show that sonorants also do not block Rendaku.

- (5) a. nise + kane --> nise+gane 'fake money'
 b. nise + sakura --> nise+zakura 'fake cherry blossom'

These phenomena in Rendaku show that sonorants as well as vowels are unspecified for the feature [voice].⁶

Then, it is a question why some sonorants, that is, /m/ and /n/, trigger voicing of /t/, while other sonorants do not in *ta* affixation. I will argue in section 2 that voicing of /t/ in the cases of (1c) and (1d) should be attributed to a restriction specific to Yamato stratum.

2. Prosodic Phonology and *ta* Affixation

In this section, the phonological changes in *ta* affixation are explained along the lines of Itô and Mester (in lectures). I elaborate on some of their analysis. However, since I mainly focus on the voicing of /t/, some cases where voicing does not occur are not discussed. I will develop a complete analyses in section 3.

⁵ This restriction is known as Lyman's Law. See Vance (1987) for details.

⁶ A more detailed analysis is in Itô and Mester (1989).

Itô and Mester (in lectures) propose an analysis for morphophonological changes in *ta* affixation. Their analysis is based on the Segment Licensing Hypothesis:

- (6) Segment Licensing Hypothesis:
Segments (Roots) must be prosodically and melodically licensed.

The followings are universal licensing conditions proposed by Itô and Mester (in lectures):

- (7) Prosodic Licensing (p-licensing):
A dominating prosodic category X p-licenses its daughter Y.
- (8) Melodic Licensing (m-licensing):
If Y is a feature-geometric dependent of X, then Y m-licenses its mother X.
- (9) Inherited Licensing:
If two root nodes have a common head (PLACE), p-licensing can be inherited through the shared head.

In addition to these universal licensing conditions, there are several other restrictions specific to the Yamato stratum in Japanese vocabulary. Itô and Mester propose the following language-specific licensing restrictions for Yamato vocabulary:

- (10) Prosodic Licensing restrictions on codas:
 μ 's do not p-license R[+cons].
- (11) Melodic Licensing restrictions on codas:
Only [nasal] m-licenses a coda Root.
- (12) Coda Voicing condition (inoperative in Foreign):
 μ 's must not dominate [voice].
- (13) Uniform m-licensing (inoperative in non-Yamato):
Heads m-license if and only if they uniformly m-license.
- (14) Labial constraint:
Non-moraic labial cannot m-license.

The above constraints explain why the following examples are ill-formed:

- (15) a. *kamda, *tinba, *kamgae
b. *kapta, *kasta, *kat, *mar
c. *kadda, *kabba, *beggan
d. *tompo, *kankae, *ontori
e. *kapa, *pati, *tapi

In (15a) nasals do not undergo place assimilation to the following consonants. Notice that the coda Roots are m-licensed by (11). The ill-formedness is attributed to the violation of p-licensing; since the coda Root is [+cons], it is not p-licensed by μ , due to (10). If spreading of place from onset Root to the coda Root occurs, the latter becomes p-licensed through Inherited Licensing (9).

In (15b) the coda Roots are not nasals. This is a violation of m-licensing, due to (11). In other words, a coda cannot be a non-nasal consonant unless it is a part of a geminate.⁷ (15c) shows that voiced obstruent geminates are ill-formed.⁸ This is a violation of Coda voicing condition (12).

In (15d) the obstruents which follow nasals are voiceless. The ill-formedness is attributed to a violation of m-licensing. Notice that the coda Roots are p-licensed by Inherited Licensing (9). That is, the place node of the onset Root spreads to the coda Root; as a result, the place node of the onset Root cannot uniformly m-license. Because of the restriction (13), the onset Root is not licensed melodically.⁹

In (15e) the examples are ill-formed because of a violation of m-licensing. Due to Labial constraint (14), the onset Root is not m-licensed. (14) describes the fact that *p* cannot exist except in a geminate form.

In the derivation of *ta* affixation, the following operation may be applied:

⁷ This constraint applies to other strata, too. This phenomenon is discussed in Itô (1986); she proposes Japanese Coda Condition to explain this fact.

⁸ Voiced obstruent geminates are only allowed in Foreign stratum.

⁹ This restriction does not apply to non-Yamato strata.

(16) Available operations:

- a. Delinking
- b. 1 Spreading (feature-filling not feature-changing)
2 Docking¹⁰
- c. Insertion

These operations may be applied, if a segment (Root) is not both p-licensed and m-licensed.

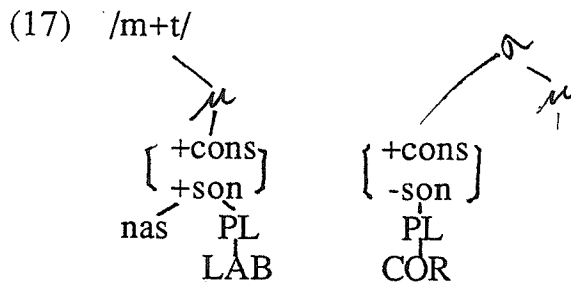
Before I discuss the conditions and their ordering for these operations, I will briefly present Itô and Mester's analysis. Mainly the /t-/d/ alternation (1a)-(1d) is discussed here. I will point out empirical and theoretical problems for their analysis. Although some theoretical arguments are included in this section, the theoretical grounds for the conditions and their ordering will be given in section 3.

According to Itô and Mester, there are two different processes for the voicing of /t/. In the cases of /b+t/ and /g+t/, docking of the feature [voice], which comes from /b/ or /g/, is the reason for the voicing of /t/.¹¹ On the other hand, in the cases of /m+t/ and /n+t/, insertion of the feature [voice] takes place. Remember that sonorants as well as vowels are not specified for the feature [voice] at the stage of *ta* affixation, as I argued in section 1. Thus, the voicing of /t/ in the cases of /m+t/ and /n+t/ cannot be explained by voicing spread or docking of [voice]; the insertion of the feature [voice] is required.

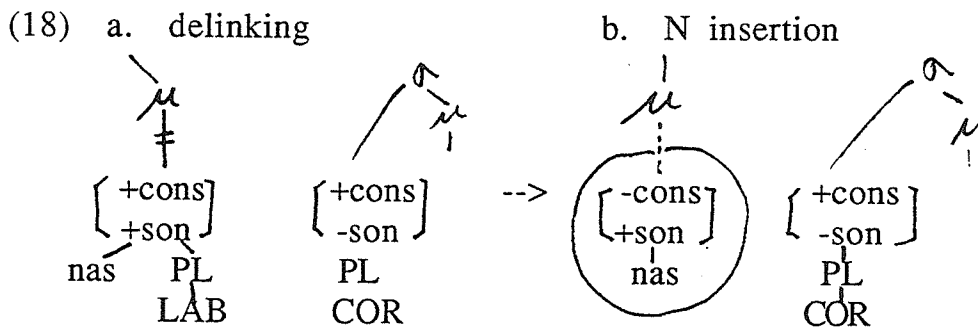
Let us look at the derivation of [nd] from /m+t/; [nd] is derived from /n+t/ in the same fashion. The underlying structure of /m+t/ is illustrated in (17). Following McCarthy (1988), I assume that the major class features [consonant] and [sonorant] (henceforce, [cons] and [son]) form the Root node.

¹⁰ Although Itô and Mester do not include docking in the available operations, they use this term in the explanation of voicing of /t/ as well as the phenomenon of Rendaku compounds. As far as I understand, docking is the association of a floating feature with a certain Root.

¹¹ In /b+t/, *b* represents the ending of a verbal stem, which is linked to a coda node, and *t* is the first segment of past tense morpheme, which is linked to an onset node. The same applies to other consonant clusters written as /C+t/.



Notice that the coda Root is not properly licensed, since it is not p-licensed by (10) even though it is m-licensed.¹² Therefore, some operation must be applied. According to Itô and Mester's (1991) analysis, delinking of Root is applied, as in (18a).¹³ Then, insertion of Root follows;¹⁴ a possible Root node to be inserted is /N/, which satisfies the Melodic Licensing restrictions on codas (11). This is illustrated in (18b). Itô and Mester claim that the Root which is inserted has to be [-cons], since a Root [+cons] is not p-licensed because of the Prosodic Licensing restrictions on codas (10).¹⁵ These operations are illustrated as follows:



After delinking of the coda Root, as in (18a), /N [-cons]/ is inserted, as in (18b); thus, [N t] is derived.

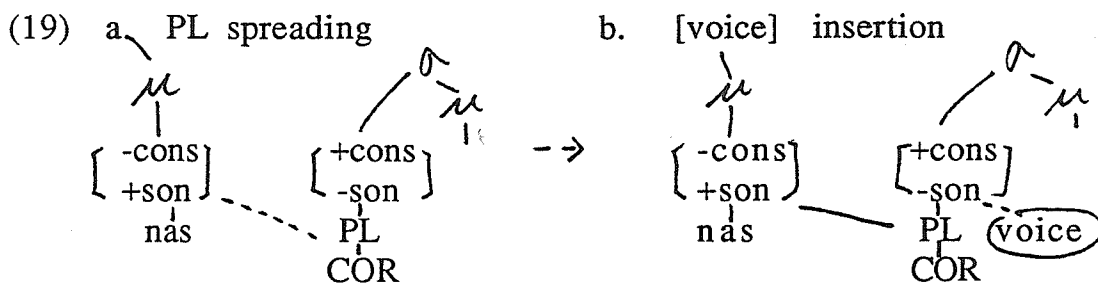
Since this is not the right result, further operations are necessary. Notice that the right result is [nd]. That is, /N t/ has to undergo two operations: spreading of PL, and insertion of [voice] into the onset Root. These processes are illustrated as follows:

¹² I use the term "coda Root" to refer a Root linked to a coda. Also, "onset Root" is a Root linked to an onset.

¹³ I argue later that it is the PL node not the Root that is delinked.

¹⁴ There is another possible operation, that is, spreading of the onset Root. Empirically, however, the spreading of Root node is not appropriate, since it would derive a wrong result, such as *yot-ta, instead of yon-da.

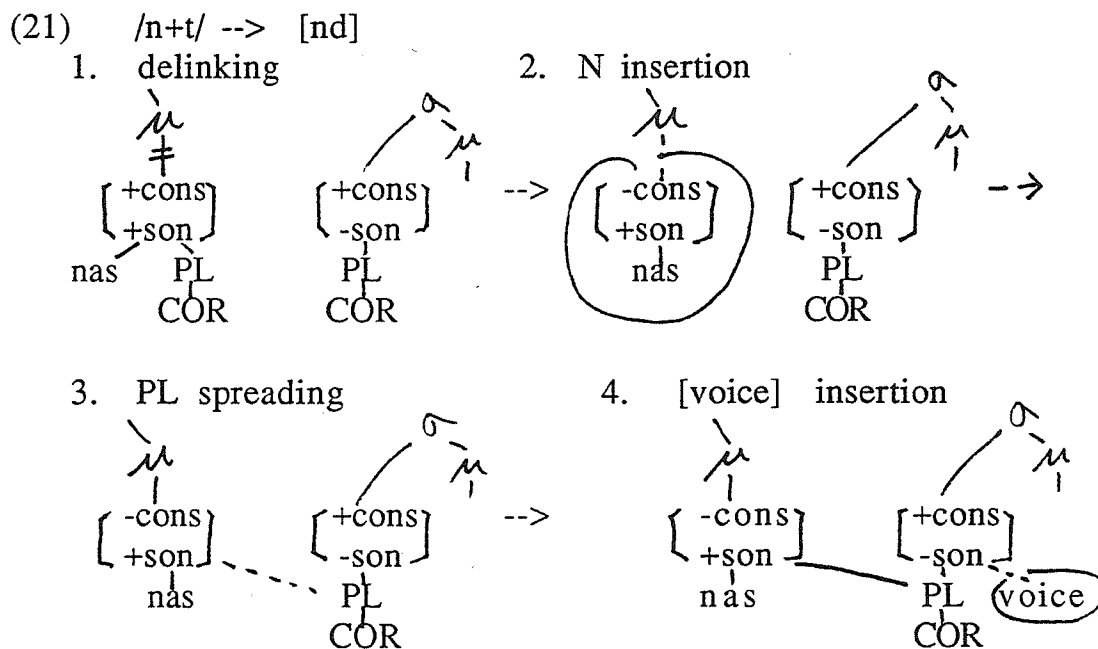
¹⁵ However, I argue below that /N[+cons]/ can be inserted, since /N/ is m-licensed as a coda by definition (15), and spreading of PL is necessarily applied in Yamato when a nasal consonant is followed by a consonant [-cont].



The order of the operations which Itô and Mester propose for the change of /m+t/ to [nd] is summarized as follows:

- (20) /m+t/ --> [nd]
- 1) delinking of Root /ø+t/
 - 2) insertion of N /N+t/
 - 3) spreading of PL /n+t/
 - 4) insertion of Voice [nd]

The derivation of [nd] from /n+t/ is achieved in the same manner:



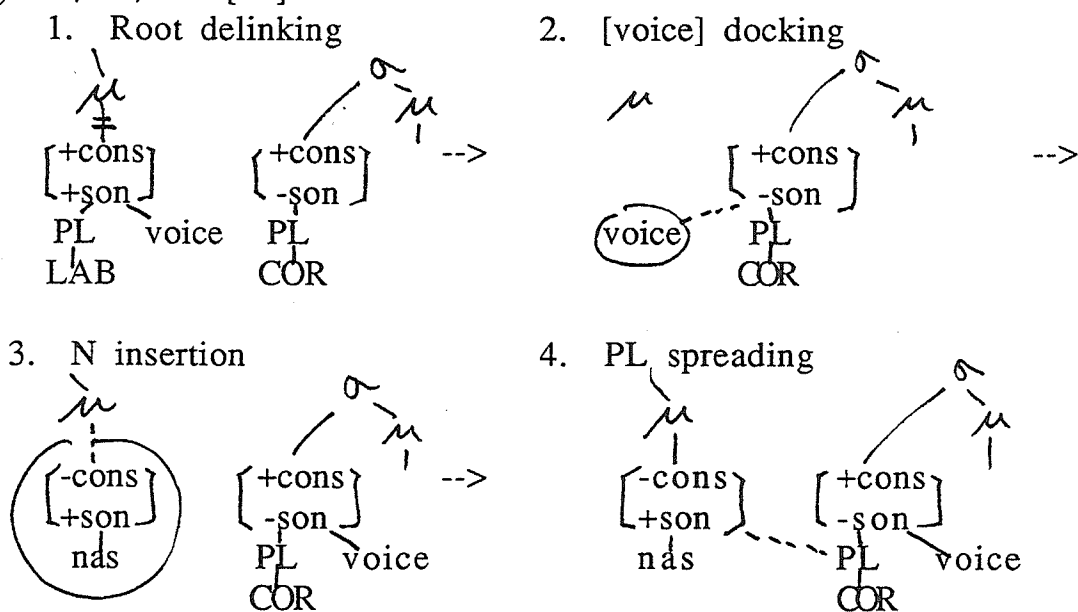
There are several problems in the above analysis, which I will return to later.

So far, we have seen the cases of /nasal+t/, where the voicing of /t/ is not triggered by voicing assimilation or docking of the floating [voice]. Let us turn now to the cases where voicing seems to be triggered by voicing assimilation- that is, the changes in /b+t/--> [nd] and /g+t/ --> [id]. Since the feature [voice] is underlyingly present

in codas in these cases, insertion of the feature [voice] is not necessary, as it is in the case of /nasal + t/; instead, the feature [voice] comes from the adjacent segment, namely, /b/ or /g/.

Let us look at Itô and Mester's analysis of the change of /b+t/ to [nd]. Notice that the coda Root is neither p-licensed by (10) nor m-licensed by (11); thus, delinking of the coda Root is necessary. After the delinking, the floating feature [voice] docks on the onset Root.¹⁶ Then, /N [-cons]/ is inserted as a coda Root and [Nd] is derived. To derive the right result, a further operation is necessary: that is, the spreading of the PL from right to left. The derivation of [nd] from /b+t/ is illustrated as follows:

(22) /b+t/ --> [nd]



(23) Operations and Ordering

- 1) delinking of the coda Root
- 2) docking of the floating [voice] on the onset Root
- 3) insertion of /N[-cons]/
- 4) spreading of the PL from right to left

¹⁶ There is an alternative analysis: Voicing Spread applies before the delinking. More precisely, it would be the spreading of the Laryngeal node (L) instead of the feature alone, since the feature [voice] does not spread if it is followed by a Vowel. For example, /tabe + ta/ --> [tabe-ta] not [tabe-da]. Since the Voice tier is autosegmental, the feature [voice] linked to /b/ could spread to the adjacent consonantal Root, if the rule relevant here were spreading of the feature [voice]. If the rule is spreading L, the following vowel should block the spreading, which is the case. However, this analysis might cause a problem in the case of /g+t/, where /i/ is inserted between /g/ and /t/.

Let us look at the derivation /g+t/ --> [id] next. Although Itô and Mester (in lectures) do not present an exact representation of the derivation, they would assume that the voicing of /t/ occurs in the same fashion as the case of /b+t/. That is, the delinking of the coda Root /g/ is applied first of all; and then docking of the floating [voice], which comes from the delinked Root, follows. Then insertion of a Root occurs. Notice that in this case a vowel /i/, instead of /N/, is inserted; thus, spreading of the PL is not necessary.

One of the theoretical problems of this derivation above is that the conditions for the insertion of Root are not clear. A theoretical explanation is needed as to when /i/ is inserted and when /N/ is inserted. Another problem is related to the ordering of the deletion of /g/ or /k/ and insertion of /i/. It has been an issue whether i) /i/ is inserted first, and then /g/ is deleted, or ii) /g/ is deleted first, and then /i/ is inserted. The former ordering is proposed by Uchida (1991).¹⁷ He argues that the deletion of /g/ and /k/ followed by /i/ is specific to inflectional morphology. Itô and Mester argue for the latter ordering. I will return to this issue in section 3.

So far, we have seen Itô and Mester's analyses of the /t-/d/ alternation. Although their analysis seems to have some theoretical merits, there are empirical problems as well as theoretical ones. First of all, the derivation in (1g), that is, /s+t/ --> [sit], is problematic for their analysis. The problem is that /s/ is not deleted even though /s/ is neither p-licensed nor m-licensed as a coda; rather, /i/ is inserted to "rescue" this Root. In fact, epenthesis is quite common in Japanese, if a consonant is not syllabified.¹⁸ Then, one problem is to predict when a Root undergoes deletion or is not deleted, with epenthesis occurring instead.

The next problem is: why does insertion of /N/ or /i/ (or another vowel) not occur in the cases of /w+t/ and /r+t/, as shown in (1e) and (1f), where the coda Roots are also delinked? Notice that in these cases the onset Roots spread from right to left. Then, the preceding problem is even more complicated, as spreading of a Root must also be accounted for.

¹⁷ Uchida follows McCawley (1968) with slight modification. McCawley's original analysis includes "spirantization" which changes /g/ to /h/, before /g/ is deleted.

¹⁸ Itô (1986) proposes an epenthetic analysis for the derivation of Sino-Japanese compounds. For example: *sek* 'stone' + *tei* 'garden' --> *seki-tei*. Also, in the Yamato stratum, epenthetic vowel /i/ is inserted in the context C + C (+ is a morpheme boundary): for example, *kak* 'write' + *naosi* 'change' --> *kaki-naosi*, 'rewrite'.

These are theoretical problems, which I will return to in section 3. Another theoretical problem concerns the insertion of /N [-cons]/. According to Itô (p.c), nasals which are specified for PL should be [+cons]. Thus, after the spreading of PL from right to left, (20) and (23), /N [-cons]/ has to be changed to /n/, which is [+cons]. In other words, this is a feature-changing operation. This contradicts the condition they made for spreading, (see (19, b.1)).

Another problem concerning the insertion of /N [-cons]/ is that /N [-cons]/ does not require the spreading of PL; for example, /N [-cons]/ in the compound /keN-sin/ 'devotion' does not become [n]. This is because the coda is properly licensed: it is p-licensed because the Root is [-cons], and m-licensed because it has the feature [nasal]. It should also be noted that the onset Root node is properly licensed in the case of /n+t/, since it is uniformly m-licensed (13) and p-licensed by definition (7). That is, both the coda Root and the onset Root are licensed prosodically and melodically. Yet the spreading of PL is required in the case of /Nt/, since /Nt/ is not well-formed in Yamato. This would lead us to the conclusion that, even though there is no violation of the licensing conditions, some cases still need phonological operations to derive well-formed results. This means that either insertion of /N[-cons]/ is inappropriate, or the licensing conditions have to be modified. Since the licensing conditions do not seem to have problems in other cases, I will maintain them as they are, and reject the insertion of /N [-cons]/.

According to Itô and Mester, the reason for the insertion of /N [-cons]/, instead of /N [+cons]/, is based on the Segment Licensing Hypothesis (6); that is, Roots must be prosodically and melodically licensed. Since there seems to be a rule which requires nasal to undergo PL assimilation before obstruent stops, insertion of /N [+cons]/ should be no problem. For, after the PL assimilation, the inserted Root gets p-licensed through the onset Root by Inherited Licensing (9). Therefore, I propose the insertion of /N [+cons]/ in the case of /b+t/. In the cases of /n+t/ and /m+t/, I propose delinking of PL from the coda Root, instead of the delinking of coda Root as Itô and Mester claim.

In this section, we have seen how /t/ in the affix *ta* undergoes voicing. There are two kinds of voicing; one is the insertion of the feature [voice], as in the cases of /nt/ and /mt/; the other type, according to Itô and Mester (in lectures), is the result of docking of the feature [voice], which comes from the previous Root, as in the cases of /bt/ and /gt/.

The former type, namely, insertion of [voice], is triggered by the feature [nasal]; since /nasal + t/ is ill-formed in Yamato, /t/ has to be

changed to /d/. This insertion is theoretically justified by the licensing conditions; and we will see this in section 3.

The latter type, voicing docking, is triggered by the feature [voice] of a delinked coda Root. Therefore, in the cases of /r+t/ and /w+t/ voicing does not occur, exactly as in the cases /voiceless C +t/, since /r/ and /w/ are unspecified for the feature [voice], as we have seen in section 1.

Another important argument in this section is the specification of /N/ which is inserted after the delinking of the coda Root in the derivation of [nd] from /b+t/. I have argued that /N/ should not be [-cons], since /N [-cons]/ does not require the PL spreading. In addition, if PL spreading is applied to /N [-cons]/, it is changed to /N [+cons]/; however, this is not desirable.

3. Conditions and Ordering

In section 2, I have discussed *ta* affixation in view of the voicing of /t/, accounting for (1a) - (1d), /nt/, /mt/, /bt/ and /gt/. In this section, I will give the complete analysis of the phonological changes which accompany *ta* affixation, and discuss rules and the ordering.

First of all, it is important to clarify the conditions for delinking of Roots. In section 2, we have simply assumed that a Root is delinked if it is not both p-licensed and m-licensed. However, this assumption has a theoretical problem. Remember that in the case of the derivation of [nd] from /m+t/ and /n+t/, the delinking of the coda Root is followed by insertion of /N/, as in (20).¹⁹ This is further followed by the spreading of PL from right to left, and then the insertion of the feature [voice]. Notice that the two operations, the delinking of the coda Root and the insertion of /N/, together have the same effect as delinking of the PL node. Considering the economy of rules, delinking of the PL is preferred to the delinking of Root in these cases.

Thus, I propose delinking of the PL instead of the Root for the cases of /m+t/ and /n+t/. Notice that the coda Roots are already m-licensed by (11) in these cases. Then, by the operation of spreading PL from right to left, which is also applied to the case of delinking of the Root, the coda Roots become p-licensed.²⁰ Therefore, we can

¹⁹ In Itô and Mester (in lectures), /N [-cons]/ is inserted. However, as I have shown in section 2, the insertion of /N [-cons]/ is problematic. Thus, it is /N [+cons]/ which is inserted in this case.

²⁰ As the result, the onset Root violate the m-license condition (17). To remedy this, the insertion of the feature [voice] is applied. It has to be noted that the alternative, that is, the delinking of Root and the insertion of /N/, also require the PL spreading.

conclude theoretically that a coda Root which is m-licensed as a coda need not be delinked, since p-licensing is assured by the spreading of the PL. So I formalize the delinking condition as follows:

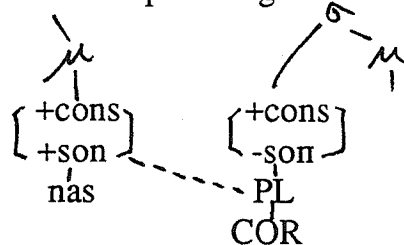
(24) Delinking condition for a coda Root

A coda Root is delinked if it is not m-licensed as a coda.

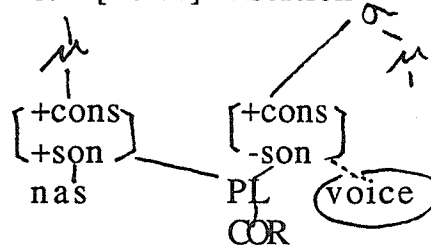
That is, nasal consonants should not be deleted in *ta* affixation.

After the delinking of PL, the PL of the onset Root spreads from right to left, as in (25a), and /nt/ is derived.

(25) a. PL spreading



b. [voice] insertion



Then, the onset Root becomes unlicensed melodically by (13), since the head (PL) of the onset Root is linked to the coda node, too. Therefore, some operation is needed in order to get the onset Root m-licensed. Remember that available operations are: delinking, spreading, docking, and insertion, as shown in (16). The possible operation here is insertion. Then, what is inserted? In this case, the feature [voice] is inserted. Notice that other features like [lateral] and [nasal] are not appropriate, since these features change a major feature [-son] to [+son], which is not desirable. Also the feature [cont] is not appropriate, since the sequence [nasal] [voiceless C] is disallowed in Yamato (Itô and Mester, 1991: 10). As the result of the insertion of [voice], we can get the right result [nd], as in (25b).

So far, we have seen that nasal codas are not subject to delinking in *ta* affixation, since they are m-licensed as codas. As for the other consonants, they are subject to delinking, for they are not m-licensed as codas by (11). Notice, however, that delinking does not necessary mean deletion.

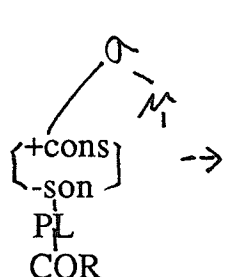
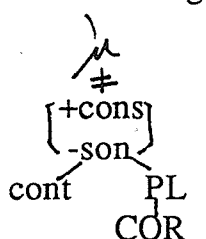
For example, in the case of /s+t/, /s/ is not deleted; instead, it becomes an onset of a new syllable. This fact indicates that some coda Roots need/should not be deleted, even though they are delinked from the coda. Thus, we have to find out when delinked Roots are deleted and when not.

I assume that a Root need/should not be deleted, (even though it is delinked from coda), if it has a daughter node which can uniformly

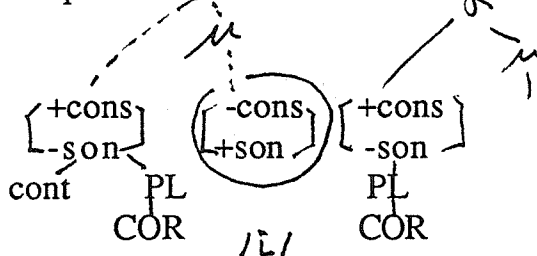
m-license it.²¹ (Notice that the conditions (13) and (14) are concerned). In such a case, epenthesis takes place, instead; thus, a vowel /i/ is inserted, as in /kas + ta/ --> [kasi-ta] in (26).

(26) /s+t/ --> [sit]

a. delinking



b. epenthesis



Notice that the Root /s/ has two daughter nodes [cont] and PL node, either of which can m-license its mother, since it is not linked to another Root. Thus, the Root /s/, which is delinked from the coda, (because it is not m-licensed as a coda by (11)), can be still qualified as an onset of a new syllable, since it can be m-licensed as an onset.²² That is, the Root need not be deleted. Rather, epenthesis takes place.

On the other hand, if a Root cannot be m-licensed even as an onset of a new syllable, that is, if any of its daughter nodes cannot uniformly m-license it, it has to be deleted.²³

(27) Condition for the deletion of a delinked coda Root:

A delinked (coda) Root is deleted if it does not have a uniform m-licenser.

For example, in the case of /w+t/, the coda Root is deleted and the onset Root is linked to the coda; thus, geminate *t*, [tt], is derived.

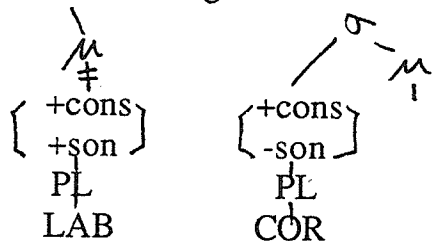
²¹ An alternative hypothesis is that the deletion takes place when a Root does not have a daughter, other than PL, by which it can be m-licensed. I will return later to the reason why I do not take this assumption.

²² Remember that the condition (11) is only for codas; thus, a Root can be m-licensed if it has a uniform m-licenser (13) which is not a labial(14).

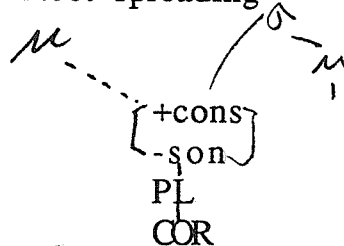
²³ See the Uniform m-licensing (13) in section 2. It should be also noted that LAB is not a m-licenser for an onset by (14).

(28) /w+t/ --> [tt]

a. delinking/deletion



b. Root spreading

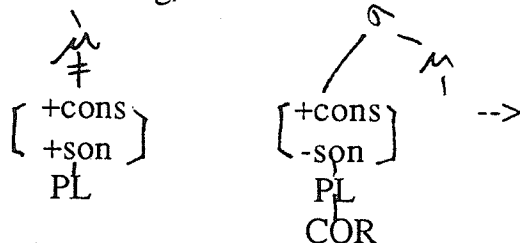


Remember that labial is not a m-licenser by the Labial constraint (14). Thus, the coda Root has to be deleted by (27). Then, spreading of PL from right to left follows, as in (28).

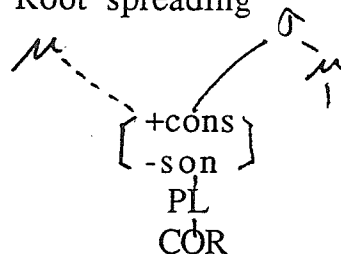
The case of /r+t/ is explained in the same fashion. According to Itô and Mester (1989), /r/ is not specified for coronal.²⁴ Thus, the PL cannot be a m-licenser, as PL-LAB cannot. Therefore, the Root /r/ is not m-licensed, and must be deleted. The derivation of [tt] from /r+t/ is illustrated in (29).²⁵

(29) /r+t/ --> [tt]

a. delinking/deletion

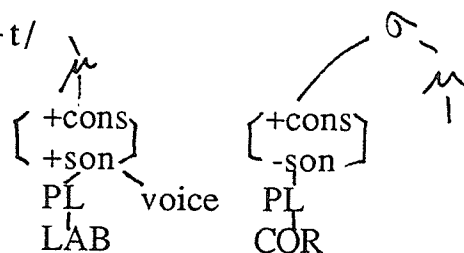


b. Root spreading



Let us turn to the case of /b+t/. The underlying representation is as follows:

(30) /b+t/



²⁴ Their argument is based on the following facts; i) there is only one liquid, /r/ in Japanese, ii) /r/ appears as an epenthetic consonant, and ii) it resists gemination. See Itô and Mester (1989, 273-6), for details.

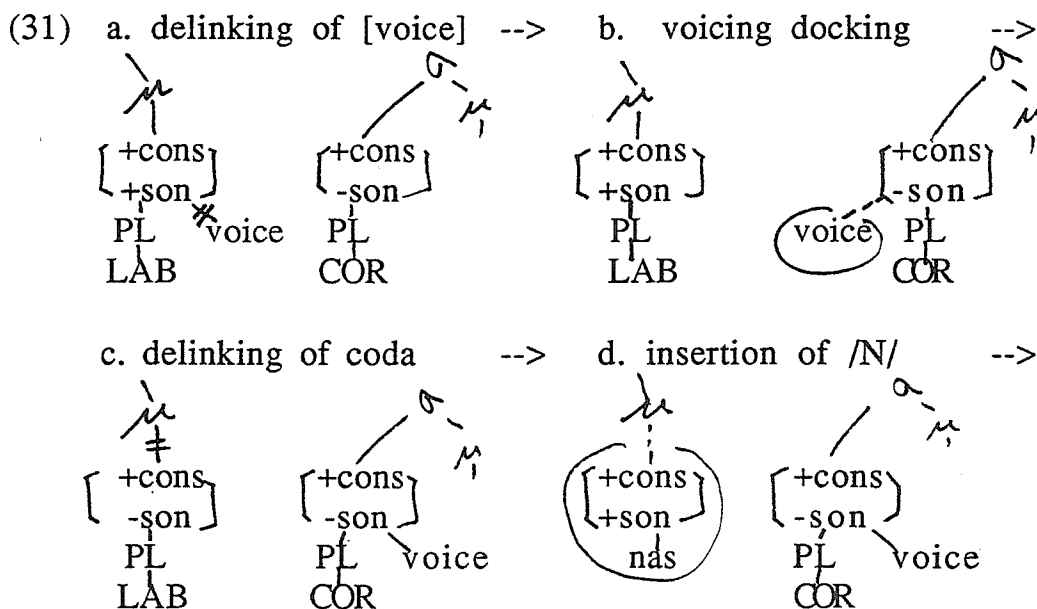
²⁵ /r/ should not be specified for the feature [lateral], since the feature [lateral] could be a m-licenser, and /r/ would not be deleted.

The coda Root is violating the Coda Voicing condition (16), since it dominates [voice]. Thus, it is reasonable to assume that the feature [voice] is delinked from the coda Root. Then, the floating [voice] docks on the onset Root, resulting the voicing of /t/.²⁶

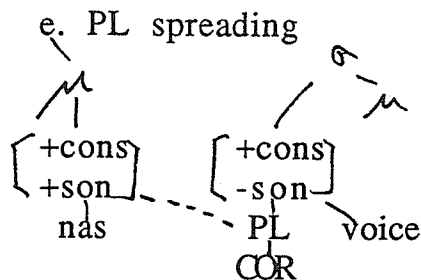
Notice that the coda Root is still violating the m-licensing condition as a coda by (11), since it does not dominate [nasal]. Then, due to the delinking condition (24), the coda Root, now /p/, is delinked from the coda. Remember that if the delinked Root is not qualified as an onset of a new syllable, it has to be deleted, due to the condition (27). Since the delinked Root has only PL which dominates LAB, it cannot be m-licensed even as an onset Root of a new syllable, due to the Labial constraint (14). Thus, the deletion of this Root takes place.

After the deletion, a Root /N/ is inserted. This is different from the cases /r+t/ and /w+t/, where the spreading of the onset Root to coda takes place. If the spreading of the Root were applied, it would derive *[dd], which is disallowed in Yamato, as shown in (15c). Thus, among the available operations (16), only Insertion is left. That is, insertion of a Root takes place. Notice that this Root is linked to the coda. In order to satisfy the Melodic Licensing restrictions on codas (11), /N/ has to be inserted. Then, spreading of the PL from left to right must follow, so that the coda Root is p-licensed by (10).

Summarizing, I illustrate the derivation as follows:

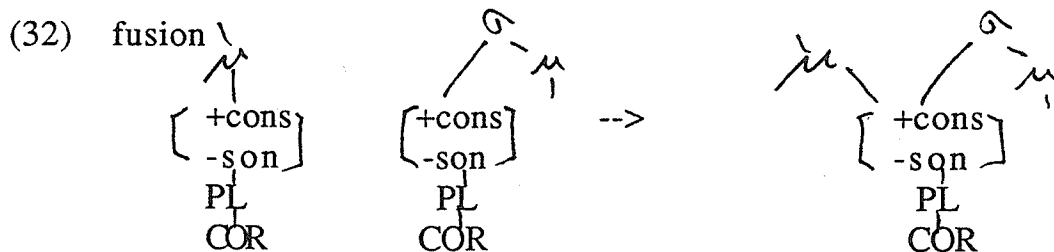


²⁶ This is similar to Rendaku voicing, as Itô and Mester (in lectures) argue.



Notice that the feature of /N/ is [+cons] rather than [-cons]; this differs from Itô and Mester's analysis. Also, the derivation (31) is different from Itô and Mester's analysis shown in (22), in that the voice docking precedes the delinking of the coda Root.

So far, we have seen that /r/, /w/, and /b/ are deleted because they are not m-licensed as onsets as well as coda. Now we are left with the three cases: /t+t/, /g+t/, and /k+t/. As for the case /t+t/, I simply assume with Itô (1986) that "fusion" takes place. That is, the two Root nodes merge, and as the result, one Root node is linked to both coda and onset nodes.

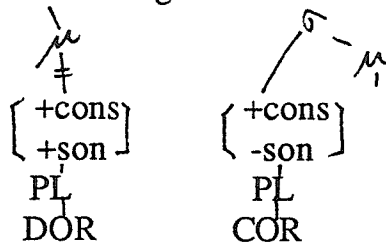


The last two cases, that is, /g+t/ and /k+t/, are controversial. As I mentioned in section 2, there are two possible derivations: i) epenthetic /i/ is inserted first, and then, /g/ or /k/ is deleted, and ii) /g/ or /k/ is deleted first, and then /i/ is inserted.

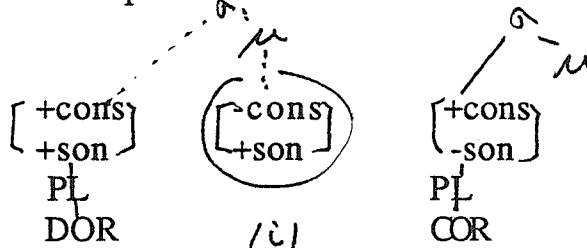
Our hypothesis predicts that the former is the right derivation. Notice that the coda Roots dominate the PL-DOR which can m-license an onset. Therefore, deletion does not take place; instead, /i/ is inserted, as in the case of /s+t/. Thus, the derivation of [it] from /k+t/ is as follows:

(33) /k+t/ --> [it]

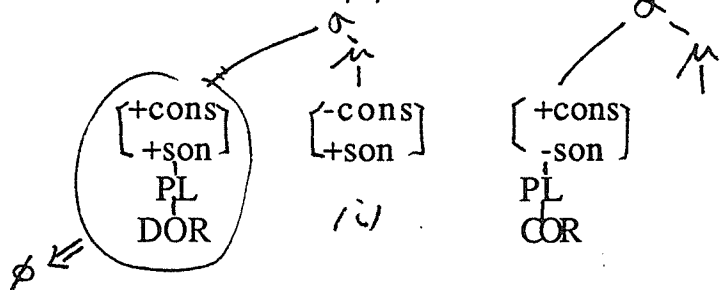
a. delinking from coda -->



b. epenthesis -->



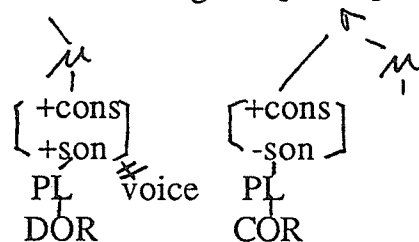
c. deletion of /k/



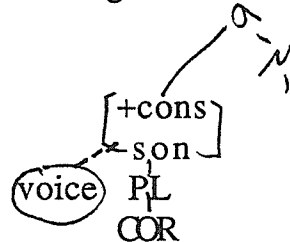
A rule which deletes /k/ is a special rule, to which I will return soon.

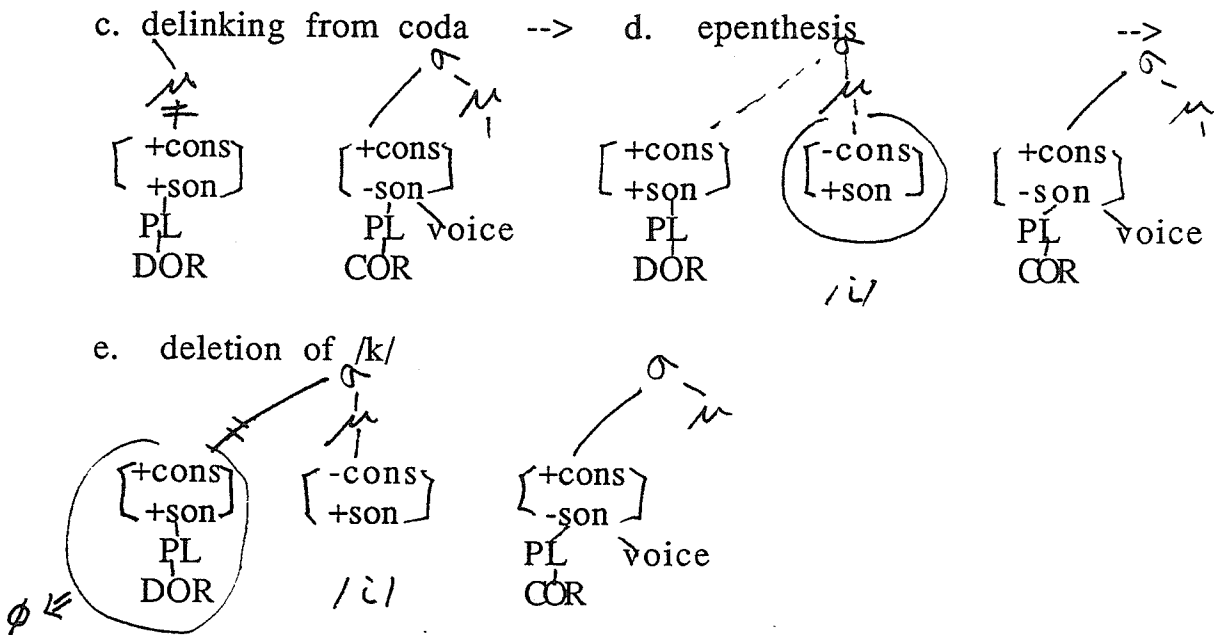
The derivation of [id] from /g+t/ is explained in a similar way, except the voicing of /t/. The voicing of /t/ is achieved by voicing docking, as in the case of /b+t/. Remember that when a coda Root dominates [voice], Coda voicing condition (12) is violated. Thus, in the case of /g+t/, the feature [voice] has to be delinked from the coda Root. Then the floating [voice] docks on the onset Root, deriving /k+d/. This is still ill-formed, since the coda Root is not m-licensed by (11). Due to the delinking condition (24), the coda Root has to be delinked. Notice that the delinked Root need not be deleted since it can be m-licensed as an onset of a new syllable, as defined in (27). Then, epenthesis takes place to "rescue" the stray Root. In order to derive the right result, the onset of the new syllable has to be deleted. The derivation is illustrated in (34):

(34) a. delinking of [voice] -->



b. [voice] docking -->





Notice that the deletion of /k/ (before /i/) is a specific rule in *ta* affixation, since in infinitival form of verbs, /k/ or /g/ is not deleted. For example:

- (35) a. huk 'blow' +i --> huk-i *hu-i
 b. kak 'write' +i --> kak-i *ka-i
 c. kag 'smell' +i --> kag-i *ka-i

This problem may be solved if we resort to the level ordering in lexical phonology (Kaisse and Shaw, 1985; Booij and Rubach 1987) or prosodic constituency proposed by Inkelas (1989). We can assume that /i/ insertion in *ta* affixation and /i/ affixation in infinitival formation are at different levels (level 1, level 2) or are of different constituency types (α , β). If this is the case, (35) is no longer a problem.

Although more study on affixations in Japanese is necessary, I tentatively give an explanation for the problem, using a similar device which Inkelas proposes for Spanish Stray Syllable Adjunction. I propose that /k/ deletion, which is a cyclic rule, applies within β constituents, but not within α constituents. I further assume that infinitival suffix /i/ is type α , and past tense morpheme is type β .²⁷ Simplified derivations are as follows:

²⁷ It should be also noted that Sino-Japanese compounding may be sub-compounding which belongs to type α in Inkelas' (1989) sense.

(36)	infinitival	past tense
	kak-i	kak-ta
α rules	$[\text{kak-i}]_{m\alpha}$	$[\text{kak}]_{m\alpha}$
	$(\text{kak-i})_{p\alpha}$	$(\text{kak})_{p\alpha}$
β rules	_____	$[[\text{kak}] \text{ta}]_{m\beta}$
	$(\text{kaki})_{p\beta}$	$(\text{kak-ta})_{p\beta}$
epenthesis	_____	(kak-i-ta)
/k/ deletion	_____	(ka-i-ta)
<hr/>		
output	[kaki]	[kaita]

It should be noted that the /k/ deletion is a cyclic rule, and hence is not applied to underived environment.²⁸ Since /k/ in *kaki* is not in the derived environment within β constituents, the /k/ deletion is not applied to it.

Alternatively, we could assume that the coda Roots were deleted before the insertion of /i/ in the cases of /k+t/ and /g+t/, if a new syllable formation required a feature other than PL for an onset. If this is the case, the deletion of consonants other than nasals and /s/ is easily explained.²⁹ However, this gives rise to several problems. For one thing, we need to explain why /N/ is inserted after the deletion of /b/, but /i/ is inserted after the deletion of /k/.³⁰ Also we need to explain why the spreading of the Root is not applied in the case of /k+t/, although the rule is applied to the other voiceless consonants.

Although it is not clear which derivation is the right one, I assume at this moment that deletion of /k/ and /g/ does not apply before the insertion of /i/ takes place. This must be so, if PL can m-license a new onset. Then, /k/ should not be deleted by the condition for the deletion (27); rather, the deletion of /k/ is attributed to another rule which is applied after the epenthesis.

In this section, I have argued that the delinking of Root does not necessarily mean the deletion of Root; the deletion of Root applies when a Root is not m-licensed as an onset. After the deletion of Root, either spreading of Root or insertion of Root, usually /N/, takes place.

²⁸ This is due to the Strict Cycle Condition.

²⁹ The voicing of /t/ in the cases of /b+t/ and /g+t/ should be explained by Voicing Spreading, rather than voicing docking, in this case.

³⁰ It might be the case that a dorsal node (DOR) attached to /g/ and /k/ is attributed to the insertion of vowel which also has Dorsal node. In other words, when DOR is floating because of the delinking operation, this DOR may trigger the insertion of /i/. On the other hand /b/, which does not have DOR, may not trigger the /i/ insertion; instead /N/ is inserted.

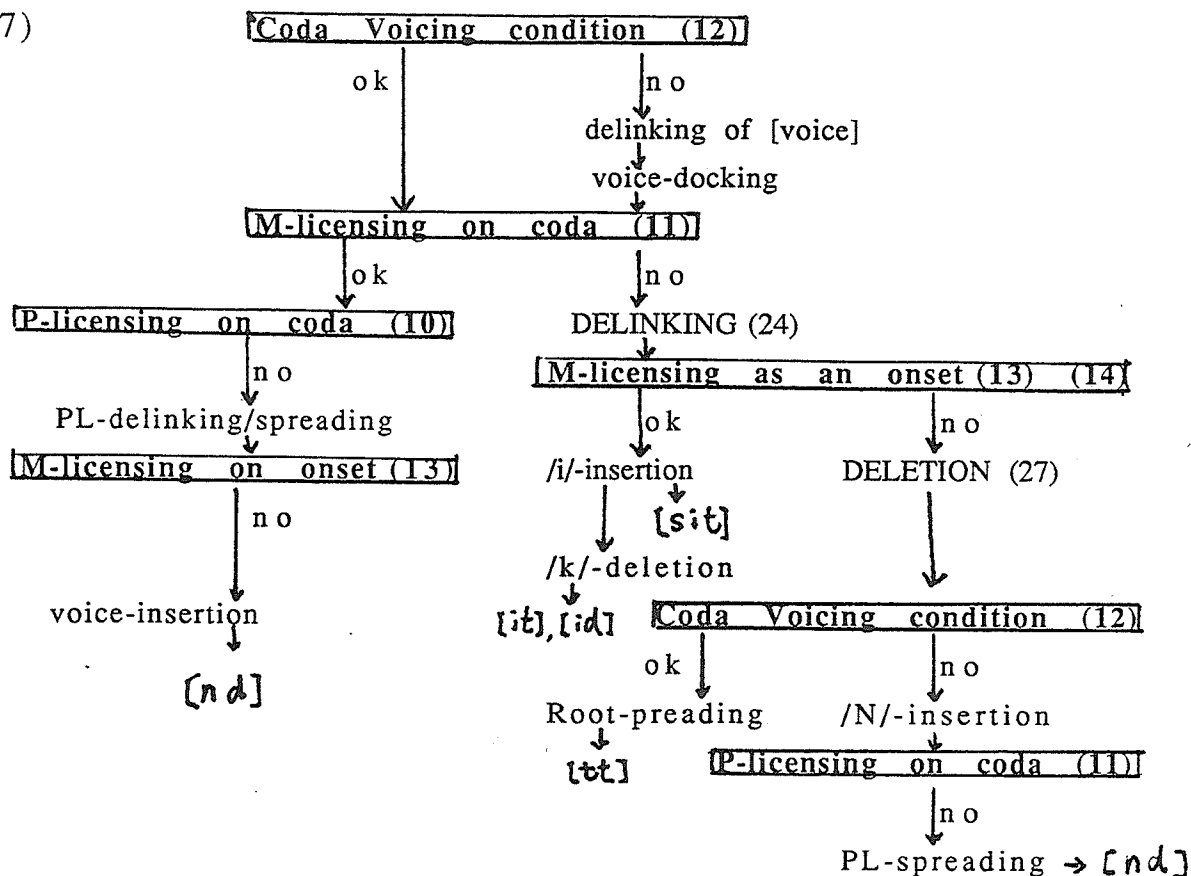
For example, in the case /b+t/, /N/ is inserted, since the /t/ is already voiced by voice docking at this stage and the spreading of Root would yield a wrong result. On the other hand, in the cases /r+t/ and /w+t/, the /t/ is not voiced and Root spreading may take place. Notice that sonorants are unspecified for [voice], as we have seen in previous sections. If a delinked coda Root can be m-licensed as an onset of a new syllable, as in the case /s+t/, epenthesis takes place. In the cases of /g+t/ and /k+t/, the hypothesis predicts that deletion of /k/ is applied after the insertion of /i/. The deletion of /k/ may be a cyclic rule and applied within β constituents but not to α constituents. This rule does not apply to infinitivals, since infinitival formation is within α constituents. However, the further study is needed for this deletion.

4. Conclusion

In this paper, I have discussed the morphophonological changes in *ta* affixation. Although the voicing of /t/ is focused, I also explained other phonological changes, using the segment licensing conditions proposed by Itô and Mester (in lectures) and feature geometry. In section 1, we have seen McCawley's (1968) analysis for *ta* affixation; I argued that the sonorants are not specified for feature [voice] underlyingly. In section 2, Itô and Mester's analysis is examined. There are two types of /t/-/d/ alternation in *ta*-affixation. One type is triggered by voicing docking, as in the cases of /b+t/ --> [nd] and /g+t/ --> [id]. The other type results from insertion of the feature [voice], as in the cases of /n+t/ and /m+t/; since sonorants are unspecified for [voice], there is no feature [voice] to be spread. In section 3, conditions for delinking and deletion of Root are discussed. In addition, I introduced a rule which delinks the feature [voice] from a coda Root. This operation is due to the Coda voicing condition (12). After the delinking of [voice], the floating [voice] docks on the onset Root.

The following algorithm shows the rules and their ordering in *ta* affixation.

(37)



Notice that all rules besides voice docking and /k/ deletion are motivated by licensing conditions (10) - (14). Since voice docking and /k/ deletion occur in other phonological changes in Japanese, the rules in (37) are not stipulative but theoretically justified by the licensing conditions.³¹

One of the merits of my proposal is that it provides the condition for epenthesis; it explains why /b+t/ does not change to [bit] and why /s+t/ does not undergo assimilation and changes to [sit]. Furthermore, my theory predicts that /k/ is deleted after epenthesis. I assumed that the deletion of /k/ is a lexical rule which applies to β constituents in Inkelas' (1989) sense. However, a further study of the phenomenon in the framework of lexical phonology will be needed.

³¹ Voice docking occurs in Rendaku voicing; /k/ deletion occurs in affixation of /i/ (present tense) in adjectival stems. For example, *akak* 'red' + *i* --> *akai*.

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Word-Internal Prosodic Words in Korean⁰

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0. Introduction

Recently Prosodic Hierarchy Theory (Selkirk 1986; Selkirk and Shen 1988; Nespor and Vogel 1986; Hayes 1989) has been extended to account for mismatches between prosodic structure and morphosyntactic structure in morphologically complex words. Selkirk's (1986, 1988) End-Based Theory was proposed to organize words into postlexical prosodic constituents. A current issue in Prosodic Phonology is how and whether to extend the Prosodic Hierarchy within the word. Along these lines, Cohn (1989) and Rice (to appear) provide arguments for extending Selkirk's End-Based Theory.

In this paper I will first show that in Korean word-internal phonological domains are predictable, supporting Selkirk (1986), Selkirk and Shen (1988), Cohn (1989), and Rice (to appear), contrary to Inkelas (1989, to appear). Secondly, modifying Selkirk's analysis (Selkirk 1986; Selkirk and Shen 1988), which claims that the syntax-phonology mapping applies postlexically, I argue that prosodic word (ω) formation in Korean must be basically lexical, supporting Inkelas (1989, to appear). This follows from the assumption that there is a lexical Bracket Erasure Convention (Mohanan 1986). Thirdly, the current proposal yields an improved analysis of Korean. Especially, Coda Neutralization, once analyzed as a multi-domain rule (both lexical and postlexical) within standard Lexical Phonology by Ahn (1985) will be reanalyzed as a prosodic word-level rule. The organization of this paper is as follows. In §1 the theoretical background will be introduced. In § 2, I propose a rule for the construction of the Prosodic Word in Korean. In § 3, I show how the domains of several rules in Korean are predicted by my domain construction algorithm.

1. Theoretical Background

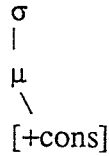
1.1. Syllable Structure and Syllabification

In this section I introduce the syllable structure of Korean and the Syllable Structure Algorithm. Note that Korean syllable structure maximally allows one consonant either in the onset or in the coda, or in both. Syllable structure is assigned by the following Syllable Structure Algorithm (SSA):

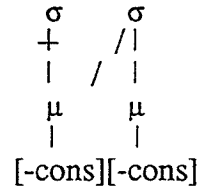
(1) SSA: a. μ -placement	b. σ -placement	c. Onset Rule
μ [-cons]	σ μ [-cons]	σ / μ / μ / μ [+cons]

⁰ This paper was presented at the second Southern California Japanese/Korean Linguistics Conference held at the University of California at Santa Barbara in September, 1991 and the 22 Meeting of the North East Linguistic Society held at the University of Delaware in October, 1991. I would like to thank Eunjoo Han, S. J. Hannahs, Junko Itô, Jongho Jun, Eunsoo Kim, Hyunsoon Kim, Young-Key Kim-Renaud, Chungmin Lee, Sang-Oak Lee, Jerzy Rubach, Elisabeth Selkirk, Cari Spring, Alice Taff, Irene Vogel, and Moira Yip for their valuable criticisms and encouragement on the earlier version of this paper. I especially thank Sharon Hargus and Ellen Kaisse for their help in writing this paper.

d. Coda Rule¹



e. Diphthong Formation



Notice that the Syllable Structure Algorithm in (1) is not a set of separate phonological rules ordered among other phonological rules but an algorithm. Following the Continuous Syllabification Hypothesis (Selkirk 1978; Halle and Vergnaud 1978; McCarthy 1979; Clements and Keyser 1983; Rubach and Booij 1988), syllabification applies continuously throughout the lexical and postlexical components, *bounded by prosodic domains*.

Mapping of segments into syllables proceeds by a syllabification algorithm in the following order: (a) a single mora (μ) is associated with a [-cons] by Mora Placement; (b) a mora is linked to a syllable node (σ) by Syllable Placement; (c) a prevocalic consonant is adjoined to the syllable node by the Onset Rule; (d) a postvocalic consonant is adjoined to the preceding mora by the Coda Rule.² Diphthongs in Korean have the same underlying representation as a sequence of two vowels. Diphthong formation operates by delinking the σ of the first [-cons] and relinking the μ to the preceding σ , as shown in (1e).

As a result of Bracket Erasure at the end of the lexical component, the Onset Rule has the power to resyllabify codas of the preceding syllable to the onset of the following one across ω 's within a prosodic phrase (ϕ), as shown in (3):³

- (3) kot oseyo --> ω (kot) ω (oseyo) --> ϕ (ko.do.se.yo)
 soon come "Please come soon" Onset Rule & voicing

Therefore, resyllabification, once regarded as a separate syllabification process, is simply the Onset Rule reapplying in the postlexical component.

1.2. Other Assumptions

Other theoretical assumptions adopted in this paper will be summarized in this section. Firstly, prosodic phonology is based on the hypothesis that prosodic structure is autonomous and independent of syntactic structure in the grammar (Selkirk 1978, 1982; Zec and Inkelas 1988). Thus, mismatches between prosodic structure and morphosyntactic structure is due to these co-existing structures. Secondly, with respect to the interaction between morphology and phonology in Lexical Phonology, I adopt the Non-Interactive

¹ As Hannahs pointed out to me, linking the onset to the syllable and the coda to the mora violates the Prosodic Wellformedness Structure Constraint. Such violation is common in the literature on mora and syllable, but McCarthy (1991) has mentioned that this type of syllable structure reconstructs onset/rhyme-like distinction. Selkirk (1986) and Inkelas (1989) claim to eliminate the mora, syllable, and foot from the prosodic hierarchy, since they violate the Prosodic Structure Wellformedness Constraint with respect to the stage in the derivation at which prosodic units are introduced into the representation. In Inkelas' (1989) analysis, the mora, syllable, and foot form the Metrical Hierarchy independent of the Prosodic Hierarchy.

² Jun (1991) has a different analysis from mine in that a consonant in the coda is given a mora forming a heavy syllable. This observation is drawn from partial reduplication of onomatopoeia in Korean.

³ In subsequent sections parenthesis () will be used to denote prosodic constituents.

Model (Halle and Vergnaud 1987 a&b; Halle and Kenstowicz 1989; Sproat 1985; Odden (to appear)) where all morphology precedes all phonology.⁴ Thirdly, Bracket Erasure (Pesetsky 1979; Kiparsky 1982; Mohanan 1982, 1986) applies to the output of the morphological component in the lexicon, erasing all internal brackets. Thus, the internal structure of words is invisible to the syntax; this is called the strong interpretation of Bracket Erasure.⁵ Fourthly, Prosodic Licensing (Itô 1986, 1991; Goldsmith 1990) plays a key role in the current analysis. Itô claims that all autosegmental materials must be licensed at the word-level. Along these lines Itô (1986), Borowsky (1986) and Goldsmith (1990) propose that if consonants are not licensed at the word-level, they will not proceed to the postlexical phonology. This means that unlicensed elements are erased by the *Stray Erasure Convention* (Steriade 1982). In this paper I claim that extraprosodicity turns off at the prosodic word-level, erased by the Stray Erasure Convention.

1.3. Word Formation and Cliticization in Korean

Regarding morphology, I follow the assumption that derivational morphology and compounding are done in the lexicon (Kiparsky 1982, Mohanan 1986).⁶ In the process of derivation, unlabelled brackets are labelled according to Feature Percolation Conventions (Lieber 1980). On the other hand, functional categories (Agreement, Tense marker, Aspect marker, Mood marker, and complementizer) are projected at D-structure in the syntax as functional heads (X^0 s), but the sequence of a lexical head V and functional categorial suffixes are agglutinated at S-structure through rightward head-movement (Chomsky 1988).

The following is the list of suffixes which attach to nouns or verbs in Korean:⁷

(4) Derivational Suffixes

Nomi	Nominalizer	-ki, im
Advi	Adverbializer	-i
Caus	Causative	-i, -hi, -li, -ki, -u, -ku, -č ^h u
Pass	Passive	-i, -hi, -li, -ki

⁴ There are two other types (extracted from Borowsky (to appear)).

a. The Interactive model: Each morphological operation is input to a phonological cycle (Pesetsky 1979; Mohanan 1982; Kiparsky 1982).

b. The Combination Model: Morphology feeds phonology cyclically at some levels and applies all in ablock before phonological rules at another (Halle and Mohanan 1985; Kiparsky 1985; Booij and Rubach 1986).

⁵ Sproat (to appear) claims that some phonetic implementation rules, considered to be postlexical, may make reference to word-internal structure, such as compounding. This is a problem for the strong interpretation of bracket erasure where it applies to the output of the morphological component in the lexicon, erasing all internal brackets.

⁶ However, there are other positions on morphology. Fabb (1984) and others have argued that compounding is done "in the syntax". Furthermore, Sproat (1985) and Lieber (forthcoming) claim that all morphology is done "in the syntax".

⁷ For more examples, see Lee (1991).

(5) Functional Categorical Suffixes

1. Case Markers

Acc	Accusative	-lil/-il
Gen	Genitive	-i
Nom	Nominative	-i/-ka

2. Agreement Markers

PL	Plural	-til
Hon	Honorific	-(i)si

3. Tense Markers

Past	Past	-as'/-əs'
Pre	Present	-in/-nin
Retr	Retrospective	-tə
Fut	Future	-kes'

4. Aspectual Markers

Peft	Perfect	-əs'/as'
Impf	Imperfective	-nin

5. Mood Markers

Dec	Declarative	-ta
Hor	Hortative	-ča
Int	Interrogative	-nya/-ni, -k'a
Imp	Imperative	-(a)la/əla

6. Cop

Copula -i

7. Comp

Complementizer -ə,-ke, -či
-ko/ku

8. Sentential Suffixes

Add	Additive	(o)to
Cond	Conditional	-(i)myon(in)
Contra	Contrastive	-la
Ind	Indicative	-ni
Pol	Polite Suffix	-(i)p
Prom	Promissive	-(i)ma
Voc	Vocative	-(y)a, -yə
Vol	Volitional	-(i)llæ

9. Postpositional Suffixes

Compa	Comparative	-oa/-koa, -čhələm, -mank ^h im, -pota
Comi	Comitative	-oa/-koa, -hako, -laŋ 'along with', 'accompanying' -hako/haku informal version of -wa
Loc	Locative	-(e)sə
Dat	Dative	-eke, -hant ^h e
Ins	Instrumental	-lo/-ilo(s'ə)

(6) Clitics

1. Top Topic (-n)in
2. Conj Conjunction Markers
-oa/-koa, -hako, -laŋ, -ko, 'and'
-kəna 'or'

3. Del Delimiters

-to	'also'
-man	'only', 'alone'
-čoč ^h a, -k'ači, -mačə	'even'
-s'ik	'each'
-mata	'every'

Case markers, plural, copular, and postpositional suffixes attach to nouns. Since verbs/adjectives in Korean do not stand by themselves, they have to be inflected by Tense, Aspect, Mood, or Honorific markers.⁸ Clitics have been discussed in the literature (Zwicky 1977, 1983, 1985; Zwicky and Pullum 1983). As observed in other languages, clitics show considerable syntactic freedom about what they attach to, and this is also true in Korean. In addition, clitics in Korean can attach to material already containing clitics.⁹ Clitics, as the phonological dependents, combine with a preceding prosodic word. The prosodic category of the host remains intact throughout cliticization.

2. Constraints on Deriving Prosodic Words in Korean

The Prosodic Hierarchy Theory (Selkirk 1978, 1986, 1988; Nespor and Vogel 1986; Shih 1985; Hayes 1989) claims that prosodic structure projected from syntactic structure serves as the domain of phonological rules. As an alternative to previous non-prosodic analyses, I propose a prosodic analysis for the domain of several rules in Korean. As constraints on deriving prosodic constituents in Korean, I adopt Selkirk's End-Based Theory (Selkirk 1986; Selkirk and Shen 1988) and the Prosodic Structure Wellformedness Constraint (Selkirk 1981, 1984; Hayes 1989; Nespor and Vogel 1986). Selkirk argues that the syntax-phonology mapping has to be parameterized depending on the grammar of an individual language, as stated in (7):

(7) The Syntax-Phonology Mapping

For each category C^n of the prosodic structure of a language there is a two-part parameter of the form

C^n : {Right/Left; X^m }

where X^m is a category type in the X-bar hierarchy.

A syntactic structure-prosodic structure pair satisfies the set of syntax-phonology parameters for a language iff the Right (or Left) end of each constituent of type X^m in syntactic structure coincides with the edge of constituent(s) of type C^n in prosodic structure.

The basic idea in (7) is that a prosodic constituent is delimited by two parameters, directionality and a level on the X' hierarchy: right or left ends of X^{\max} (the Prosodic Phrase) or X^0 (the Prosodic Word). The four logical possibilities are represented in (8):¹⁰

⁸ Adjectives in Korean are sometimes classified as descriptive verbs or adjectival verbs, because they behave similar to verbs (action verbs). Adjectives as well as verbs have to be inflected by mood, aspect, and tense suffixes.

⁹ See Zwicky (1991) for the common types of clitics and also Choe (1991) and Cho and Sells (1991) for the distribution of clitics in Korean. Delimiters can attach either to nouns or to postpositions in Korean.

¹⁰ Usually the right-end or left-end parameters correspond to head-initial or head-final languages, respectively. However, this is not always true. Two dialects of Chinese, Xiamen (Chen 1987) and

- (8) (i) $]X^m = C^n$ (ii) $X^m[= C^n$
 a. $]X^0 \rightarrow)\omega$ $X^0[\rightarrow \omega($
 b. $]X^{max} \rightarrow)\phi$ $X^{max}[\rightarrow \phi($

The projection of prosodic constituents, ω or ϕ , from syntactic structure is cross-categorical. But only the lexical categories (N, V, A, Adv, etc) can form prosodic constituents. However, the mapping rule in (7) alone cannot exhaustively predict the location of the prosodic constituents of a sentence. Thus, each prosodic constituent is further conditioned by a universal well-formedness constraint, the *Prosodic Structure Wellformedness Constraint* (i.e., *Strict Layer Hypothesis*):

(9) **Prosodic Structure Wellformedness Constraint**

(Selkirk 1981, 1984; Hayes 1989; Nespor and Vogel 1986)

The prosodic structure of a sentence must conform to the rule schema

$C^n \rightarrow C^{(n-1)*}$

Keeping the two constraints (7) and (9) in mind, let us turn to Korean. At first glance, for Korean, as a head-final language, the left-end parameter in (8.ii) seems appropriate. The $X^p[$ setting derives the prosodic phrase correctly. Then, what about the prosodic word? The question at this point is at what level prosodic words are formed in the grammar. Selkirk's original idea was that prosodification applies postsyntactically after Bracket Erasure (Mohan 1986). Thus, the $X^0[$ setting derives only a single ω at most, due to Bracket Erasure at the end of the lexical component, which is a problem for several languages with respect to complex words: in Hungarian and Italian (Nespor and Vogel 1986; Vogel 1990), Indonesian (Cohn 1989), Polish (Booij and Rubach 1984, 1990), and Korean (Han 1991; Kang 1991a&b), each member of a compound forms a separate ω ; in French (Hannahs 1991) and Korean (Han 1991; Kang 1991a&b) a prefix also forms an independent ω of its stem.

Therefore, I (Kang 1991c) proposed a parameter for prosodic word formation (henceforth PWF). Zec (to appear) has claimed that ω 's may be derived lexically or postlexically across languages. I suggest that this follows from the relative ordering of Bracket Erasure with respect to PWF, which is parameterized according to languages. That means that Selkirk's X^0 setting in (8) precedes Bracket Erasure in some languages but follows it in others. Thus postlexical PWF predicts the domain of several rules in Greek (Nespor and Vogel 1986) and Shanghai Chinese (Selkirk and Shen 1988), in which a syntactic word $X^0[$ coincides with a ω (see Kang (forthcoming)). On the other hand, the lexical PWF can explain the derivation of ω 's for complex words in Korean, Hungarian and others. If PWF is lexical, a bracket $X^0[$ would coincide with a $\omega($, because all internal structure is visible in the lexicon. Then, each member of a compound as well as a prefix in a prefix + stem combination would form an independent ω . Note that PWF preceding Bracket Erasure is equivalent to there being no Bracket Erasure as has also suggested by Sproat (to appear) and others. Thus, I (Kang 1991b) proposed the Korean Prosodic Word Rule, which extends Selkirk's (1986, 1988) $X^0[$ setting within the word, as in (10) followed by (11):

Shanghai (Shen and Selkirk 1990) have identical syntactic structure, but have different settings; Xiamen for the right-end setting; Shanghai for the left-end setting.

- (10) Korean Prosodic Word Rule (KPWR: lexical)¹¹
 $x\omega[\rightarrow \omega((X \text{ is a lexical category})$

Note that (10) is very much in accord with Prosodic Minimality (McCarthy and Prince 1986, 1990) in that both predict that only lexical categories can form ω 's. That means, functional categorial suffixes and clitics in Korean do not constitute separate ω 's.

Since only lexical categories (N, V, Adj, Adv...) map into ω 's in the lexicon, prosodically dependent elements are incorporated into a preceding ω , as shown in (11):¹²

(11) Stray Adjunction/Incorporation

ω is left-headed, with leftward adjunction of stray material

(1) lexical adjunction: derivational suffix

(2) postlexical adjunction: functional categories, clitics

Adjunction of phonologically dependent elements to the preceding ω is a direct consequence of Prosodic Licensing (Itô 1986, 1991). Derivational suffixes will be incorporated into the preceding ω 's lexically. Then the lexically created ω is also present postlexically where the functional categorial suffixes or clitics are available in the syntax. This supports the claim that ω is visible both in and out of the lexicon (Booij and Rubach 1987 and Inkelas and Zec 1988).¹³ Clitics and functional categorial suffixes are phonologically dependent and as such they are cliticized to the preceding ω postlexically.

Keeping (10) and (11) in mind, let us consider why PWF should be lexical in Korean. The lexical vs. postlexical PWF predict different results for the domain of syllabification and Coda Neutralization (CN). The following is the result of the postlexical PWF:

(12) i) Morphological Structure	ii) Phonological Structure
a) Prefixation : [təs N[os]] 'outer' 'cloth'	
b) Percolation : N[təs N[os]]	
c) BEC : N[təsos]	a) PWF (postlexical): $\omega(təsos)$
	b) syll. & CN : $\omega(t\ \underline{e} \ s \ o \ \underline{s})$
	$\begin{array}{cc} \vee & \vee \\ \sigma & \sigma \end{array}$
	c) output : *(tə.σot)

¹¹ Han (1991) has a similar idea, suggesting that the prosodic word in Korean coincides with either the left-end of a stem or the left-end of a prefix.

¹² Yip (in personal communication) pointed out to me that instead of postulating lexical vs. postlexical adjunction, we can generalize it in the following way: adjunction applies whenever things are available.

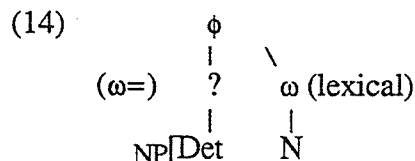
¹³ Inkelas (1989) mentioned the special status of the prosodic word in the grammar as follows:
 The prosodic word is sometimes treated as lexical (Booij and Rubach 1984; Nespor and Vogel 1986) and sometimes postlexical. This special status comes from the independent fact that the transition from lexical to postlexical phonology occurs at the point in the derivation when the prosodic word is the largest available prosodic constituent. Thus it cuts across both modules.

As outlined before, morphological structure and phonological structure are copresent, as shown in (12). If PWF applied after Bracket Erasure, the sequence of a prefix and a stem would be a single ω , within which syllabification and Coda Neutralization take place. This derives the wrong output *(tə.sot), as shown in (12.ii.c), and leads to the conclusion that PWF should apply before Bracket Erasure, as shown in (13):

(13) i) Morphological Structure		ii) Phonological Structure	
a) Prefixation	: [təs _N [os]] 'outer' 'cloth'		
b) Percolation	: N[təs N[os]]	a) PWF (lexical):	ω (təs) ω (os)
c) BEC	: N[təs os]	b) Syll.& CN	: ω (təs) ω (os) \vee \vee σ σ ω (tət) ω (ot)
		c) Resyll.	: ϕ (tə.tot)
		d) Voicing	: ϕ (tə.dot)

If PWF applies before Bracket Erasure, as in (13.ii.a), we can correctly derive two ω 's. Bracket Erasure at the end of the lexical component would not affect the derived ω 's, since they are in different structures.¹⁴ Within each ω , syllabification and Coda Neutralization apply. This means we have to know the domain of the ω before we construct syllables, since syllabification is bounded by the ω .

PWF in Korean is thus lexical. However, PWF must also apply postlexically. Determiners (i.e., functional category), such as quantifiers and numerals situated to the left of a content word will leave the lexicon without any prosodic specifications:



The noun in (14) becomes a ω by the KPWR (10) in the lexicon. In the syntax, the string determiner + noun forms a prosodic phrase (ϕ) by the χP setting. Note that the Prosodic Structure Wellformedness Constraint (9) implicitly requires that an utterance be exhaustively parsed into a hierarchy of prosodic constituents. Thus, the determiner in (14) is prosodified as a ω postlexically. Notice that adjunction of the determiner to the following ω is blocked, since the direction of adjunction in (11) is leftward. To sum up, the Korean Prosodic Word Rule in (10) and the Prosodic Structure Wellformedness Constraint are required to derive the word-internal prosodic constituent in Korean.

¹⁴ Possibly bracket erasure does not matter after PWF.

Next, let us compare the present proposal with Inkelas' (1989, to appear) Prosodic Lexical Phonology. To derive prosodic constituents, the following Prosodic Constituent Formation Algorithm (henceforth PCF) was proposed.¹⁵

- (15) Prosodic Constituent Formation (Inkelas: to appear)
- | | | | | |
|-----------------------|----------------------|-----|-----------------------|--------------------|
| m-structure | p-structure | --> | m-structure | p-structure |
| $\langle X \rangle_i$ | [X] _{i-1} | | $\langle X \rangle_i$ | [X] _i |

Prosodic constituents are formed on the basis of morphological constituents, as in (15). A new prosodic constituent is derived whenever a prosodically bound morpheme is attached, producing the effect of cyclicity, as stated in (16)

- (16) Phonological rules apply automatically upon the construction of a new p-constituent.

In Inkelas' framework, suffixes will be listed with prosodic as well as morphological subcategorization in the lexicon. The UR of the affix *in-* in English is given in (17):

- (17) UR: $\langle in \langle \rangle_\alpha \rangle_\alpha$, [in []_α]_α

But, there is a restriction on the base in that PCF only applies to well-formed morphological constituents, (derived or free) stems.¹⁶ Therefore, bound roots which do not meet this morphologically wellformedness condition never precede the PCF, as shown in (18c), but acquire the prosodic feature specifications (α , β) by affixation:¹⁷

- (18) Root + Affix --> Stem
- a. UR: $\langle \langle \rangle_\alpha \text{fer} \rangle_\alpha$, $\langle in \langle \rangle_\alpha \rangle_\alpha$
[in []_α]_α
 - b. $\langle \langle in \rangle_\alpha \langle \text{fer} \rangle_\alpha \rangle_\alpha$
[[in]_α [fer]_α]_α
 - c. PCF : _____
 - d. Bracket Erasure: [infer]_α

The p-structure for the affix *in-* listed in the lexicon, as in (17), is more specific than, and hence overrides, the more general PCF (15), as in (18c).

Since the default PCF (15) can not apply in morphologically complex words, where each stem of a compound as well as a prefix in a prefix + stem combination corresponds to a distinct prosodic constituent, Inkelas provides a special algorithm for compounds, as in (19), for languages in which the two constituents of a compound form separate ω's:

¹⁵ Angled brackets indicate morphological constituency and square brackets, prosodic constituency. M-structure refers to morphological constituency and p-structure refers to the domain of phonological rules (see Inkelas to (appear)).

¹⁶ Only stems serve as inputs to the PCF to derive the prosodic constituents which is the special case where $i = 1$ in (15).

¹⁷ In addition to this, prosodic subcategorization frames (Inkelas 1989:105) also encode information about the type of prosodic constituent attached to (α/β) and the linear order in which the morpheme combines with its host.

(19) PCF for compounds

m-structure		m-structure		p-structure
$\langle X_i \rangle_m \dots \langle X_n \rangle_m$	-->	$\langle X_i \dots X_n \rangle_m$		$[X_i]_p \dots [X_n]_p$

As for prefixes in Korean, another rule is needed. Therefore, in addition to the regular PCF, we need two more rules for Korean in Inkelas' analysis: one for prefixes, as in (20a), and the other for compounds, as in (20b):

- (20) a. $\text{təs} : [_ m [\]] \text{ --> } \omega [\text{təs}] \omega [\]$
 'outer'
 b. $[m [\] m [\]] \text{ --> } \omega [\] \omega [\]$

Inkelas' algorithm is much more complicated than the Selkirkian approach adopted in this paper and for Korean, at least, this extra power is not warranted as phonological word boundaries in Korean are predictable. In the following section, I will discuss how the current proposal correctly predicts the domain of several rules in Korean.

3. Evidence for a Prosodic Constituent within Words

In this section, I introduce five rules which must refer to a word-internal prosodic constituent (i.e., the prosodic word) and show the present prosodic analysis is superior to non-prosodic Lexical Phonology in defining the domains of those rules.

3.1. The Onset Rule and Coda Neutralization

In this section I will show how Ahn's (1985) level ordered analysis fails to explain mismatches between prosodic structure and morphological structure. Instead, I claim that syllabification and Coda Neutralization (henceforth CN) are in fact prosodically conditioned rules, bounded by the ω .

In Korean the three-way laryngeal contrast of lax, aspirated and tense consonants in the onset position is simplified to lax stops in the coda, as represented in (21):

(21) Coda Neutralization (CN)

p,	p',	p ^h]σ	-->	p
t,	t',	t ^h]σ]	
s,	s',	s ^h]σ	-->	t
č,	č',	č ^h]σ]	
k,	k',	k ^h]σ	-->	k

In Korean all consonants are underlyingly voiceless, but intervocalically they surface as voiced within the ϕ .¹⁸

¹⁸ Critically only lax consonants in Korean undergo Voicing.

Let us first consider the cases where the Onset Rule applies:

(22) Bound Root + Derivational suffix¹⁹

- a. N[v[kip^h] i] --> ω(ki.p^{hi}), *ω(kip.i) --> *ω(ki.bi)
 'deep' -Nomi 'depth'
- b. Adv[v[kat^h] i] --> ω(ka.č^{hi}), *ω(kat.i) --> *ω(ka.di)
 'alike' -Advi 'together'
- c. v[v[v[nop^h] i] ta] --> ω(no.p^{hi}.da),
 'high' Caus-Dec *ω(nop.i.ta) --> *ω(no.bi.da)

(23) Noun + case marker

- a. N[N[os] i] 'cloth' -Nom --> ω(o.sⁱ)
 b. N[N[os] il] 'cloth' -Acc --> ω(o.s^{il})

(24) Verb root + functional suffix

- a. v[v[v[k'oč] as'] ta] --> ω(k'o.č^{at}.t'a),
 'to arrange' Past Dec *ω(k'oč.at.t'a) --> *ω(k'o.d^{at}.t'a)
- b. v[v[v[k'ək'] əs'] ta] --> ω(k'ə.k^{ət}.t'a),
 'to cut' Past Dec *ω(k'ək.ət.t'a) --> *ω(k'ə.g^{ət}.t'a)

In (22a) the bound root-final consonant *p^h* is syllabified to the onset of the vowel-initial suffix *-i*. The noun stem-final *s* in (23a) surfaces as the onset of the following vowel-initial nominative case marker *-i*, and the verb-root final *č* in (24a) is also realized as the onset of the vowel-initial tense morpheme *-as'*.

Contrary to (22)-(24), the following shows where the Onset Rule is blocked. If not syllabified as an onset, target consonants undergo CN:

(25) Compound (stem + stem)

- a. N[N[čəč] N[əmi]] --> ω(čət) ω(əmi) --> φ(čə.d^ə.mi)
 'milk' 'mother' 'nursing mother' *φ(čə.č^ə.mi)
- b. N[N[puək^h] N[an]] --> ω(pu.ək) ω(an) --> φ(pu.ə.g^{an})
 'kitchen' 'inside' 'inside of kitchen' *φ(pu.ək^h.an)
- c. v[N[təs] v[əpsta]] --> ω(tət) ω(əp.t'a) --> φ(tə.d^əp.t'a)
 'a short time' 'not exist' 'transient' *φ(tə.s^əp.t'a)

(26) Compound + Derivational suffix

- a. Adv[N[N[ap^h] N[ap^h]] i] --> ω(ap) ω(a.p^{hi}) --> φ(a.ba.p^{hi})
 'front' 'front'-Advi 'to each person' *φ(a.p^ha.p^{hi})
- b. Adv[N[N[nač^h] N[nač^h]] i] --> ω(nat) ω(na.č^{hi}) --> φ(nan.na.č^{hi})
 'piece' 'piece' Adv 'thoroughly'

¹⁹ In this paper the following abbreviations are used: Nomi (nominalizer), Advi (adverbializer), Nom (nominative case marker), Acc (accusative case marker), Past (past tense marker), Dec (declarative ending), Cau (causative suffix).

(27) Prefix + Stem²⁰

a. N[tə _s N[os]]	--> ω(tə _t) ω(ot)	--> φ(tə . <u>d</u> ot),
'outer' 'cloth'	'outer cloth'	*φ(tə . <u>s</u> ot)
b. N[ha _s N[os]]	--> ω(hat) ω(ot),	*φ(ha . <u>s</u> ot)
'wadded' 'cloth'	'wadded cloth'	
c. √[nič _v [olita]]	--> ω(ni _t) ω(o.ri.ta)	--> φ(ni . <u>d</u> o.ri.da)
'late' 'bloom'	'bloom late'	*φ(ni . <u>o</u> .ri.da)
d. N[su _s N[imsik]]	--> ω(su _t) ω(imsik)	--> φ(su . <u>d</u> im.sik)
'untouched' 'meal'	'untouched meal'	*φ(su . <u>s</u> im.sik)
e. N[p ^h u _s N[namul]]	--> ω(p ^h u _t) ω(namul)	--> φ(p ^h u _n .na.mul)
'young' 'herb'	'young herbs'	

The examples in (26) are crucial ones which show the mismatches between prosodic structure and morphological structure for the domain of the Onset rule and CN. In (26a) the adverbial suffix *-i*, which has scope over the whole compound *ap^hap^h*, is grouped with the second stem for the domain of the lexical Onset Rule, where the compound-final *p^h* is syllabified as the onset of the following syllable of suffix *-i*. On the other hand, the first stem-final consonant *p^h* does not surface as the onset of the following syllable across compound-internal boundaries, but gets neutralized to *p*. This suggests that each member of a compound forms a separate prosodic constituent for the domain of the Onset Rule and CN. By the same token, in (27) each prefix constitutes a prosodic unit independent of the stem for the domain of CN. If either compound in (25)-(26) or prefix + stem in (27) were a single prosodic constituent, the Onset Rule would apply across compound-internal boundaries or prefix-stem boundaries, which is not correct here.

Therefore, (25)-(27) motivate a prosodic constituent within words rather than one which is coextensive with a morphological constituent for the following reasons: i) both prefixes and suffixes are bound morphemes but they show an asymmetry with respect to the prosodic constituent to which they belong, as shown by the domains of the Onset Rule and CN; ii) a stem and a prefix are different from each other in morphological category, but they form separate prosodic constituents with respect to these rules.

CN has been analyzed as a syllable-sensitive rule by Kim-Renaud (1974:116) and K. Chung (1985). Kim-Renaud names the above process 'Obstruent Unreleasing' in syllable final position as a syllable-boundary phenomenon. It occurs before a consonant, a phrase boundary or a compound boundary. The compound boundary (ϕ) can be

²⁰ Prefixes in Korean are not independent syntactic words, since they do not stand in isolation. Therefore, they are bound morphemes. Eunsoo Kim and Yongkyoon No have pointed out to me that the underlying representation of the prefix-final consonants in (17) should be *t* since neither *s* nor *č* surfaces as *s* or *č*. That is not true. Jun (in personal communication) has pointed out to me that "It would be simply due to that it is not used any more as other function than prefix. We can guess it may be used as other functions such as just verb or adverb, in which *s* or *č* would surface". We can find the trace of prefixes in the following content words:

(a) mač-	'facing'	Adv[mač _v u]	'face-to-face'	
(b) nič-	'late'	√[nič _v]	'to be late'	[ničəsə], [ničilkəs'ita] 'will be late'

As shown in (a) and (b) the prefix-final consonant *č* surface as *č* when followed by a vowel-initial suffix. This supports our claim that spelling (Korean orthography) should be taken as the UR for the prefix-final consonant in this case.

reinterpreted as ω in the current analysis. Next, let us review how CN was analyzed within standard Lexical Phonology. Ahn (1985) claims that the lexicon in Korean is composed of four levels, as represented in (28):²¹

- (28) Level 1 : subcompounding --> t-epenthesis
 Level 2 : cocompounding
 Level 3 : derivation --> t-palatalization
 Level 4 : inflection & case marking --> Predicate Tensing & t-palatalization

Ahn assumes that syllabification and resyllabification apply cyclically both in the lexical and postlexical components after every morphological operation. Also, he analyzes CN as a multi-domain rule (both lexical and postlexical). First, let us look at an example of the lexical CN in (29) (Ahn 1985:172):

- (29) N[N[os] N[an]] : subcompounding (level 1)
 'cloth' 'inside'
 [ot] [an] : CN
 [o.tan] : resyllabification
 [o.dan] : Voicing (post-lexical)

As shown in (29), the first stem-final *s* of the compound is neutralized to *t* when it is followed by a vowel-initial stem in level 1. Based on the fact that CN precedes the postlexical rule of Voicing, Ahn concludes CN occurs either at level 1 or 2 as a lexical rule. On the other hand, Ahn defines the CN occurring in (30) as postlexical, which shows a mismatch between the prosodic structure and morphological structure: in terms of morphological structure the suffix *-i* is affixed after the compound *nat^h-nat^h*; in terms of prosodic structure, the first stem of the compound is in a prosodic constituent for the domain of CN, and the second stem and the following suffix is in another prosodic constituent for the domain of the Onset Rule:

- (30) Adv[N[N[nat^h] N[nat^h] i] --> [nannač^hi]
 'piece' 'piece' -Advi 'thoroughly'
 lexical a. [[nat^h] [nat^h]] : level 2 co-com. & syll.
 b. [[nat^hnat^h] i] : level 3 derivation &
 (Lexical rule of CN is blocked by the ad-hoc condition)
 c. [nat^hnač^hi] : t-palatalization
 postlexical d. [nat^hnač^hi] : CN
 e. [nannač^hi] : Nasal Assimilation

Ahn posits the ad-hoc and unusual condition that consonants do not undergo level 3 application of CN in (30b) (cf. (31b)) if followed by a vowel-initial word at either level 3 or 4, while they do when followed by a consonant. The postlexicity of CN in (30d) results from its ordering after the cyclic rule *t*-palatalization. Notice that he also assumes that CN precedes Nasal Assimilation.²² For if CN had applied cyclically in level 2, the following would be expected:

²¹ For a detailed analysis of problems with Ahn's Lexical Phonology, see Park (1990).

²² Any consonant occurring at the coda must undergo neutralization. For example, Adv[N[N[pak'] N[pak']] i] is pronounced as (pak.p'a.k'i).

(31) lexical	a	[[nat ^h] [nat ^h]]	:	level 2 cocompound
		[[nat] [nat]]	:	CN
postlexical	b.	[[natnat] i]	:	level 3 derivation
		[natnač̣i]	:	t-palatalization
	c.	[nannač̣i]	:	Nasal Assimilation
	d.	*[nannaǰi]	:	Voicing

If so, each stem-final t^h of the compound in (31a) would be neutralized to t in level 2. The problem arises when, in level 3, the neutralized compound-final t is followed by the suffix $-i$, causing t to undergo t -palatalization, as shown in (31b), and subsequently voicing postlexically, as in (31d), which is incorrect. To derive the correct output, Ahn concludes that CN in (30) applies postlexically after t -palatalization. However, is level ordering between t -palatalization and CN necessary? For the derived adverb nat^h-nat^h-i , the prosodic structures for CN and the lexical syllabification are (nat^h) and (nat^hi), which does not correspond to their morphological structure. Furthermore, application of CN at levels 1, 3, 4 and postlexically constitutes a violation of the Continuous Stratum Hypothesis (Mohan 1982), which was reported by Sohn (1986), Park (1990) and Kang (1991a). Considering the fact that the determiner-final consonant \check{c}^h always gets neutralized before it precedes the postlexical resyllabification as in (32a), Ahn's motivation for CN as a postlexical rule does not hold:

(32) a.	NP[Det[myəč̣ ^h] N[ai]]	-->	ω(myət) ω(ai)	-->	φ(myə.da.i)
	'several' 'child'				*φ(myə.č̣ ^h a.i)
b.	N[N[myəč̣ ^h] i]	-->	ω(myəč̣ ^h i)		
	'several' Nom				

Therefore, I conclude that CN cannot be postlexical.

First, I claim that before we construct syllables, we have to know the ω , since syllabification is delimited by the ω . Secondly, the leftward adjunction in (11) plays a key role in explaining the blocking of several rules. Let us see how the current prosodic analysis dispenses with Ahn's (1985) level ordering problem between t -palatalization and CN, as shown in (33):

(33) Adv[N[N[nat ^h] N[nat ^h]]i]	(34) N[N[os] i]
'piece' 'piece' Adv i	'cloth' Nom
a) KPWR : ω(n a t ^h) ω(n a t ^h) i	a) KPWR : ω(o s) i
b) Adjunc : ω(n a t ^h) ω(n a t ^h) i	b) Adjunc. : ω(o s) i
c) syll : \ / \ \	c) syll. : \
σ σ σ	σ σ
d) CN : ω(nat)	d) CN : _____
e) t-pal : _____ ω(na.č̣ ^h i)	e) output : (o.si)
f) NA : φ(na _n .na.č̣ ^h i)	
g) output : (na _n .na.č̣ ^h i)	

By the KPWR (10), we derive two ω 's here, $\omega(\text{nat}^h)$ and $\omega(\text{nat}^h)$. The adverbial suffix $-i$ is adjoined to the second ω by lexical adjunction, as shown in (33b). Lexical syllabification applies within each ω . In the first ω , the first stem-final t^h undergoes CN, as shown in (33d). Within the second ω , the stem-final t^h is realized as the onset of the

following vowel-initial suffix *-i*, further undergoing t-palatalization, as shown in (33e). The crucial point here is CN applies to the consonant in the coda position and *t*-palatalization, in the onset position; they are in complementary distribution. Therefore, Ahn's argument for CN as a multi-domain rule no longer holds, instead, it is simply a ω -level rule. The mismatch between prosodic structure and morphological structure for the domain of syllabification and CN in (33) is due to their co-existing structures. Also, in (34) the noun *os* forms a ω by the KPWR (10) and the following case marker *-i* is incorporated to the preceding ω postlexically, as shown in (34b). Therefore, lexical syllabification and CN are delimited by the ω .

3.2 t-palatalization

T-palatalization in Korean is analyzed as a lexical rule (Ahn 1985 and others) in which a stem-final *t*, *t^h* become \check{c} , \check{c}^h when followed by a suffix beginning with a high front vowel *i*, as shown in (36)-(37). T-palatalization only applies to morphologically derived forms (Kiparsky 1973) but it is blocked across compound-internal word boundaries, prefix+stem, or word-boundaries, as shown in (38):

- (35) within nonderived words: NA
- | | | | |
|------------------------|-----|---|--|
| a. N[mat̪i] 'knob' | --> | ω (ma.d̪i), * ω (ma.ʝi) | |
| b. N[pant̪i] 'firefly' | --> | ω (pan.d̪i), * ω (pan.ʝi) | |
| c. Adv[əti] 'where' | --> | ω (ə.d̪i), * ω (ə.ʝi) | |
- (36) between root+suffix or stem +clitic
- | | | | | |
|------------------------------------|-----|------------------------------------|-----|------------------|
| a. N[[mat̪] i] | --> | ω (ma.č̪i) | --> | ω (ma.ʝi) |
| 'old' 'person' | | 'the oldest' | | |
| b. V[V[V[put ^h] i] ta] | --> | ω (pu.č̪ ^h i.da) | | |
| 'to attach' Cau-Dec | | | | |
| c. Adv[A[kat ^h] i] | --> | ω (ka.č̪ ^h i) | | |
| 'same' Adv _i | | | | |
| d. N[N[pat ^h] i] | --> | ω (pa.č̪ ^h i) | | |
| 'field' Nom | | | | |
| e. N[N[pat ^h] ilaŋ] | --> | ω (pa.č̪ ^h iraŋ) | | |
| 'field' and | | | | |
- (37) between root + suffix within a compound
- | | | | | |
|---|-----|---|-----|-------------------------------------|
| a. N[N[hæ] N[V[tot] i]] | --> | ω (hæ) ω (do.č̪i) | --> | ϕ (hæ.do.ʝi) |
| 'sun' to rise-Nomi | | 'sunrising' | | |
| b. N[N[mul] N[V[pat]i]] | --> | ω (mul) ω (pa.č̪i) | --> | ϕ (mul.ba.ʝi) |
| 'water' to hold-Nomi | | 'drain pipe' | | |
| c. N[N[p'i] N[V[put ^h]i]] | --> | ω (p'i) ω (pu.č̪ ^h i) | --> | ϕ (p'i.bu.č̪ ^h i) |
| 'blood' to attach-Nomi | | 'family members in a direct line' | | |
| d. N[N[V[V[put ^h]i]m] N[səŋ]] | --> | ω (pu.č̪ ^h im) ω (səŋ) | --> | ϕ (pu.č̪ ^h im.s'əŋ) |
| to attach-Caus-Nomi 'nature' | | 'sociability' | | |
- (38) t-palatalization : NA
- | | | | | |
|------------------------------------|-----|----------------------------------|-----|----------------------|
| a. N[N[pat ^h] N[ilaŋ]] | --> | ω (pat̪) ω (i.raŋ) | --> | ϕ (pa.d̪i.raŋ), |
| 'field' 'ridge' | | 'the ridge of a field' | | * ϕ (pa.ʝi.raŋ) |

- b. N[N[ho^h] [ipul]] --> ω(hot) ω(ipul) --> φ(ho.di.bul),
 'single' 'comforter' 'unlined comforter' *φ(ho.ʃi.bul)
- c. PP[AdP[kot] PP[NP[ili- p[lo]]]] --> ω(kot) ω(iro) --> φ(ko.di.ri.ro),
 'soon' 'here' 'to' '(He will) come to here soon.' *φ(ko.ʃi.ri.ro)

T-palatalization applies within each part of a compound if it is derived, as in (37). If either the compound (38a) or the prefix+stem (38b) were a single prosodic constituent, *t*-palatalization would apply there. Therefore, the examples in (38) also indicate that there should be a word-internal prosodic constituent for the domain of *t*-palatalization.

T-palatalization is a domain span rule, formulated as in (39):

- (39) $t, t^h \rightarrow \check{c}, \check{c}^h / \omega(\dots _ i \dots) \omega$

Then, the rule in (39) accounts for the application of *t*-palatalization in (36) and (37). Since the ω does not explain the non-occurrence of *t*-palatalization in (35), (39) must still be restricted to morphologically derived forms by some version of the *Strict Cycle Condition* (Mascaró 1978; Kiparsky 1984; Halle and Mohanan 1985). Therefore, examples in (38) do not meet the structural description for *t*-palatalization, since the target *t* is followed by *-i* across ω 's.

3.3. Stray Erasure

Underlyingly tautomorphemic consonant clusters $C_i C_j$ in Korean are either simplified or surface as heterosyllabic due to Korean syllable structure, as shown in (40) and (43):

- (40) $C_i C_j \#$
 a. N[kaps] 'price' --> ω(kap)
 b. N[nəks] 'spirit' --> ω(nək)
- (41) $C_i C_j + C$
 a. N[N[kaps] kwa] --> ω(kap.k'wa)
 'price' and
 b. N[N[nəks] to] --> ω(nək.t'o)
 'spirit' too
- (42) $C_i C_j + V$
 a. N[N[kaps] i] --> ω(kap.s'i)
 'price' Nom
 b. N[N[nəks] il] --> ω(nək.s'il)
 'spirit' Acc
- (43) $C_i C_j [V]$
 a. N[N[kaps] N[ə^hi]] --> ω(kap) ω(ə^hi) --> φ(ka.bə.č^hi)
 'price' 'value' 'value' *φ(kap.s'ə.č^hi)
 b. N[N[č^hæk] N[kaps] i] --> ω(č^hæk) ω(kap.s'i) --> φ(č^hæk.k'ap.s'i)
 'book' 'price' Nom

When the tautomorphemic consonant cluster $C_i C_j$ appears word-finally in (40), the C_i adjacent to the nucleus is syllabified as a coda and then the C_j is deleted. When $C_i C_j$ is followed by a consonant-initial suffix in (41) forming a triconsonantal cluster, the C_j is also deleted. However, where $C_i C_j$ is followed by a vowel-initial suffix in (42), C_i closes the

preceding syllable by the Coda Rule and C_j begins the following syllable by the Onset Rule. In contrast to (42), in (43a) where the first stem ends with the cluster *ps*, the *s* cannot be syllabified onto the onset of the vowel-initial syllable *ə* of the second stem, but is deleted. If (43a) is a single prosodic constituent, *ps* would be fully syllabified, which derives the wrong output *(kap.s'ə.č^hi). The application of Stray Erasure within the compound in (43a) also supports our claim that each stem of a compound constitutes a ω .

This phenomenon was analyzed as Consonant Cluster Simplification (henceforth CCS) by Kim-Renaud (1974), Chung (1980) and Ahn (1985). Following Steriade (1982), I claim that CCS is a result of the Stray Erasure, not a separate rule (see Itô 1986).

Thus, stray erasure in Korean is bounded by ω , which is illustrated in (45):

<p>(44) N[N[kaps] i] 'price' Nom</p> <p>a) KPWR : $\omega(k a p_s i)$ b) Adjun. : $\omega(k a p_s i)$ c) syll. : $\backslash / \backslash /$ $\sigma \quad \sigma$</p> <p>d) : $\omega(kap.s_i)$ e) POT : $\omega(kap.s'i)$</p>	<p>(45) N[N[kaps]N[əč^hi]] 'price' 'value'</p> <p>a) KPWR : $\omega(k a p s) \omega(ə č^h i)$ b) syll. : $\backslash / \quad \backslash /$ $\sigma \quad \sigma \quad \sigma$</p> <p>c) SE : $s \rightarrow \emptyset$ d) : $\omega(kap) \omega(ə č^h i)$ e) resyll. : $\emptyset(k a.p ə. č^h i)$ f) voicing : $\emptyset(k a.b ə. č^h i)$</p>
--	---

In (44) the noun *kaps* forms a ω by the KPWR (10) and the following case marker is adjoined to the ω postlexically. Then within the ω , tautomorphic consonant cluster *ps* are fully syllabified, and *p* is realized as the coda of the preceding syllable; *s* surfaces as the onset of the following vowel-initial syllable *-i*. In (45), the compound projects two ω 's by the PWFR (10). Due to Korean syllable structure, within the first ω , *p* is syllabified as a coda and then *s* is erased by the Stray Erasure Convention. If stray erasure is delayed until the postlexical level, *s* may be syllabified to the onset of the syllable-initial *ə*, producing the wrong output *(kap.s'ə.č^hi).²³ Therefore, I claim that extraprosodicity turns off at the prosodic-word level, erased by the Stray Erasure Convention.

3.4. l-deletion

Korean has underlying tautomorphic *l*-C clusters, and an *l*-deletion rule to simplify them. In this section I will discuss only how this applies to nouns. The domain of *l*-deletion is similar to Stray Erasure discussed in 3.3.. Then, let us consider the examples in (46)-(49):

(46) / C _i	
a. N[talk] 'chicken'	--> $\omega(tak)$
b. N[hilk] 'soil'	--> $\omega(hik)$

²³ However, Rice (1988) argues that for the domain of syllabification in Trukish and Slave extraprosodicity continues to operate postlexically.

- (47) $l C_i + C_j$
 a. $N[N[\text{talk}] \text{to}] \quad \rightarrow \quad \omega(\text{tak.t'o})$
 'chicken' 'too'
 b. $N[N[\text{salm}] \text{kwa}] \quad \rightarrow \quad \omega(\text{sam.gwa})$
 'life' 'and'
- (48) $l C_i + V$
 a. $N[N[\text{salm}] \text{i}] \quad \rightarrow \quad \omega(\text{sal.mi})$
 'life' 'Nom'
 b. $N[N[\text{talk}] \text{in}] \quad \rightarrow \quad \omega(\text{tal.gin})$
 'chicken' Top
- (49) $l C_i] [V$
 a. $N[N[\text{talk}] N[\text{emi}]] \quad \rightarrow \quad \omega(\text{tak}) \omega(\text{emi}) \quad \rightarrow \quad \phi(\text{ta.gə.mi})$
 'chicken' 'mother' 'mother chicken' * $\phi(\text{tal.gə.mi})$
 b. $N[N[\text{hilk}] N[\text{akuŋi}]] \quad \rightarrow \quad \omega(\text{hik}) \omega(\text{akuŋi}) \quad \rightarrow \quad \phi(\text{hi.ga.guŋ.i})$
 'soil' 'furnace' 'soil furnace' * $\phi(\text{hil.ga.guŋ.i})$

Contrary to our expectation, an *l* which is adjacent to the nucleus is deleted so that the following consonant is syllabified as the coda, as shown in (46) and (47). In (48) when *lk* is followed by a vowel-initial suffix, they are both fully syllabified. However, in (49) where the *lk* appear compound-internally, *l* cannot be syllabified but is deleted. The compound-internal *l*-deletion also motivates the prosodic constituent within words.

L-deletion was once analyzed as a special case of Consonant Cluster Simplification (Kim-Renaud 1974; Chung 1980). But I will analyze it as a separate rule. As a ω -bounded rule, *l*-deletion is also a domain span rule, as shown in (50):

$$(50) \quad l \rightarrow \emptyset / \omega(\dots _ C' \dots)\omega \quad (C': \text{unsyllabified } C)$$

L-deletion has to precede the Coda Rule. Let us look at *l*-deletion within a compound, as in (51):

$$(51) \quad N[N[\text{talk}] N[\text{emi}]] \rightarrow \omega(\text{tak}) \omega(\text{emi}) \rightarrow \phi(\text{ta.gə.mi})$$

a) KPWR : $\omega(\text{t a lk}) \omega(\text{e m i})$

b) Onset Rule : $\begin{array}{cc} \backslash | & | \backslash \\ \sigma & \sigma \sigma \end{array}$

c) *l*-deletion : $l \rightarrow \emptyset$

d) Coda Rule : $\omega(\text{t a k}) \omega(\text{e m i})$
 $\begin{array}{cc} \backslash | / & | \backslash \\ \sigma & \sigma \sigma \end{array}$

By the KPWR in (10) we derive two ω 's; within the first ω , *l* is deleted, which confirms our rule (50).

However, when *lk* are followed by a vowel-initial suffix, *lk* are fully syllabified, as shown in (52):

- (52) $N[N[\text{talk}] i] \rightarrow \omega(\text{tal.gi})$
 a) KPWR : $\omega(\text{talk}) i$
 b) adjunction : $\omega(\text{talki})$
 c) Onset Rule : $\omega(\text{t a l k i})$
 $\quad \backslash \! / \quad \backslash \! /$
 $\quad \sigma \quad \sigma$
 d) l-deletion : $\omega(\text{t a l k i})$
 e) Coda Rule : $\omega(\text{t a l k i})$
 $\quad \backslash \! / \quad \backslash \! /$
 $\quad \sigma \quad \sigma$
 f) Voicing : $\omega(\text{tal.gi})$

By the KPWR in (10), the noun projects a ω and the suffix is adjoined to the preceding ω . Then, within ω , l is syllabified as the coda of the first syllable and k , as the onset of the second syllable. So, the structural description for l -deletion is not met.

4. Conclusions

In this paper I have proposed that Korean provides evidence for a word-internal prosodic constituent, the prosodic word, which is the domain of syllabification, Coda Neutralization, t -palatalization, stray erasure and l -deletion in complex words. A parameter for prosodic word formation was also introduced. In some languages prosodic word formation precedes bracket erasure, assigning the ω to each member of a compound as well as a prefix (for those languages, which select the left-end parameter), but follows it in other languages.

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Two Types of Serial Verb Constructions in Korean⁰

Sookhee Lee

1. Introduction

One of the syntactic or configurational structures most actively discussed in the African linguistic literature for the last few decades may be SERIAL VERB CONSTRUCTIONS (SVCs). SVCs are constructions in which a sequence of verbs with tense/aspect agreement appears in a single clause without any markers of coordination or subordination, as in (1):¹

(1) a. intransitive + intransitive

Zhāng-sān shàng-loú shuì-jiào (Mandarin, Li and Thompson 1973)
Zhang-san go upstairs sleep
'Zhang-san goes upstairs and sleeps.'

b. transitive + intransitive

Ajàò gbé àpótí wá (Yoruba, George(1975))
Ajao took box come
'Ajao brought the box.'

c. transitive + transitive

Kofi naki Amba kiri (Sranan, Sebba(1987))
Kofi hit Amba kill
'Kofi struck Amba dead.'

d. intransitive + transitive

ofóni-bi tọrọ fin bẹ́n-mi (Ijo, Williamson(1965))
bird river fly cross-Past
'The bird flew across the river.'

e. transitive + ditransitive

li pase liv-la bay mari (Haitian, Déchaine(1985))
3Sg pass book-DET give Marie
'S/he passed the book to Marie.'

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¹ In principle, serialization is a phenomenon that any number of verbs come together in a series. Therefore, there is no *a priori* group of verbs called serial verbs. In this paper, I discuss examples with only two verbs, even though more than two verbs can occur in a serial verb construction.

The examples in (1) refer to a single overall event, even though the actions of two verbs may not be simultaneous.

SVCs do not seem to exist in Indo-European languages. They are found in the Kwa group of Niger-Congo languages in West Africa, in Caribbean creoles, in New Guinean languages, and also in East Asian languages such as Mandarin Chinese and possibly Thai. Among them, Ijo, spoken in the Niger Delta area of Southern Nigeria, has a unique word order (see Williamson 1963, 1965): it is the only serializing language with subject-object-verb (SOV) word order; all other serializing languages are of the subject-verb-object (SVO) type.

The constructions formed as [V-*e* V] in Korean have been traditionally considered to be complex predicates derived from a multi-clausal source or as compound predicates formed in lexicon (see Choe 1988; I. Yang 1977; and Suh 1990). In this paper, however, I claim that these are none of those predicates but rather SVCs and that Korean is also an SOV type serializing language. I first investigate the function of the morpheme *-e* which occurs between two verbs, and argue that it is just a DUMMY MORPHEME with no lexical meaning. Then, I propose that there are two types of SVCs in Korean, SVC1 and SVC2. I provide several empirical and theoretical tests to support this distinction. Accepting Baker's(1989) DOUBLY-HEADED VP structure, I formulate the configurational structures and thus show structural difference between SVC1 and SVC2.

2. Properties of *-e* and Clausal Complex Predicates

Unlike SVCs in other serializing languages, SVCs in Korean have the morpheme *-e* between the first verb V1 and the second verb V2. Presumably, one might hesitate to approach Korean complex predicates from the perspective of SVCs, since *-e* has been overtly dealt with as an Infl (see Choe 1988) or a Comp (see H. Lee 1976 and D. Yang 1976) in the framework of generative grammar. However, let us start our discussion with an assumption that *-e* in Korean SVCs is just a dummy morpheme.

2.1. *-E* as a Suffix for Morphological Closure

The morpheme *-e*, which has no lexical meaning is introduced right after V1, since every Korean verb is a bound morpheme and requires the presence of at least one verb-final suffix to stand alone. Kang(1988:78) also captures the same idea, and claims that Korean verbs, being bound morphemes, are subject to the following morphological principle:

(2) Morphological Closure

Bound predicates must be closed off by a set of suffixes belonging to the category C.

(C = verb-final suffixes)

Kang says that the Category C does not include the aspectual/tense/Agr/modal suffixes in Korean. This proposal is in accord with our assumption that *-e* is a dummy morpheme which is suffixed to make a bound verb free in a morphological sense.

Besides, according to Williamson(1965:53), the morpheme *-ni* suffixed to V1 in Ijo SVCs is just a LINKER with no lexical meaning. Korean *-e* also seems to function as a linker to connect two verbs. Even though Korean *-e* is morphologically oriented and Ijo *-ni* is phonologically controlled, these suffixes seem to have the same

funciton.2

The idea that *-e* is a linker leads us to predict that its suffixation to a verb causes no change of grammatical category of the verb. Since *-e* is a dummy morpheme, it is not expected to serve a significant grammatical function. In fact, this comes out when we compare *-e* with other verb-final suffixes, as in (3):

- (3) a. Swuni-nun chayk ilk-ki-lul cohaha-n-ta
Swuni-Top book read-KI-Acc like-Pres-Dec
'Swuni likes to read a book.'
- b. Swuni-nun ku chayk-ul ilk-ci-lul anh-ass-ta
Swuni-Top the book-Acc read-CI-Acc do not-Past-Dec
'Swuni did not read the book.'

In (3a) and (3b), the suffixes *-ki* and *-ci* play a role of nominalizer. The realization of an accusative Case after those suffixes implies that they change the grammatical category of the verbal stem *ilk*- 'read' into a noun or of the whole verbal category including *ilk*- and its argument into a nominal one. Let us consider another verbal suffix *-nun*, given in (4):

- (4) Swuni-ka *t_i* cohaha-nun chayk_{*i*}
Swuni-Nom like-Rel book
'the book that Swuni likes'

In (4), *-nun* plays an important grammatical function, a relativizer, like 'which' or 'that' in English. However, *-e* just links and has no influence upon their grammatical status. Therefore, I claim that *-e* is just a dummy-morpheme linker which is used to satisfy the requirement of morphological closure.

2.2. Is *-e* an Infl or a Comp?

It is still possible to regard *-e* as an Infl or a Comp. I will show somewhat indirectly that it is none of these functional categories. That is, if a plausible candidate for an embedded clause shows no indication of clausehood, the candidate is not actually an embedded clause at any level of representation. In fact, there are several cases of sentences exhibiting a remnant of clausal embedding in deep structure. Causative sentences are such a case, given in (5):

- (5) a. ku-nun Swuni-ka chayk-ul ilk-key ha-ess-ta
he-Top Swuni-Nom book-Acc read-Comp do-Past-Dec
'He made Swuni read the book.'
- b. ku-nun Swuni-eykey chayk-ul ilk-key ha-ass-ta
-Dat
- c. ku-nun Swuni-lul chayk-ul ilk-key ha-ass-ta
-Acc

In (5) *Swuni* is not only a semantic subject of the verb *ilk*- 'read' but also a causee. While it has nominative Case in (5a), it has dative Case in (5b) and accusative Case in (5c). This arguably suggests that (5b) and (5c) are derived from (5a) which includes an

² In Ijo, the suffix *-ni* is introduced usually when the next unit begins with a vowel and has no syntactic significance. See Williamson(1963, 1965).

embedded clause and that the verbal suffix *-key* is a Comp (see S. Lee 1990) for the detailed discussion of causative constructions in Korean).

Also, the first verb in causative sentences can be followed by an honorific morpheme *-si*, which is an explicit realization of an Agr in Korean, as in (6):

- (6) ku-nun halmeni-lul TV-lul po-si-key ha-ass-ta
 he-Top grandmother-Acc TV-Acc watch-Hon-Comp do-Past-Dec
 'He made the grandmother watch the TV.'

This directly shows that causative sentences include an embedded clause.

In contrast, this kind of syntactic phenomena never happen in SVCs. First, there is no subject of V1's own in SVCs; rather the subject of V1 is always the same as that of V2, as shown in (7):

- (7) ku-nun (*Swuni-ka) kang-ul heyemchi-e kenn-ess-ta
 he-Top Swuni-Nom river-Acc swim-L cross-Past-Dec
 'He swam across the river.'

So, it seems to be unsupported to regard *-e* as a tenseless Infl (cf. Choe, H.S.(1988)).

Secondly, the V1 in SVCs is never followed by an honorific morpheme, as in (8):

- (8) apeci-kkeyse cip-ey tol>(*usi)-e o-si-ess-ta
 father-Nom(Hon) home-at turn-Hon-L come-Hon-Past-Dec
 'The father returned home.'

Thirdly, a tense morpheme is never realized after V1, but there comes a tense morpheme after V2, as in (9):

- (9) ku-nun koki-lul kwu>(*ass)-e mek-ess-ta
 he-Top meat-Acc broil-Past-L eat-Past-Dec
 'He broiled the meat and ate it.'

As shown in (7)-(9), V1-*e* involves no indication of an Infl and consequently represents a category smaller than CP and IP. Here we come up with two categorial possibilities: one is VP or V' and the other is a brand-new maximal category whose head is a functional category *-e*. But I have already shown that *-e* is too weak in its meaning and grammatical function status to have its own categorial value. Therefore, it is very natural to think V1-*e* to be a part of the verbal category for the whole [V1-*e* V2] and *-e* a dummy morpheme.³

To summarize, SVCs never behave as if they are multi-clausal structures. Neither is V1 a verb of an embedded clause, nor is V2 a verb of a main clause, and [V1-*e* V2] is not a complex predicate derived from a complex clausal deep structure.

3. Two Types of SVCs

3.1. SVC1

Bamgbose(1974, 1982) maintains that there are two types of SVCs in Yoruba, spoken in the western part of Nigeria. Those are the modifying type SVC and the linking type

³ I assume that the morpheme *-e* neither exists in the lexicon nor has a categorial value, but is inserted in syntactic process--before PF and LF--to make up for the deficiency of boundness of a verb.

SVC.⁴ Even though I do not agree with his transformational approach to SVCs, I find his classification similar to my distinction between SVC1 and SVC2 in Korean. I cite his idea about modifying verbs below:

'...when they occur in a minimal sentence, they have all the characteristics of a full verb; but when they occur in a serial construction, they take on a modifying function and do not have the full range of verbal characteristics. In other words, the difference in the behavior of a verb varies according to whether it occurs as the only verb or as one of a number of verbs in a sentence.' (Bamgbose 1974:32)

That is, modifying verbs in Yoruba SVCs mainly modify or emphasize the meaning of main verbs, and sometimes their meaning is radically changed when they occur in SVCs.

We also have this kind of verbs in Korean and they have been traditionally called AUXILIARY VERBS. The following are examples with an auxiliary verb (the data in (10) have been chosen from Kim 1984):

- (10) a. ku-nun sihem-ul phokiha-e peri-ess-ta
 he-Top test-Acc give up-L throw away-Past-Dec
 'He just gave up on the test.'
- b. ku-nun 100-mite-lul 10-cho-ey talri-e nay-ess-ta
 he-Top 100-meter-Acc 10-second-in run-L take out- Past-Dec
 'He ran 100 meters in just 10 seconds.'
- c. ku-nun cikum-kkaci cal sal-a o-ass-ta⁵
 he-Top now-until well live-L come-Past-Dec
 'He has lived a good life until now.'
- d. ceswuci-uy mwul-i mal-a ka-n-ta
 reservoir-Gen water-Nom dry-L go-Pres-Dec
 'Water in the reservoir is drying up.'
- e. ku-nun pang-ey tul-e o-ass-ta
 he-Top room-at enter-L come-Past-Dec
 'He entered the room.'
- f. ku-nun san-ey ol-a ka-ass-ta
 he-Top mountain-at climb-L go-Past-Dec
 'He went up the mountain.'
- g. ku-nun khun sori-ro chayk-ul ilk-e tay-ass-ta
 he-Top loud voice-with book-Acc read-L supply- Past-Dec
 'He continued to read the book in a loud voice.'
- h. ku-nun umak-ul thul-e noh-ass-ta
 he-Top music-Acc turn on-L leave-Past-Dec
 'He had the music turned on.'

⁴ In his analysis, the former is derived from a single underlying sentence and the latter from two or more underlying sentences.

⁵ The realization of *-e/-a* is conditioned by the preceding vowel, which is a case of vowel harmony.

- i. ku-nun Swuni-eykey pimil-ul malha-e cwu-ass-ta
 he-Top Swuni-to secret-Acc tell-L give-Past-Dec
 'He told Mary the secret (for her).'
- j. ku-nun ku chayk-ul ilk-e po-ass-ta
 he-Top the book-Acc read-L see-Past-Dec
 'He tried reading the book.'

All the sentences in (10) involve a construction [V1-*e* V2]. They have a series of verbs in a single sentence without any conjunction marker.

Interestingly, however, it is hard to assign an English gloss to some of them, because the meaning of V2 as a main verb in a simple sentence hardly shows up in this construction. Instead of fully expressing its own meaning, the V2 adds special meaning or aspect to the meaning of the whole sentence. For example, even though the verb *peri-* has the meaning 'throw away' by itself, it does not express its meaning in (10a), but rather means 'finish' or 'get through'. So, (10a) is not just the statement of an event that he gave up on the test but emphasizes the completion of the event. In the same way, in (10c), not just the fact that he lived a good life is described, but it is expressed that his state of living a good life has been continued from the past until now. That is, the verb *o-*'come' adds the aspect of duration of the event but indicates no property of a motion verb.

The meanings modified by V2s are arranged in (11):⁶

(11)

V2 in (10)	The meaning of Ve as a main verb in a simple sentence	The modified or enriched meaning by V2 in [V1- <i>e</i> V2]
a) <i>peri-</i>	'throw away'	completion
b) <i>nay-</i>	'take out' 'put forth'	completion
c) <i>o-</i>	'come'	duration
d) <i>ka-</i>	'go'	duration
e) <i>o-</i>	'come'	direction
f) <i>ka-</i>	'go'	direction
g) <i>tay-</i>	'supply' 'draw into'	continuance
h) <i>noh-</i>	'put' 'keep'	retention
i) <i>cwu-</i>	'give'	benefaction
j) <i>po-</i>	'see'	trial

As illustrated in (10) and (11), the meaning of [V1-*e* V2] is different from the combination of the meaning of V1 and of V2 in simple sentences.

Now, let us consider why these combinations are a type of SVCs. First, all V2s are primarily independent verbs, whatever secondary function they may serve. They can be used as the only verb in a simple sentence, as in (12):

- (12) a. ku-nun ssureyki-lul peri-ess-ta
 he-Top garbage-Acc throw-Past-Dec
 'He threw away the garbage.'

⁶ Since the meaning of auxiliary verb on their own are so varied according to context, I list only some of their main meanings or the meanings possibly related to the ones in auxiliary verb constructions.

- b. ku-nun non-ey mwu-ul tay-ess-ta
 he-Top rice paddy-in water-Acc draw into-Past-Dec
 'He irrigated the rice paddy.'
- c. ku-nun Swuni-eykey chayk-ul cwu-ess-ta
 he-Top Swuni-to book-Acc give-Past-Dec
 'He gave a book to Swuni.'

That is, all of these so-called auxiliary verbs are not auxiliary at all when they are the only verb.

Nonetheless, one might suspect that V2s in (10) are auxiliary or even deficient in the sense that they do not project their argument structure and the arguments preceding [V1-*e* V2] seem to be all selected by only V1 but not by V2. This is true in some cases, but the other way around also holds in other cases: rather, some V2s project their own argument structure and consequently enrich the argument structure of the whole sentence. Let us compare the examples in (13):

- (13) a. ku-nun noray-lul pwul-ess-ta
 he-Top song-Acc sing-Past-Dec
 'He sang a song.'
- b. *ku-nun Swuni-eykey noray-lul pwul-ess-ta
 he-Top Swuni-to song-Acc sing-Past-Dec
 'He sang a song for Swuni.'
- c. ku-nun Swuni-eykey noray-lul pwul-e cwu-ess-ta
 he-Top Swuni-to song-Acc sing-L give-Past-Dec
 'He sang a song for Swuni.'
- d. ??ku-nun noray-lul pwul-e cwu-ess-ta
 he-Top song-Acc sing-L give-Past-Dec
 'He sang a song (for whom??).'

The prepositional phrase *Swuni-eykey*'to Swuni' is allowed in (13c) but not in (13b), and it is necessary in (13d) but not in (13a). This means that the addition of *Swuni-eykey* results from the influence of the verb *cwu*- 'give' upon the argument structure of the whole sentence.

Secondly, all examples in (10) describe a single event, not a sequence of separate events. So the meaning of (10d), for example, is far from the sequence of two separate events (14a) and (14b):

- (14) a. ceswuci-uy mwul-i maru-n-ta
 reservoir-Gen water-Nom dry up-Pres-Dec
 'The water in the reservoir dries up.'
- b. *ceswuci-uy mwul-i ka-n-ta
 reservoir-Gen water-Nom go-Pres-Dec
 'The water in the reservoir goes away.'

Instead, (10d) describes the state of water drying up in the reservoir, and thus is just a single event not a combination of separate events. Remember that it is a general property that the two verbs together denote a single event.

Thirdly, the tense, marked only after V2 in (10), has a scope over the whole sentence and thus the two verbs are interpreted to have the same tense.

Fourthly, there are only a fixed number of auxiliary verbs and their combination with another verbs is extremely productive. Even though there is sometimes a selectional restriction between two verbs which seems to be semantically controlled, all the V2s in (10) follow a quite large variety of V1s. For instance, as in (15), *nay*-'put forth', *tay*-'supply', and *noh*-'put' are not preceded by verbs describing mental or psychological state such as *nukki*-'feel' or *sarangha*-'love' (see Kim 1984):

- (15) a. *ku-nun Swuni-eykey sarang-ul nukki-e nay-ess-ta
 he-Top Swuni-to love-Acc feel-L put forth-Past-Dec
 'He felt love for Swuni.'
- b. *ku-nun Swuni-lul sarangha-e tay-ess-ta
 he-Top Swuni-Acc love-L supply-Past-Dec
 'He kept loving Swuni.'

However, except a few cases of this kind semantic selectional restrictions which generally apply for most verbs, the combination of V1 and V2 is considerably free.

Therefore, there is no need to assign them to a special unique category called AUXILIARY VERB CONSTRUCTIONS (AVCs). They may as well be included in more general one, SVCs, and syntactically derived. They are products of the syntactic phrasal projection of two verbs, not specific-class verbs which are lexically derived.

3.2. SVC2

In addition to SVC1, there is another type of SVC in Korean, SVC2. SVC2 is distinguished from SVC1 in several ways. First, while V2s in SVC1 are a small number of closed class verbs, V2s in SVC2 are an open class. Second, the meaning of SVC1 may not be compositionally deduced from the literal meanings of V1 and V2, since they usually express a modified meaning, even though there is a consistence in their modified meaning as shown in (11). But in SVC2 the meanings of V1 and V2 are independently expressed. Third, the argument structures of V2s are fully realized in SVC2, but not in some SVC1. That this division into SVC1 and SVC2 is on the right track will be thoroughly shown in section 3.3, both theoretically and empirically. For now, I provide and discuss some typical sentences of SVC2.

Based on the transitivity of verbs, SVC2s provide four types of combination of V1 and V2 as in (16)-(19):⁷

- (16) intransitive + intransitive
 ku-nun cip-ey kel-e ka-ss-ta
 he-Top home-at walk-L go-Past-Dec
 'He walked home.'
- (17) transitive + intransitive
 ku-nun maul-ul thongkwaha-e o-ass-ta
 he-Top village-Acc go through-L come-Past-Dec
 'He came through the village.'

⁷ The discussion of SVC2 with transitive V1+ditransitive V2 is not included in this paper. For this, see S. Lee's dissertation(in preparation:ch4).

(18) transitive + transitive
 ku-nun koki-lul kwu-e mek-ess-ta
 he-top meat-Acc broil-L eat-Past-Dec
 'He broiled the meat and ate it.'

(19) intransitive + transitive
 ku-nun kang-ul heyemchi-e kenn-ess-ta
 he-Top river-Acc swim-L cross-Past-Dec
 'He swam across the river.'

Again, all sentences include a series of verbs with no marking of coordination or subordination, and the two verbs denote a single event. The tense marked on only one of the two verbs is understood to cover both of them. The lexical properties of both V1 and V2 are completely projected in all SVC2s in (16)-(19), and the meaning of a whole [V1-e V2] can be deduced from the meanings of its parts, V1 and V2.

3.3. Supporting Evidence for the Analysis

In this section I carry out some experiments to see whether SVC1 and SVC2 are also structurally different and consequently to support our classification into two types of SVCs.

3.3.1. -*se* Insertion

The first test is related to the insertion of the particle *-se* 'by means of' after V1-*e*. The SVC1 verbs reject the insertion of *-se* and the SVC2 verbs allow it (see also Kim 1984).⁸ Let us compare (20) and (21):

(20) a.*ku-nun cikum-kkaci cal sal-a-se o-ass-ta (SVC1: duration)
 he-Top now-until well live-L-SE come-Past-Dec
 'He has lived a good life until now.'

⁸ The reason why SVC1 and SVC2 show a difference with respect to this insertion seems to be semantic in a way and is probably associated with the meaning relationship of V1 to V2 in SVC2. In SVC2, V1 in general tends to describe the way V2 is done, and thus we can use an SVC2 sentence, but not an SVC1 sentence, as an answer to a possible question with *ettehkey* 'how' and V2. Let us compare (i) with (ii):

(i) A: ku-nun ettehkey o-ass-ni? ((10c):SVC1)
 he-Top how come-Past-Int
 'How did he come?'

B: ??ku-nun cikum-kkaci cal sal-a o-ass-e
 he-Top now-until well live-L come-Past-Dec
 'He has lived a good life until now.'

(ii) A: ku-nun cip-ey ettehkey ka-ss-ni? ((16):SVC2)
 he-Top home-at how go-Past-Int
 'How did he go home?'

B: ku-nun cip-ey kel-e ka-ss-e
 he-Top home-at walk-L go-Past-Dec
 'He walked home.'

As in (i) and (ii), only an SVC2 sentence sounds natural as an answer to *ettehkey* 'how'.

b.*ku-nun san-ey ol-a-se ka-ss-ta (SVC1: direction)
 he-Top mountain-at climb-L-SE go-Past-Dec
 'He went up the mountain.'

(21) a. ku-nun cip-ey kel-e-se ka-ss-ta (SVC2: motion)
 he-Top home-at walk-L-SE go-Past-Dec
 'He walked home.'

b. ku-nun maul-ul thongkwaha-e-se o-ass-ta
 he-Top village-Acc go through-L-SE come-Past-Dec
 'He came through the village.'

Ka- 'go' in (20a) and *o-* 'come' in (20b) seem to be the same verbs as those in (21a) and (21b). But these apparently identical verbs are actually homophonous. In SVC1, they are used with a specific meaning of duration or direction, but in SVC2 with their original meaning of motion.⁹ It is impossible to insert *-se* before 'go' or 'come' in SVC1, but possible in SVC2. Consequently, this *-se* insertion test shows that V1 in SVC1 is more tightly linked to V2 than V1 in SVC2 is.

3.3.2. Adverbial Insertion

A second test is based on the possibility of the occurrence of an adverb between V1 and V2. In both SVC1 and SVC2, an adverb can occur in front of V1, or, if any, in front of an object NP. Interestingly enough, an adverb can not occur between V1 and V2 in SVC1, but it can in SVC2. Let us compare the SVC1 in (22) and the SVC2 in (23):

(22) a.*ku-nun sihem-ul phokiha-e kapcaki peri-ess-ta (SVC1)
 he-Top test-Acc give up suddenly throw away-Past-Dec
 'He suddenly gave up on the test.'

b.*ceswuci-uy mwul-i mal-a cemcem ka-n-ta
 reservoir-Gen water-Nom dry out-L gradually go-Pres-Dec
 'The water in the reservoir is gradually getting dried up.'

(23) a. ku-nun koki-lul kwu-e masisskey mek-ess-ta (SVC2)
 he-Top meat-Acc broil-L deliciously eat-Past-Dec
 'He broiled the meat and enjoyed it.'

b. ku-nun kang-el heyemchi-e tanswumey ken-ess-ta
 he-Top river-Acc swim-L in a breath cross-Past-Dec
 'He swam fast across the river.'

An SVC2 in general allows insertion of an adverb between V1 and V2 but an SVC1 does not. This again indicates that V1 and V2 are more tightly linked in SVC1 than in SVC2.

⁹ The directional V2s 'go' and 'come' are virtually universal in serializing languages (see Sebba 1987: 185-193).

3.3.3. Scope of Negation

A third test is concerned with the scope interpretation of negation. In the so-called long form negation where the negation word *anh-* 'not' follows the final verb of the sentence, the negation scope in SVC1 is sometimes interpreted to be different from the negation scope in SVC2.¹⁰ For instance, whereas the whole V1-*e* V2 is negated in SVC1 as in (24), only V1 can be negated in SVC2 as in (25):

(24) A: ku-ka sihem-ul phokiha-e peri-ess-ni? (SVC1)
he-Nom test-Acc give up-L throw away-Past-Int
'Did he give up on the test?'

B: *ku-nun sihem-ul phokiha-e peri-ci-nun anh-ass-ci-man,
he-Top test-Acc give up-L throw away-CI-Cont do not-Past-CI-Del,
peri-ki-nun ha-ss-e
throw away-KI-Cont do-Past-Dec
'?He did not give up on the test, but threw it away.'

(25) A: ku-ka koki-lul kwu-e mek-ess-ni? (SVC2)
he-Nom meat-Acc broil-L eat-Past-Int
'Did he broil and eat the meat?'

B: ku-nun koki-lul kwu-e mek-ci-nun an-ass-ci-man,
he-Top meat-Acc broil-L eat-CI-Cont do not-Past-CI-Del,
mek-ki-nun ha-ss-e
eat-KI-Cont do-Past-Dec
'He did not broil the meat, but ate it.'

As in (24), V1 and V2 in SVC1 resist being separately negated. But the independent negation of V1 is possible in SVC2, as shown in (25). In this way, the difference of scope interpretation of negation supports the idea that V1 and V2 in SVC1 have a closer relationship than in SVC2, whatever that relationship is.

3.4. Structures and Theoretical Issues

Based on these three tests, I postulate that the form [V1-*e* V2] of SVC1 has a structure different from that of SVC2 at a certain level of representation, even though their deep structure representations are not different. In this section, I discuss their structural differences and related theoretical issues.

Accepting Baker's (1989) analysis of SVCs based on his Head Licensing

¹⁰ The response to an SVC2 sentence such as (i) may be marginal:

(i) ?ku-nun cip-ey kel-e nuckey ka-ss-ta
he-Top home-at walk-L late go-Past-Dec
'He walked home late.'

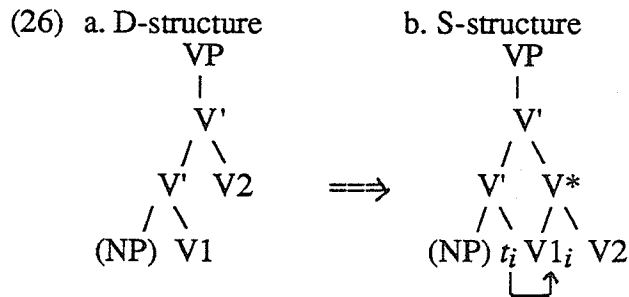
But the sentence sounds natural when there is a slight pause after V1-*e* or when *-se* follows it, as in

(ii) ku-nun cip-ey kel-e se nuckey ka-ss-ta
he-Top home-at walk-L-by means of late go-past-Dec
'He walked home late.'

Condition (HLC), I assume that Korean SVCs have a doubly-headed verb projection, and that both V1 and V2 are main verbs in an SVC. That is, a VP in SVCs has two verbal heads, V1 and V2, whose lexical properties are projected in syntax following the Projection Principle.

3.4.1. SVC1 Structure

Let us start with SVC1 first. The V2s in SVC1 are a fixed number of a closed class. They lose semantic and syntactic weight in SVC1, even though they are originally independent verbs: i.e., i) they sometimes enrich the argument structure of the sentence but often do not project their argument structures, as discussed in section 3.1, and ii) they lack of their original full meaning and instead add a special meaning or aspect to the meaning of the whole sentence. Here, I claim that this semantic and syntactic weakness of V2s in SVC1 triggers a head movement of V1 with full content. It is not surprising that a semantically minimal or weak verb triggers another verb to be moved and incorporated to it, as illustrated in head movement and incorporation phenomenon in causative sentences of many languages (see Baker 1988:ch4 and S. Lee 1990). At the deep structure, V1 and V2 are separate verbs, but V1 is moved and incorporated to V2 in syntax, as shown in (26):



Following Baker's Head Licensing Condition, both V1 and V2 are equally heads of the maximal projection VP in (26a). The NP is θ -marked by V1 under sisterhood in the sense of Chomsky's(1981, 1986b) theta theory in D-structure. The V2 in (26a) does not necessarily θ -mark the preceding NP, since it is not in a sisterhood relationship to the NP.¹¹ The NP is Case-marked by the V*, which consists of V2 and V1 incorporated into it, under government based on Baker's(1988:65) Government Transparency Corollary (GTC).

The trace of V1 in (26b), known to exist by the Projection Principle, must be properly governed to satisfy Chomsky's(1981) Empty Category Principle (ECP).¹² For V1 to govern its trace, two conditions must be met: it must c-command its trace and there must be no barrier that intervenes between the two. The V* category formed by adjunction does not count. Since it is not a maximal projection, it is not a potential barrier and does not block V1's c-commanding t_i .¹³ Therefore, V1 governs its trace

¹¹ This seems to be a reason why the argument structure of V2 in SVC1 is not fully realized.

¹² This means that it must be governed by the chain coindexed V1. Since V1 and V2 have no θ -relationship in that a lexical category usually θ -marks a maximal category (see Baker 1989:53), the trace of V1 is not θ -coindexed with V2. Actually in every SVC, V1 and V2 are not θ -related in the sense of the Revised θ -Criterion by Emonds (1985:78). Therefore, the trace must be antecedent-governed by the coindexed V1.

¹³ I accept here Aoun and Sportiche's(1983) definition of c-command:

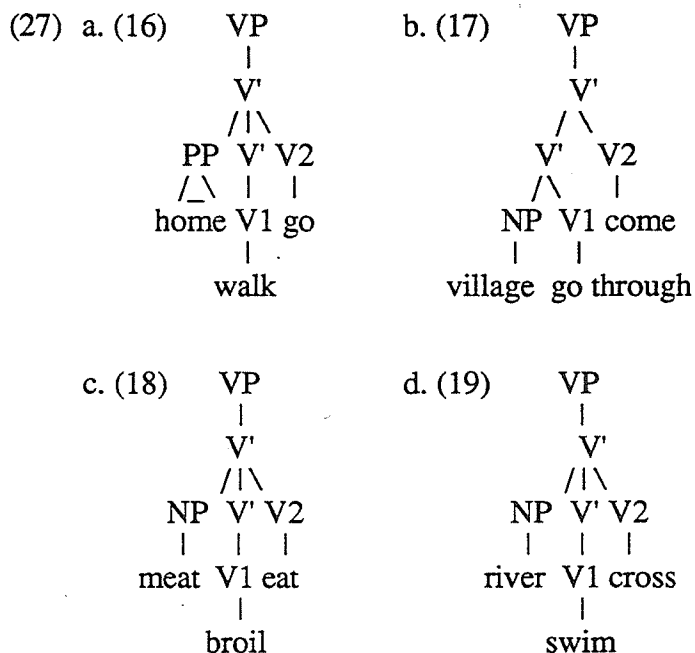
α c-commands β if α does not dominate β and for every maximal projection γ , if γ dominates α then β dominates .

and the ECP is satisfied.

As illustrated in (26b), after incorporation, V1 and V2 no longer look like separate verbs but one compound verb. This accounts for why V1 and V2 in SVC1 exhibit a very rigid link in the preceding tests.

3.4.2. SVC2 Structure

Following Baker's Head Licensing Condition again, SVC2 also has a doubly headed VP. Let us compare four cases of SVC2 structure according to the transitivity of verbs in (27):



In (27a), both V1 and V2 are intransitive verbs which have no internal θ -roles to assign. The NP is a structural sister to V1 in (27b) and to V2 in (27d). Thus, NP is assigned a θ -role by V1 in (27b) and by V2 in (27d). The NP in (27c) is θ -marked by V2, which is a structural sister, and also by V1, which is a V'-internal transitive verb. This is an example of pure OBJECT-SHARING in Baker's (1989) sense. Baker (1989) argues that, in a doubly-headed VP of an SVC, there must be object sharing especially when the first verb is transitive. However, this is not the case, as we see in (27b). Rather, I notice that all examples of SVC2 given in (16)-(19) involve SUBJECT-SHARING rather than object sharing.¹⁴ Both V1 and V2 percolate their external θ -roles to their maximal projection VP where they are assigned to the subject. In this way, the two verbs share a subject instead of an object. The subject sharing idea is further supported by all SVC1 data in (10), in which no object is shared.

In the light of Chomsky's (1986b) θ -Criterion, it is not problematic for an NP to receive more than one θ -role in the same position. His θ -Criterion prohibits a θ -marked NP from receiving another θ -role in another θ -position after movement. But in (27c) the NP gets two θ -roles in the same D-structure position.

In (27c), NP is supposed to be Case-marked by both V1 and V2, as it is θ -

¹⁴ Only if both verbs are transitive, must there be object sharing. See S. Lee's dissertation (in preparation: ch3).

marked by both of them. This causes no conflict with any principles in the framework of Government and Binding Theory. The Case Theory and the θ -Criterion bar a Case-marked NP trace and allow Case to appear only on the head of a chain (see Chomsky 1986b:186-204), but they do not disallow a doubly Case-marked NP in the same D-structure position.

4. Concluding Remarks

In previous research, it has been taken for granted that Korean has a special class of verbs called auxiliary verbs and that they construct so-called auxiliary verb constructions. This is presumably because most research focus has been put only on semantic and syntactic deficiency of these verbs (cf. I. Yang 1977 and Choi 1991).

However, in this paper, I have argued that auxiliary verb constructions are actually a part of serial verb constructions. I have also claimed that Korean is a serializing language, which has two types of SVCs, SVC1 and SVC2, and that auxiliary verb constructions correspond to SVC1. Unlike previous research of SVCs in African linguistics (cf. Bamgbose 1974, 1982; George 1975; Oyelaran 1982; Schachter 1974; Stahlke 1970, etc.), typological dichotomy of Korean SVCs has been made based on purely syntactic and theoretical arguments.

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Grammatical Representations as Scientific Theories

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"Gross coverage of a large mass of data can often be attained by conflicting theories; for precisely this reason it is not, in itself, an achievement of any particular theoretical interest or importance."

N. Chomsky

0.0 Introduction.

The structure of this paper is as follows: section (1) concerns some methodological preliminaries and outlines an important problem in modern linguistics, section (2) argues for the notion that different theories of grammar can be productively compared, part (3) explores some dimensions along which comparison can take place, and part (4) addresses the issue of why these types of comparisons have not been popular within the mainstream of linguistic theory.

1.0 Methodological Preliminaries.

Science, as with all complex human endeavor, is a multifarious thing, and can be described at many levels. The topic of this paper is therefore (necessarily) ambiguous between "science" as a formal system, and "science" as a sociological phenomenon. In this paper I will try to balance these two aspects of science in consideration of the role of grammatical representations as theories of the tacit knowledge that underlies the human capacity for language.

In as much as one can speak about the contents of scientific debate affecting the course of development of a discipline, I will try to draw attention to what I believe (at least retrospectively) were the scientifically substantive issues. Likewise, the sort of reasoning that goes on in science in relation to the sociological factors has received a lot of attention in the philosophy of science. For example, the notion of scientific revolution, which contains formal and informal features, has been developed to describe the situation when one paradigm overthrows another (Kuhn 1962). Because science is rightly both of these things, each has its place in a full account of the process of scientific discovery.

Science has a set of general rules, one of which states that if you encounter some phenomenon that is beyond your capacity to explain, it is against the rules to make up an explanation that appeals to miracles, ghosts, dragons or unicorns. This is called an "empirical epistemology," which means simply that we can only appeal to naturalistic explanations (Gale 1976). This is not to be confused with an "empiricist epistemology," which is a subclass of an empirical epistemology. An empiricist or rationalist epistemology is the property of a particular paradigm. The shift from behaviorism to nativism, for example, entailed moving from an impoverished epistemology under which only observation was allowed, to an enriched epistemology in which abstract mental objects, although unobservable, were also allowed. Thus, one of the functions of a paradigm is to limit the ontological status of theoretical entities and the types of explanation that can be used.

Another function of a paradigm is to limit the range of phenomena that can reasonably bear on the theory. My thesis is that a significant part of the reason that we

now have no unified theory is that there is no agreement on what types of data a theory of language should be held responsible for explaining.

1.1 The Lack of a Research Consensus.

The current state of affairs very much resembles descriptions of disciplines before the establishment of a unified paradigm. There are two typical examples (Kuhn 1962, pp. 12-14): optics before Newton, and research on electricity in the early eighteenth century. As regards optics, there were competing schools of thought which each focused on a clustering of phenomena as fundamental to the description of light. Each individual researcher was set with the task of re-inventing the discipline-- there were no phenomena which all were obliged to account for, nor were there a set of methods which were held in common. This is not to say that they were not scientists: the paradigm which Newton brought to the discipline borrowed from the various types of explanation. But viewed as a whole, in absence of a unified paradigm, something less than science was being pursued.

There are significant commonalities between the pre-paradigmatic stage, and our current state of the art in linguistics. A good test to see whether a unified research paradigm has been established is to examine the entry level textbooks in the field. I have in mind, for example, Sells (1985). The first few chapters outline the parts of the theory that are common to all three theories, and then subsequent chapters go on to describe the differences. For many, this is not troublesome: Pinker (1984, p. 25), for example. Although he adopts LFG as his theory of choice, he argues that the choice is of reduced consequence in light of the fact that the three theories all posit more or less the same mechanisms. A variant on this view that I will argue against is the notion that all theories approximate the underlying mental grammar in some particular way, each revealing an aspect of UG.

I feel there are important reasons for not maintaining the status quo, however. There are concerns (both substantive and methodological) which weigh against remaining in our present state: it is unproductive-- not just because there is only one correct theory (as I will argue below), but also because only a single theory can take us to the next stage in the scientific progression of discovery. There is no way to make sense of the notion that a discipline is "robust," and hence as a plethora of theoretical explanations. If we accept that the way science progresses is through scientific revolutions, then it is crucial that we set the stage for such a change by entering the period of unified activity which allows revolution to take place. The solution lies in selecting the best theory from a set of candidate theories. How we go about doing just that will be the concern of the remainder of this paper. Hence, the first conclusion of this paper is that there exist sociological factors which require particular attention to the task of comparing grammars.

2.0 Levels of Explanation.

It is useful to go back to the fundamental questions like: What do we want a theory of linguistic behavior to do for us? Theories are constructed for the purposes of explanation; that is, we require of them that they describe the particulars at a level at which causality can be evaluated. If we apply this to language, it is apparent that a grammar is nothing more than a theory of language (Chomsky 1965, p. 24). Therefore, we ask that at a minimum, a grammar should reveal causality.

What does causality mean for a grammar? Grammars are computational systems, and as a result, causality is defined in a somewhat different fashion from what one might generally expect. Unlike theories of physical phenomena, causal relations in computational theories are a function of the their representational system in virtue of the fact that they are

semantic systems constructed of elements that mean that P; thus, the formal properties of their representational systems are what count in the operations of the system (Fodor 1975, p. 74). Hence, causality (as it applies to grammars) is defined over its representational system.

That grammars are theories of language seems straight forward enough as to hardly need much elaboration; that computational systems show causality based on the formal properties of their representational system, on the other hand, is a bit harder to grasp. What I take to be the issue is the distinction between what is termed rule governed vs. law governed behavior. Following Fodor (1975), let us compare the sort of work that a theory does in a discipline like linguistics with the work that a theory does in a discipline like physics. Each discipline employs a representational device to explicate the nature of some observed phenomenon. In the case of language we use a rule system (grammar); in describing physical laws, one relies on another type of formal system (mathematics).

The different roles of the representational systems of theories in the two disciplines comes to light when you consider the prospect of giving an account of the movement of the planetary bodies in terms of a physical law expressed in mathematical terms. [Fodor 1975, p. 74] It makes not a bit of difference what type of mathematical system you use to encode the laws which describe the motion of the planets. But, by analogy, if you change the representational system used in a grammar, you have in fact interfered with the causal structure of the system, because the formal properties of the code are a determinant of the behavior of the system; i.e., the workings of a theory of language are dependent on the representational system in a way that they aren't in a theory of physical phenomena. To answer put it in a nutshell: theories of language need to be specific to such a point that the representationally dependent causal interactions are apparent.

To take a familiar example-- the shift that occurred from behaviorism to nativism had many of the identifying characteristics of a change from a search for law governed behavior, to a search for rule governed behavior. (Moreover, the nature of the change conforms to what Kuhn has argued is a scientific revolution, revealing the interaction between the contents of scientific argumentation and sociological factors.) The name of the game in behaviorism was to describe lawful relations between external stimuli and resultant behavior. Anomalies (structure dependent syntactic processes best characterized by a rule system--a grammar) that fell outside the scope of behaviorist theory were used to show the vacuity of its explanations. There was rapid defection of younger members of the old theory to the new theory (nativism). Work of the old theorists (Skinner, Watson) began to be ignored, and there was the establishment of a new paradigm of "cognitive science" (see Fodor (1975) for a full account). The point is, having a computational theory of mind puts big constraints on what counts as an explanation: rules had explanatory power with respect to linguistic behavior, law did not.

The shift from behaviorism to nativism entailed moving to a representational theory of mind, from a non-representational theory of mind. It is yet another matter to compare different theories of language based on their representations. However, the sorts of issues that might distinguish between grammars are not necessarily subtle. Differences between grammars can be (and in most cases are) striking. Some of the dimensions along which grammars vary that I want to address are: the degree to which they rely on formal vs. substantive universals, the type of implementational scheme that is employed, and the overall shape and structure of the grammar. These issues crucially all depend in one way or another on the nature of the representational system, and it ought to be the case that we can put to work some of what we have been able to learn in the last thirty years to answer these questions.

3.0 Tools of Explanation.

I take the foregoing discussion to be along the same lines as that initiated by Chomsky with regard to levels of adequacy. One of the first things that Chomsky recognized was that construction and comparison of linguistic theories would require more "devious methods" than were necessary in the debate behaviorists over the existence of mental representations. Chomsky outlined three levels of adequacy: observational adequacy, descriptive adequacy, and explanatory adequacy. Observational adequacy is achieved when a grammar accurately describes the data; descriptive adequacy holds when, in addition, the grammar conforms to the intuitions of the speaker; explanatory adequacy is achieved when a grammar accounts for the data in the manner of descriptive adequacy, but in addition has an internal structure that yields predictions in a principled fashion.

For the most part, Chomsky identified the issue of explanatory adequacy with language acquisition. A grammar is explanatory to the extent that it was learnable (Chomsky 1965, pp. 25-26). Chomsky did not pursue his push for language acquisition as an orthogonal dimension along which to compare grammars. The reasons behind this (I will argue below) have to do with the direction taken by the debate at that and subsequent periods in time--specifically, the types of argumentation and data that were relevant to it. I suggest that this attempt on the part of Chomsky to use learnability as a tool with which to compare different grammars is not in principle different from using other sources of data such as on-line sentence processing, computational complexity, neurological studies, etc.

What I would like to do in this section is draw attention to some threads of discontent that are lingering in the linguistic community, and bring them together as examples of issues that could possibly bear on the nature of representations. Some of these issues have antecedents in the literature, but I will focus on topics in their current form; topics I believe will be crucial to the process of comparing grammars. Some of the issues addressed are associated with the process in which a single theory split into several, different theoretical positions. It is useful, I feel, to explore the particulars associated with how we got in this situation: to observe the sort of argumentation used in the divergence of the theoretical orientations in order to understand what might be done to bring these observations and concepts back under a single program of research.

It is not coincidental that the issues we will explore here are the same issues that are currently under intense investigation. If we can clearly trace the forces of general discontent that have persisted for a time, or specific clashes which, for example, led theories apart, we will see re-occurring patterns (or gaps) that require explanation. Here lie the clues as to how the various types of explanation might be forged into a unified research program. It also bears mentioning that the main issues that have troubled linguists about the standard theory all have to do with transformational rules at one level or another, but with different specific complaints in each case.

3.1 Formal and Substantive Universals.

One issue which is important to the question of linguistic representations is the way in which linguistic knowledge is encoded. Chomsky (1965, pp. 28-29) outlined two ways in which "innate schema" for language can be represented: substantively, i.e., the tacit knowledge that the child has consists of a fixed class of items, or formally, i.e., linguistic universals fall out from the description and character of the rules that are present in the grammar. This issue has rarely been raised since it was sketched by Chomsky early in the history of generative linguistics. Crain and Fodor (forthcoming) have been looking at this distinction and as it turns out, the implications associated with having substantive linguistic universals are not trivial. What it entails, in fact, for a child to be endowed with substantive

linguistic knowledge when she is born is that she has a list of propositional contents that tell her what the class of possible natural languages is.

Ignoring issues of modularity for the present, assume that there is a system of mental representation-- a language of thought (along the lines of Fodor 1975); and this LOT has properties of natural language, i.e., it has "syntactic rules", and "semantic rules", and "lexical items" in just the same sort of way that NL does. Similarly, the meaning is compositional; that is, the meaning of any complex predicate is a function of the meaning of the parts and their mode of combination. Now consider that pretty much the whole of UG is simply present, already encoded in the child's head at birth, written in the LOT. That is, the child has a set of sentences represented in the mental language, and the child knows a priori that the propositions in her head are true.

First of all, the picture you end up with on this type of story is that the brain is just innately structured in this particular way. This places a greater burden on whatever the evolutionary processes were that got that information in there to begin with. Secondly, the development will be a function of the implicational structure of the predicates that the child has in her head and the input. Language development, on Chomsky's view, entails the "unfolding of the deductive consequences of the innate beliefs in interaction with a body of perceptual data." [Fodor 1983, p.7]

A different sort of account is that the child has some hand in assembling the knowledge by inscribing it in its linguistic mental code. Formal universals are consistent with the picture describe above, only on this view it is the formal properties of the representations, not their contents, that determine the types of constraints and limitations that are placed on language development. That is, what the child has when she is born is a code, and learning a language consists of writing the rules in this limited mental language. In this story a lot more of the work of constraining a the character of the grammar that the child arrives at is done by the form of the representation. The question of interest here it the extent to which the formal aspects of the representations are apparent in current explanations of linguistic development. It is unfortunate to note that most research in generative grammar has been concerned only with finding substantive linguistic universals. This leaves a whole class of possible accounts unexplored.

Some examples of substantive universals are transformational rules in the old sense (before move-alpha). During the 70's, lists of transformations began to collect as the result of more constructions being brought under analysis. What the project amounted to was putting a rule for every construction found in any language into the child's head. This seemed like an implausible system from an efficiency standpoint, apart from general considerations about elegance. However, the heart of the question is the tendency of linguists to posit substantive rather than formal constraints on language acquisition.

Given these types of problems, the theory moved from a rule based explanation to principle based type of theory, where principles are subject to parametric variation. The advantage really is that there is only one transformation, "move-alpha," and all that children need to acquire their language is enough input to trigger the appropriate parameter values. This move constitutes the "revision" of the Revised Extended Standard Theory. However, as research continues into crosslinguistic variation, almost every new analysis brings a new parameter or parameter value. The situation is not unlike that in early transformational grammar, when the number of proposed transformations began to increase at an alarming rate. The point is that linguists have not yet come to grips with the issue of formal vs. substantive constraints. Note that one type of account that is possible on a substantive view of linguistic universals (which posits a set of propositional contents that are innate) is that to say that members of the set mature at different rates.

Some have taken this radical innatist position (Borer and Wexler, 1987, 1990), whereby certain principles of grammar take more time than others to mature. The strict commitment to substantive principles is evident in this position. Presumably no such account is permitted on the formal view of grammatical constraints. On a formal model of linguistic universals, the information that is innately specified is not of a form that could be dissociated in this way. Presumably a set of substantive propositions could be represented in different neurological substrate, and hence maturational factors could come into play (but see Fodor 1983, pp. 5-6).

3.2 Issues of Implementation.

One issue related to the formal nature of grammatical principles, is the way in which the representations are spelled out in the parsing procedure. The types of argumentation at this level focus on such issues as transparency, i.e., does the parser use information from the grammar in the same form that the grammar represents it? Also relevant here is the issue of complexity-- does the type of algorithm chosen to model human sentence processing slow down and crash in the same contexts that humans in fact do?

3.2.1 Features vs. Categories.

Johnson (1991) notes that theories which treat syntactic categories not as monadic, but rather employ attribute-value feature structures are computationally more tractable and hence more desirable for linguistic theory. Lexical entries and syntactic rules combine to constrain the feature structures that may appear in a phrase structure tree through the process of unification. Lexical entries impose constraints on the terminal nodes that dominate them, and rules constrain the features that appear on the parent node in relation to the immediate constituents.

This type of grammar is familiar to anyone who has had a look at GPSG or LFG. By axiomatizing the properties of feature specifications into a first-order logic notation, Johnson achieves a high degree of compactness. Further, the resulting class of formulae (with certain limitations on the order of quantifiers) are known to be decidable.

The type of formal mechanism outlined by Johnson is only relevant to a type II grammar, i.e., a context-free phrase structure grammar. As mentioned above, the issue of whether natural language corresponds to a class of grammars defined by the Chomsky hierarchy has long been in debate (cf. Berwick and Weinberg 1984).

3.2.2 Precompiled Rules vs. On-line Derivations.

A different answer to the same problem is found in the procedure of precompiling rule structures so that the parser does not have to spend a lot of time working on-line to recover phrase structures by applying a disparate set of modular principles. Fong (1991) shows that for a reasonably complex set of natural language data (sentences from Lasnik and Uriagereka, 1988), 80% of the parsing effort was devoted to recovery of phrase structure. "This proportion dropped to the 20% level when grammar rules were compiled using the canonical LR(1)-based techniques...as opposed to on-line interpretation of the rules with no pre-completion." This decrease in parsing effort represents a twenty-five-fold improvement in recovery time for phrase structure.

An issue like whether phrase structure rules are pre-compiled can yield interesting predictions. For example, if the parser draws on a set of phrase structure rules in the on-line assignment of structure to an input string, then it will be very difficult for this parser to

apply constraints over phrase structure at a different point in the parsing procedure. Therefore, if you see no dissociation in the applications of constraints in the operations of the parser (there is no division of labor whereby the parser generates phrase structure and the constraints toss them out), then a pre-compiled model of parsing operations is supported.

I am in the process of running an experiment (McKinnon, Fodor, Quinn and Osterhout) to test just this issue. The experiment addresses the question by asking whether information about constraints on movement are accessible to the sentence processing mechanism at a point at which the construction of the phrase marker takes place. To this end, sentences of the following type were constructed:

(1) a. *I wonder which of his staff members the candidate was annoyed when his son was questioned by.
b. I wonder which of his staff members the candidate was annoyed that his was questioned by.

(2) a. I wonder whether the candidate was annoyed when his son was questioned by his staff member.
b. I wonder whether the candidate was annoyed that his son was questioned by his staff member.

Two on-line measures are being used in this design: word-by-word reading, and event related potentials. It is predicted that the parser should show some indication that it has encountered a wh-island in the condition (1a).

3.3 Psychological Reality.

The contribution that on-line sentence processing can make to the program is similar to that sketched above with respect to computational issues: it can uncover the architecture of the system by showing that a particular type of information constitutes a natural class in processing terms and that this class corresponds to distinctions that the grammar recognizes. For example, sentence processing can have something to say in answer to questions concerning multiple levels of representation in the grammar, or typologies of empty categories. (see J.D. Fodor (1990) for a full treatment of this issue)

In the case of evidence from sentence processing there have been periods of optimism and skepticism as regards the relationship between grammar and parser. Originally, a rule-by-rule sort of transparency was posited, where the every operation of the grammar is mirrored by the parser in a one-to-one fashion. This was the Derivational Theory of Complexity, where the standard theory of Chomsky (1965) was construed as transparent in the strong sense in which "token" derivations were undone, or run backwards to uncover deep structures. It was soon found that the psychological complexity of sentences did not conform to a theoretical metric based on derivations. There was also a great deal of indeterminacy in this system. Transformations run backwards do not lead to unambiguous representations.

This initial disconfirming evidence was interpreted by the mainstream of the discipline as an indication that the relationship that the grammar bears to the parser is not transparent. Hence, the response of the majority of the discipline (the "standard" theory) was to scale back the scope of evidence that the theory was obliged to pay attention to. Others took this as evidence that certain important generalizations were being missed, and

explored other ways of describing grammatical relations. Bresnan (1978; 1982) argued for a view of grammatical relations which eliminates transformational rules from the syntactic component in favor of lexical rules (LFG). Lexical rules comport better with the facts from sentence processing, and have desirable properties from the standpoint of learnability as well (see, Berwick and Weinberg (1985) for a different account, however).

The result of this split is that the two theories make different predictions based on the formal objects that each represents. For example, GB predicts a range of empty categories (EC), including WH-trace, NP-trace, PRO and pro. Other theories predict subsets of these. On-line sentence processing can show evidence for one set of ECs and not another. LFG, for example, as noted before, treats the passive as a lexical rule, and hence has no need for NP-trace. Preliminary findings have shown a marked difference in processing between WH-trace and the other types of empty categories (Nicol, 1988; Fodor, McKinnon and Swinney, in prep.).

4.0 The Special Status of Intuitional Data.

The important question here is: why haven't these types of arguments been influential in the field. As noted above, the trend in normal science within a paradigm is to try to protect the theory from being deluded. That is, it is the responsibility of the practitioners of a particular theory to keep the problems within the scope of that theory tractable. Thus, there has been great resistance to attempts to broaden the sources of data that are included in "theoretical" reasoning and may conflict with the core source of data (intuitional). The following is one (of several) possible accounts.

There are two types of theories in science: theories from first principles, and phenomenological theories. Theories from first principles build from the bottom up, beginning with well understood principles and working toward the less well understood. Phenomenological theories attempt to organize a level of description which is roughly outlined, and contains elements for which there exist good evidence. It tends to be the case that phenomenological theories are more vulnerable to reductive arguments, than are theories from first principles. Linguistics and psychology represent ideal cases of phenomenological theories. It is for this reason that early generative linguists spent a great deal of time on methodology, arguing the correctness of the mentalist approach and the scientific exploration of abstract entities. Much of the early debate dealt with the nature and reliability of intuitional data, idealization of the data, and the competence/performance distinction (Chomsky 1964). Also, early generative linguists gave great care in formalizing the theory, in order to be as specific as possible about predictions from the theory, and to aid in the process of falsification. These issues were argued during a "revolutionary" period of change, paradigmatic change in the sense of Kuhn (1962). It is in this context that Chomsky began to look for other types of data to bear on the question of comparing grammars. What happened? I suggest that institutional maintenance brought on by the ensuing debate with the generative semanticists had a great deal to do with dropping the search for an orthogonal variable within mainstream linguistic theory. The issues in this type of debate generally focus on a narrow set of phenomena, and all other research questions are put on hold. In addition, sociological factors begin to dominate the character of debate.

4.1 Scientific vs. Non-scientific Modes of Thought.

When a paradigm is threatened, non-scientific modes of behavior become more apparent. One way to identify such a situation is by examining the nature of the debate in the field. Non-scientific modes of thought offer a model for explaining the way in which dialogue and conflict are resolved. For example, in religious thought, rebellion produces

heretics, revolution produces partisanship, and there is no process for synthesis. In science, on the other hand, one would have thought that skepticism is a good thing. Rebellion spurs debate, and revolution (to a new paradigm) is the natural process of change. When rebellion in science does occur, however, there is a tendency for positions to become hardened, theoretical positions to become routinized, and less opportunity for extending the theory. Most activity is aimed at protecting the theory.

I believe that certain arguments from the period of paradigmatic change-- and its defence in the subsequent period-- have become routinized. Specifically, the special status given to intuitional data in linguistic theorizing today, I argue, stems from a misinterpretation of the arguments that Chomsky gave in the first instance to allow this type of data to be exploited at all, and subsequently in the defence of autonomy from the generative semanticists. That is, the rationalist epistemology that is associated with the nativist approach has become confounded with the notion of doing "theoretical linguistics." In fact, when theorists probe their intuitions, they have performed an experiment, with all the features of any analytic psychological design (lacking perhaps only public replicability).

What needs to happen is a re-orientation about what counts as data in linguistics. In fact, anything that concerns the description of mental processes is rightly just psycholinguistic. It is not my purpose to debunk the gains of "theoretical" linguistics. The point should be made is that a lot has been learned in the last thirty years as a result of intuitional data. A lot more is known about what the scope of explanation of a theory of autonomous syntax is, and what it can do (anyone in any doubt can see Newmeyer, 1983). Intuitional data does have certain advantages. For example, it is cheap, and easy to access. There is no need to invest in expensive hardware to conduct sensitive psychological experiments. You don't need a lot of people (unlike the 50-100 who participate in a psychological experiment of modest design).

4.2 An Open Epistemology.

As I mentioned, the notion of a rationalist epistemology as opposed to the practice of using speaker intuitions as evidence for theoretical linguistics needs to be sorted out. The point of a rationalist epistemology is just that one may appeal to the intuitions of native speakers as a source of data for linguistic theory. Doing so does not constitute "theoretical linguistics." One is not directly examining competence when using speaker judgements. Theoretical linguistics, rather, is the process of building and examining the theory a priori of specific evidence. For example, speculating about the effects of considering IP as a blocking category in Japanese (just to pick a random example), is an instance of looking at the ramifications of aspects of the theory. If you choose contrasts in that language which will bear on this issue, you have designed an experiment, and are then, a posteriori, evaluating a hypothesis.

4.3 Complete Evidence.

The problem stems from the fact that if one is limited to distributional evidence based on intuitions of the sort that theoretical linguists use, the data greatly underdetermines the shape of the grammar. That is, given the (intuitional) evidence on hand, several theories are compatible with all the data. This can be true in a trivial way between any corpus of data and set of theories. For example, one could just add the statement at the end of theory: " $2(n)/n=2$." This logically true statement does not effect the truth value of the theory in any way. One could create an infinite set of such different yet compatible theories is by adding another statement increasing the value of n for each successive theory.

There is a non-trivial way in which different theories can all be compatible with the same data. This example concerns hypothesis formation (Carnap 1962). Consider the following evidence (e1,e2) and hypotheses (h1,h2) based thereon:

- (e1): Jones has a strong heart, but must have a kidney transplant. 98% of all people with these properties who have such an operation are fine.
- (h1): Jones will be fine.
- (e2): Jones is ninety years old, and must have a transplant operation because of a massive failure of his kidneys. 6% of all people with these properties who have such an operation are fine.
- (h2): Jones will not be fine.

The issue is, of course, that (e1) and (e2) can both be true of the same individual. What needs to happen now is to get back on the original course set out by Chomsky early in the program. The next question is: How do we do this? I feel an important step is to pay more attention to the sorts of issues raised in the first half of this paper.

5.0 Conclusion.

The main point of this paper is to examine the steps that need to be taken from here to move to a more productive way of doing research. The process is neither quick nor easy. Theories are composed of an interconnected system of statements, and it has been argued (Duhem, 1954; Kuhn, 1962; Quine, 1953), that there is no way to evaluate the truth of any particular hypothesis independent of the other aspects of the theory. That is, no theory is directly refuted based on some "crucial experiment" which proves the falsity of some prediction. Every theory has a set of explicit or tacit assumptions which might explain the observed pattern of results. Rather, theories are evaluated as a whole, and live or die on the bases of their internal consistency and their relation to other theoretical accounts of the same phenomenon.

It has been my contention that the time is right to begin collecting the sorts of arguments that can be used to evaluate theories. The only option left, and, as I see it, the only one allowed by the nature of linguistic representations, is to begin the process of reducing the vast theoretical apparatus that we have built, and arrive at a single, unified theory in all possible haste. There is no danger of losing some crucial aspect of one of the theories. If we are guided by concerns about conservative steps in the process of reducing to a single theory, then we will have ranked the various theoretical options at our disposal. At the very least, these options are formulated with enough specificity to be good descriptions of the relevant phenomena, and hence will not be lost into oblivion.

Theoretical options will be selected according to the "bang for the buck" principle. This general principle holds that in any question of theoretical explanation, one wants the most generality for the least amount of theory (also known as Occam's Razor). Once this has occurred, it will be easier to make the decision as a discipline when one type of explanation is unable to account for a particular phenomenon.

On the whole, I would venture to say that the outlook is not hopeless. In the period before we reach a research consensus, useful generalizations that someday will be incorporated into a unified theory are being made under many different theories. The question that remains is whether we begin the move toward a unified research program sooner or later.

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RELATIVIZED MINIMALITY AND LOGICAL FORM*

Pascual José Masullo

0. Introduction

Logical Form (LF) has been established over the last decade or so as a syntactic level of some aspects of the semantic representation of a sentence, on the basis of a cluster of properties that also characterize SS configurations. In particular, it has been persuasively argued by Huang (1982) and others that LF movements are subject to the ECP, and --although the consensus in this regard is by no means universal-- that LF operations must obey subjacency (see, for example, Pesetsky, 1987).

The aim of this paper is to examine the behavior of minimality barriers (m-barriers) in LF. I will adopt a notion of *relativized* minimality as defended extensively in Rizzi (1990), and further refined in Contreras (1990). I will especially explore the extent to which certain "affective" operators in the sense of Klima (1964), such as *not*, and a few quasi-negative adverbials like *hardly* and their equivalents in other languages, block LF movements. Since these elements act as barriers to overt movement, one can a priori assume the null hypothesis with a certain degree of confidence: they are also barriers at LF. This is by and large true, although in some areas the conclusions to be drawn are less than definitive, as we shall see in the course of the discussion.

The paper is organized as follows: I first give a sketchy summary of the key concepts of minimality which are relevant to the task at hand, and then proceed to test out the effect of minimality on three types of operation purportedly occurring at LF: X^0 (or head) movement in abstract incorporation structures in Spanish, Quantifier Raising (QR), and Wh-Raising (WhR) in languages with no overt (or optional) Wh-movement at S-structure (in particular, Japanese and French). Finally, in section 4, I outline a tentative solution to superiority effects in terms of the theoretical apparatus provided by Rizzi.

1. Relativized Minimality

Reviewing all the arguments that Rizzi (1990) has advanced in favor of a relativized notion of minimality is certainly beyond the scope of the present work. Suffice it to say, in this context, that potential antecedent governors count as minimality barriers to antecedent government, a situation not contemplated by Chomsky (1986), who only considers potential head-governors as m-barriers. Rizzi's proposal is formalized in 1 below:

1. *Relativized Minimality*:

X α -governs Y only if there is no Z such that

- (i) Z is a base-generated position
 - (ii) Z is α -GT compatible with Y
 - (iii) Z c-commands Y and does not c-command X
- (Rizzi, 1990, 27)

(GT = government-compatible)

a) Z is a typical potential head governor for Y iff Z is a head m-commanding Y.

- b) Z is a typical potential antecedent governor for Y, Y in an A-chain iff Z is an A-specifier c-commanding Y.
 c) Z is a typical potential antecedent governor for Y, Y in an A-bar chain iff Z is an A-bar specifier c-commanding Y.
 d) Z is a typical potential antecedent governor for Y, Y in an X^0 chain iff Z is a head c-commanding Y.
 (Rizzi, 1990, 7)

Rizzi argues that the following contrasts can be accounted for in terms of (c), since the elements in bold act as minimality barriers to antecedent-government:

- 2.a. Why_i do you believe that John committed the crime t_i?
 2.b. * Why_i don't you believe that John committed the crime t_i?
 2.c. * Why_i do you hardly believe that John committed the crime t_i?
 3.a. Who_i do you think t_i could solve the problem?
 3.b. * Which student_i do you wonder how t_i could solve the problem?

As Contreras (1990) aptly points out, however, Rizzi does not contemplate the situation in which a potential antecedent acts as a barrier to government of a head. Contreras reinterprets this state of affairs by claiming that some designated *lexical* elements, such as *hardly*, *scarcely*, *barely*, and a few others, which are analyzed by Zagana (1988) as occupying the Spec position of VP¹, act as *rigid minimality barriers*², a claim that will find confirmation in the ensuing analyses: "There are two kinds of m-barriers: (a) relativized m-barriers, as in Rizzi's proposal; (b) absolute m-barriers [blocking both head and antecedent government], defined as in [4 below]:

4. γ is an absolute m-barrier for β if γ is the immediate projection of ξ , a zero-level *lexical* category distinct from β ." ³
 (Contreras, 1990, 469)

2. Head movement at LF

Baker (1988) has demonstrated quite convincingly that the complex predicates found in so-called polysynthetic languages arise from a process of incorporation, i.e. X^0 movement of a lexical head to another, subject to general principles of the grammar, in particular ECP. 5 below exemplifies a typical incorporation configuration:

5. [YP [X_i + Y]_Y [XP t_i]] (Baker, 1988, 202)

Baker also claims that in languages without overt incorporation, for example, most Romance languages, causative and similar constructions can be analyzed in a like manner, in terms of reanalysis via coindexation in the mapping from DS to SS, and subsequent movement at LF.

As I argue in Masullo (1990), however, complex causative verbs arise from actual movement at SS, for reasons that I cannot reproduce here. Nevertheless, other complex predicate constructions in Romance *do* lend themselves readily to an analysis in Baker's terms. Consider the following sentences:

- 6.a. Quisiera verlo_i pro_i
 I would like to see it

6.b. Lo_i quisiera ver pro_i

In 6.a the agreeing clitic *lo* (Suñer, 1988) is associated with the verb subcategorizing the direct object (represented by means of *pro*). On the other hand, in 6.b the clitic is associated with the main verb, which clearly does not subcategorize the direct object with which the clitic agrees. These cases of "clitic climbing" (Aissen and Perlmutter, 1983) can certainly be seen as instances of abstract incorporation, as shown in 7 below:

7. DS: pro_j quisiera ver pro_k
SS: pro_j quisiera $_i$ ver $_i$ pro_k (by reanalysis)
PF: *Lo* quisiera ver (by case-marking)
LF: pro_j quisiera-ver $_i$ t_i pro_k (by head movement)

When the Case module scans the SS configuration in 6.b, it will insert the agreeing clitic *lo* under the Agreement-Object (AGR-O) node of the main verb (Chomsky, 1988), instead of that of the lower verb, since the latter has now incorporated. I am assuming that the clitic, being an agreement marker rather than a true argument, is not present at DS, but is inserted quite late in the derivation, instead.

It must be noted that Baker does not offer any external evidence for X^0 movement at LF, beyond a desideratum of crosslinguistic uniformity: much in the same way as languages vary according to whether Wh-movement takes place at SS or at LF, they can also differ according to whether X^0 movement takes place at SS or LF. The best testing ground for this hypothesis is, of course, the ECP module. Are there any configurations which would block proper government of the trace left by X^0 movement at LF, other than the wonted ones resulting from extractions out of non-theta marked positions? In fact, there are. Consider the following Spanish sentences (the behavior of their Italian equivalents appears to be the same):

- 8.a. Quisiera no/apenas/hasta verlo
I would like not/hardly/even to see it
8.b. * *Lo* quisiera no/apenas/hasta ver
9.a. Continué simplemente haciéndolo
He continued simply to do it
9.b. * *Lo* continué simplemente haciendo
10.a. Quisiera mucho/tanto verlo
I would like very much/so much to see it
10.b. * *Lo* quisiera mucho/tanto ver

The elements in bold have been shown to block Wh-movement of an adjunct at SS (see section 1). On the surface, what we see in 8.b, 9.b and 10.b. is that they block clitic climbing as well (a fact already noted by Luján (1976, 1977) and Contreras (1979)). An explanation in terms of the ECP operating at LF is readily available. For the sake of illustration, let us flesh out the derivation of 8.b. Coindexation of the lower predicate *ver* with the main verb *quisiera* will take place in the mapping from DS to SS. When the Case module maps the SS to the PF component, it will take the main verb as relevant for object-agreement, attaching the clitic to the left of *quisiera*. So far, the derivation has not violated any principles of the grammar. It is in the mapping from SS to LF, however, that something seems to have gone awry: the coindexation triggers movement of *ver*, as Baker argues, creating the following configuration:

11. *proj quisiera-ver_i no/mucho/hasta t_i pro_k*

Proper government of the trace can only be satisfied in terms of antecedent-government, since heads, not being referential expressions, cannot be theta-governed. However, the elements in bold get in the way between *ver* and its trace, creating a barrier for proper government. Thus, the analysis presented here gives empirical support both to Baker's proposal concerning reanalysis, and to Rizzi's notion of relativized minimality. More important, it bears out the more general claim that LF, as a syntactic component of the grammar, is subject to exactly the same principles as SS.

The analysis I am presenting here clashes with Rizzi's on one score, however: as we saw in section 1 above, he not only proposes a symmetry between the type of potential governor and the type of government being blocked, but also a categorial symmetry between governor and governee. Thus, he claims that only a head can be a minimality barrier to another head. This is not, however, what the data above seem to show: except for NEG, which has been argued to head its own projection (Chomsky, 1988; Pollock, 1989), the other elements are certainly not heads, but specifiers (*apenas, hasta, simplemente*) or degree adverbials (*mucho, tanto*)⁴, instead. Notice also that the m-barrier can be associated either with the incorporated verb, or with the incorporating predicate. In 8.b and 9.b the barriers are in the specifier position of *ver*, while in 10.b the barriers are degree adverbials associated with *querer*.

12.a might be construed as a counterexample to the claim that the adverbials under consideration are m-barriers to incorporation processes:

- 12.a. *Le hice simplemente/hasta lavar los platos a Juan*
I made John simply/even do the dishes
12.b. * *Le hice no lavar los platos a Juan*
* I made John not do the dishes

However, as I argue in Masullo (1990), causative complex predicates arise from overt movement, otherwise we would not be able to account for the ungrammaticality of 13:

13. * *Le hice a Juan lavar los platos*

Thus, the fact that in 12.a *simplemente* and *hasta* do not act as barriers can be accounted for if we assume overt movement at SS, and if, furthermore, we assume that when V moves to the main clause verb it carries its specifiers along with it⁵:

14. *pro hice-hasta-lavar_i t_i los platos Juan*

In the above configuration, *hasta* is innocuous as a government-blocker, since it does not intervene between *lavar* and its trace.

Finally, 12.b cannot be ruled out in terms of minimality. In Masullo (1990), I claim, following Zagana (1982), that causative verbs subcategorize a verbal small clause. Verbal small clauses do not contain polarity, tense, mood, or aspect specifications.

3. QR, WhR and minimality

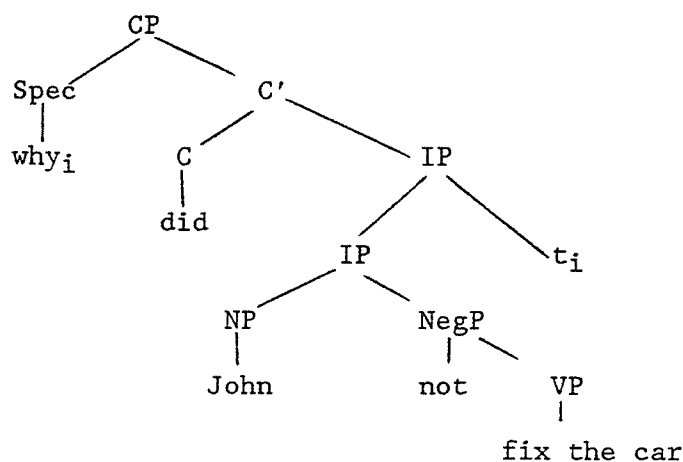
3.1. Introduction

Before discussing the possible effects on QR and WhR of the kinds of rigid minimality barriers introduced in section 1, I think it would be appropriate to establish some paradigms that obtain at SS as a result of Wh-movement over a m-barrier. In particular, I would like to draw attention to a striking asymmetry between *why* and *how*. Against this background, I will explore the behavior of certain adjunct constituents with respect to QR and WhR in English, French and Japanese.

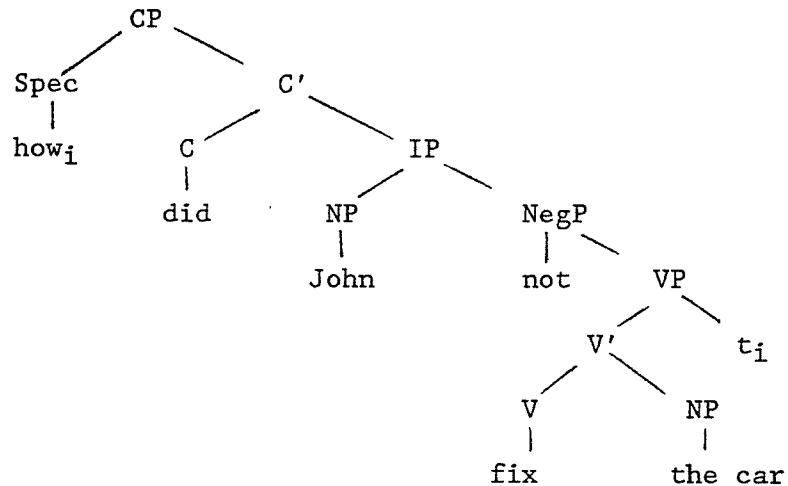
- 15.a. Why didn't John fix the car?
- 15.b. Why did John hardly/even/just fix the car?
- 15.c. It is for this reason_i OP_i that John did not fix the car t_i
- 15.d. * It is for this reason_i OP_i that I do not think t_i that John fixed the car t_i
- 16.a. * How didn't John fix the car?
- 16.b. * How did John hardly/even/just fix the car?
- 16.c. * It is in this way_i OP_i that John did not fix the car t_i
- 16.d. * It is in this way_i OP_i that I do not think t_i that John fixed the car t_i

An apparent paradox is in need of an explanation: extraction of *how* is blocked either by a m-barrier in the same clause in which it originates, or in an upper clause. This is not so with *why*, movement of which is only blocked by a m-barrier in an upper clause. The explanation is not hard to find: while *how* originates under VP, *why* originates under IP, and so neither an adverbial in Spec of VP, nor NEG (arguably heading a projection between IP and VP) can c-command its trace, and so will not constitute a barrier to antecedent-government⁶. This is illustrated diagrammatically below (irrelevant details omitted):

17.



18.



3.2. Quantifier Raising

Testing the effects of minimality barriers on QR (May, 1977) does not prove so easy, since the data are hard to come by. In the first place, there is no long QR (Hornstein, 1984), and, to make matters worse, negative elements usually call for *any*-type quantifiers, which, according to Hornstein (1984), do not undergo movement at LF. Besides, the quantifiers discussed in the literature are generally in argument positions, which obviates the need for antecedent-government.

The following facts, however, properly construed, might point in the desired direction. Let us examine the behavior of two quantifier phrases in adjunct position: *for some reason*, and *somehow* (in the intended interpretation of "in some manner or another").

- 19.a. He did it for some reason
- 19.b. He did not do it/hardly did it for some reason (or another)
- 20.a. He did it somehow (or other)
- 20.b. * He did not do it/hardly did it somehow (or other)⁷

The contrast shown in 19 and 20 is reminiscent of the situation that arises with overt Wh-movement, exemplified in 15 and 16. As argued above, NEG and other specifiers can be m-barriers for manner adverbials occurring in the same clause, since the latter are either under or adjoined to VP, and so will be inescapably c-commanded by the former. Reason adverbials, on the other hand, have been argued to be under IP, and so are outside the scope of NEG, if they are both in the same clause.

At LF, after QR, we will get the following configurations for 19.b and 20.b respectively:

- 21. [IP for some reason_i [IP he did [NegP not [VP do it]] t_i]]
- 22. [IP somehow_i [IP he did [NegP not [VP do it t_i]]]]

As in cases of overt movement, NEG blocks antecedent government of the trace of *somehow*, since it c-commands it. This is not so with the trace of *for some reason*. Thus, we find at LF the same contrast holding between reason and manner adverbials at SS. This parallel can only be explained in a principled fashion if

we assume that SS and LF movement are subject to the same principles and constraints.

3.3. *Wh-Raising in English*

WhR (in the sense of Aoun et al., 1981) in a language with overt Wh-movement like English is not the best place either to test the hypothesis that minimality operates at LF, since the structures needed are those requiring antecedent-government, i.e. with extraction of a subject or adjunct, which will in any case be ruled out by superiority. Nevertheless, consider the following sentences:

- 23. * Who said he worked how?
- 24. ** Who said he did not work how?

Under the pre-Barriers account of superiority, 23 is ruled out in terms of the ECP on the assumption that the trace of *how* cannot be properly governed by its antecedent at LF, since Comp has already inherited the index of *who*, which moved there first. The same situation obtains in the case of 24. However, as Heles Contreras (p.c.) points out, 24 seems to evince a higher degree of ungrammaticality than 23, which can be explained if we assume that NEG acts as a m-barrier at all levels of syntactic representation.

A better place to look, however, is in languages with WhR not involving multiple questions. Below I examine data from French, in which Wh-movement is optional at SS in most cases, and from Japanese, which does not exhibit any Wh-movement at SS⁸.

3.4. *WhR in French*

Consider the following paradigms:

- 25.a. Où travaille Jean?
Where does John work?
- 25.b. Jean travaille où?
- 26.a. Quand est venu Jean?
When did John come?
- 26.b. Jean est venu quand?
- 27.a. Comment Jean a fait le travail?
How did John do the work?
- 27.b. Jean a fait le travail comment?
- 28.a. Pourquoi Jean est venu?
Why did John come?
- 28.b. * Jean est venu pourquoi?
- 29.a. Où Jean ne travaille pas?
Where doesn't John work?
- 29.b. Jean ne travaille pas où?
- 30.a. Quand n'est pas venu Jean?
When didn't John come?
- 30.b. Jean n'est pas venu quand?
- 31.a. * Comment Jean n'a pas fait le travail?
* How didn't John do the work?
- 31.b. * Jean n'a pas fait le travail comment?
- 32.a. Pourquoi Jean n'est pas venu?
Why didn't John come?
- 32.b. * Jean n'est pas venu pourquoi?

- 33.a. Quand/où tu ne penses pas que Jean ait travaillé t?
When/where don't you think that John has worked?
- 33.b. Tu ne penses pas que Jean ait travaillé quand/où?
- 34.a. Comment tu penses que Jean a réparé sa voiture t?
How do you think that John fixed his car t?
- 34.b. Tu penses que Jean a réparé sa voiture comment?
- 35.a. * Comment tu ne penses pas que Jean ait réparé sa voiture t?
* How don't you think that John has fixed his car t?
- 35.b. * Tu ne penses pas que Jean ait réparé sa voiture comment?

The above paradigms are a clear confirmation of the hypothesis being entertained here that NEG and a few adverbials in Spec(VP) are rigid minimality barriers both at SS and LF. All adjunct Wh-elements except *pourquoi* 'why' can be left in situ in affirmative sentences in French, regardless of the depth of their embedding (see Rizzi, 1990, for a possible explanation of the exceptional behavior of *pourquoi*). However, if NEG intervenes between the Wh-element and its trace after WhR, we obtain the following results⁹:

1) NEG is not a barrier to proper government of the trace of *où* 'where' and *quand* 'when', whether it is in the embedded or main clause. This should not come as a surprise if we assume, together with Huang (1982), Aoun et al. (1987), and Rizzi (1990), that place and time adverbials pattern with complements for the purposes of extraction, since, being referential expressions, they can dispense with antecedent-government for their identification.

2) NEG is a barrier to proper government of the trace of *comment* 'how', whether it is in the lower or upper clause. Not being a referential expression, it can only satisfy the ECP by means of antecedent-government; however, because it is under VP, it will always be c-commanded by NEG, which will act as a barrier.

3.5. WhR in Japanese

The contrast shown by 36 and 37 below provides additional evidence for the claim that NEG acts as a m-barrier at LF. As is well-known, Wh-movement in Japanese occurs at LF, rather than at SS. In 36, movement of *dare-o* 'who' across NEG is allowed, since it is in an argument position, and so its trace will be lexically governed by *aishiteiru* 'love'. However, 37 is ruled out since the trace of *naze* 'why' depends on antecedent-government, which NEG blocks, and so the ECP is violated:

36. John-wa Mary-ga dare-o aishiteiru to shinji taku-nai no?
'Who doesn't John want to believe that Mary loves?'
37. * John-wa Mary-ga naze Tom-o aishiteiru to shinji-taku-nai no?
'Why_i doesn't John want to believe that Mary loves Tom t_i?'

3.6. Some residual problems

Hornstein (1984) rules out 38 as a weak crossover violation at LF:

38. * That he_i might be sent to the front should not worry every soldier_i

However, as Contreras (1989) argues, the degree of acceptability of the above sentence increases considerably if *not* is removed:

39. That he_i might be sent to the front should worry every soldier_i

Contreras (1990) explains the grammaticality of 39 in terms of antisubjacency: *he* is antisubjacent to the quantifier at LF, as opposed to other cases of weak crossover, in which the pronoun is not so deeply embedded. The following contrasts are quite suggestive too:

40.a. Mary will (not) give any man_i money if she hates him_i

40.b. * Mary will not give every man_i money if she hates him_i

40.c. Mary will give every man_i money if she hates him_i

We can gather from the contrasts established above that it is the presence of NEG that gives rise to ungrammaticality, and not a violation of the Leftness Condition. However, we cannot assimilate these cases entirely to the ones discussed in the preceding sections, since in 38 through 40 extraction of the quantifier is out of an argument position, and so its trace will be properly governed anyway. Nonetheless, it is obvious that NEG is responsible for the prohibition of some operations at LF, a fact that deserves careful investigation.

4. Superiority¹⁰

The following superiority effects are usually assumed to derive from an ECP violation in the case of 41.b:

41.a. Who will read what?

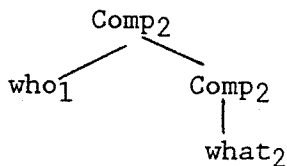
41.b. * What will who read?

Lasnik & Saito (1984) synthesize the standard account of superiority in the pre-Barriers framework. Following Aoun et al. (1981), they rule out violations of superiority in terms of the ECP by assuming a Comp-indexing rule along the lines of 42:

42. [COMP XP_i...] --> [COMP_i XP_i...]

In 41.b the trace of *who* left by WhR at LF cannot be antecedent-governed by Comp because it does not bear the index of its antecedent, but that of *what* instead. By moving first, *what* prevents *who* from bequeathing its index to Comp. 43 depicts 41.b's unfortunate predicament:

43. * [Comp who₁ [Comp what₂]₂]₂ [will t₁ read t₂]



In the Barriers framework (Chomsky, 1986), however, with the assimilation of functional categories to the general X-bar schema, we cannot appeal to Comp-indexing to block antecedent government of the trace of the subject in 41.b, since CP dominates it and therefore does not c-command it¹¹ (I am assuming a

standard definition of c-command). So we are apparently left without a formal account of superiority effects.

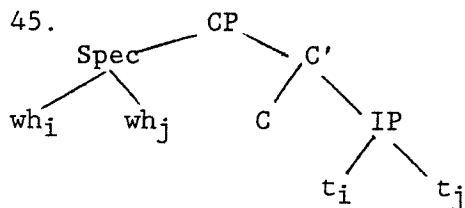
I would like to suggest, albeit tentatively, that it would not be implausible to handle superiority in terms of minimality. As pointed out in section 1, wh-island violations can be regarded as cases where a potential wh-antecedent acts as a minimality barrier to government of a subject or adjunct trace by its real antecedent, the wh-element with which it is coindexed. A similar account can be given for superiority if we assume that WhR *adjoins* the Wh-element to CP, yielding a configuration in which a competing (or, in Rizzi's terminology, government-compatible) constituent prevents the real antecedent from governing its trace. This is illustrated in 44:

44. SS: * What_i did who say t_i?
 LF: [CP who_i [CP what_j did [IP t_i say t_j]]]?¹²

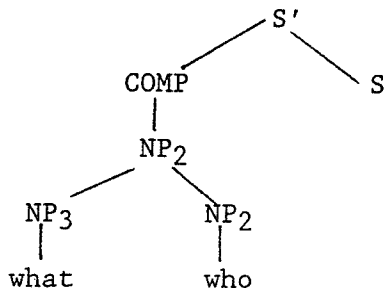
Paradoxically, Rizzi does not make use of his own theory in this case, assuming that Comp can be multiply filled at LF:

"In fact, the idea that nodes can be multiply filled at LF is not implausible, as the uniqueness of fillers at S-structure may be regarded as a consequence of the obligatory linearization at PF, a process that does not affect LF representations: multiply filled nodes cannot be properly linearized." (Rizzi, 1990, 21).

That is, Rizzi would probably envisage the LF representation of multiple questions in 45, in which the two Wh-elements form an unordered coordinate constituent dominated by Spec, a representation quite similar to that of May (1985) (46 below):



46. May (1985)

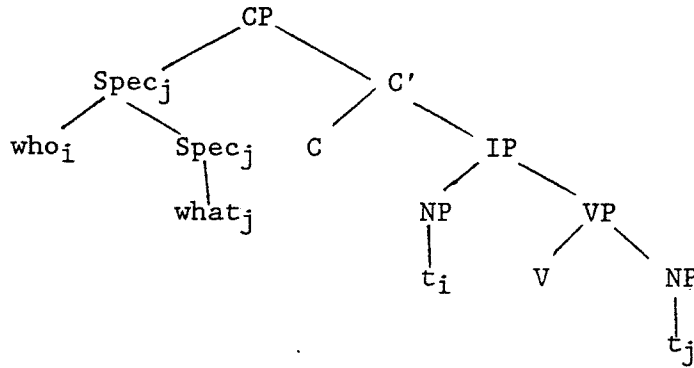


However, it would obviously be desirable to have LF conform to the same structural requirements as SS. Notice also that although in multiple questions the Wh-elements form unordered tuples, this fact is only an interpretation phenomenon, which need not have a structural correlate at LF. (Cf. Hornstein, 1984, for a similar discussion in connection with quantifiers). Besides, no

movement operation as conceived of at present can give rise to a coordination-type configuration.

We could postulate adjunction to Spec of CP, but this move would still not allow us to rule out superiority violations in terms of Comp-indexing (for the reasons stated above), or in terms of minimality, since, as 47 shows, *what* does not c-command the trace of *who*, and so cannot be a barrier to its proper government.

47.



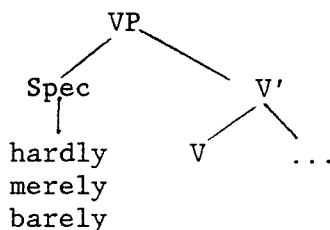
5. Conclusion

The analysis of the linguistic data examined in this paper serves a double purpose. On the one hand, evidence has been brought to bear to support a notion of minimality as proposed by Rizzi (1990) and Contreras (1990). On the other hand, yet more evidence has been gathered that argues for the existence of LF as a level of syntactic representation mediating SS and the semantic representation of a sentence. As we have seen, a number of designated lexical elements block antecedent government of traces in incorporation structures in Romance, in QR configurations, and in cases of WhR, in particular in French and Japanese. In other cases, the hypothesis is untestable (e.g. in Tamil). Finally, I also claimed that superiority effects can be tackled in terms of minimality as well. This analysis is, however, in need of further elaboration and substantiation, and can only be taken as a very tentative solution.

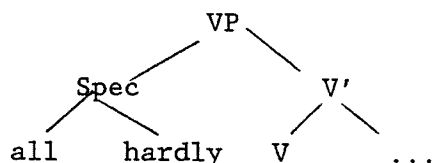
Notes

* An earlier version of this paper was presented at the North West Linguistics Conference, held at the University of Victoria in February of 1991. I am indebted to Heles Contreras for many valuable comments, as well as to María León, Akira Watanabe, and Vasu Renganathan, with whom I discussed the French, Japanese, and Tamil data respectively.

1. Zagona's analysis is sketched below:

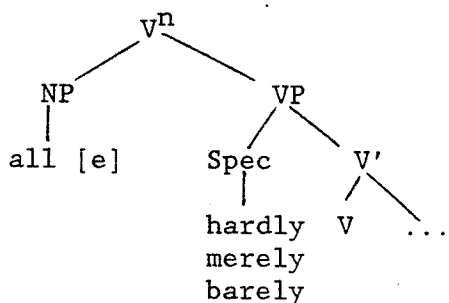


However, not all adverbials in Spec (VP) seem to act as barriers to government, in particular, so-called floating quantifiers such as *all*, for which Zagana postulates the following analysis:



How_i will they all fix the car t_i?

This situation is not hard to remedy, however. Two solutions suggest themselves: either *all* is not a barrier because of its semantic content (witness also *How does she usually fix the car?*), or floating quantifiers originate in the subject position of a verbal small clause and are then stranded when the rest of the NP moves to Spec (IP), as suggested by Koopman & Sportiche (1988):



2. See also Baker and Hale (1990), who argue for a similar position.
3. Neither NEG nor affective operators are ever, to the best of my knowledge, real antecedent-governors, a fact that lends further support to Contreras' claim that these are rigid minimality barriers, interfering with the ECP in all kinds of contexts.
4. The categorial symmetry can be maintained, however, if one argues that elements such as *even* and *hardly* are functional heads of some kind, a not implausible analysis in view of the recent developments in X-bar theory. Being quantifier-like elements, *mucho* and *tanto* must also raise at LF; strictly speaking, then, it is their traces that will act as m-barriers. Notice also that these adjuncts do not fall under the same category as *hardly*, *barely*, *even*, etc., which suggests that the notion of rigid m-barrier must be somewhat broadened.
5. I will not say anything about the position of the subject of the embedded clause.
6. This does not imply that reason adverbials can never be within the scope of NEG. Cf. *He did not leave the party because he was tired, but because he was sick*; possibly, in these cases, there is NEG raising.
7. This sentence is grammatical with comma intonation after *did it*, or with the adverbial in initial position in the sentence:

He did not do it, somehow (or other)
Somehow or other, he did not do it

However, in these cases *somehow* is not a manner adjunct, but a disjunct or sentence modifier, similar in meaning to *for some reason (or another)*.

8. Other languages without overt Wh-movement such as Tamil cannot provide evidence for the behavior of affective operators, since, as Renganathan (1990) argues, the Tamil equivalent of *Why do you think that John came?* will not be ambiguous. As the examples below show, the Wh-element in situ will be adjacent to the verb with which it is associated:

jaan vandaan-nnu nii een nenakk-ale
John came-he that you why think-neg
'Why_i don't you think t_i that John came?'
jaan een vand-aan-nnu nii nenak-ale
John why came-he that you think-neg
Why_i don't you think that John came t_i?
(Renganathan, 1990, 17).

9. For the sake of simplicity, I will assume that both *ne* and *pas* constitute a barrier as a whole, without attempting to analyze the structure of NegP in French.

10. In many ways, this section is a development of ideas discussed by Contreras in his seminar on Logical Form, fall 1990.

11. Naturally, Comp-indexing would have to be mediated by Spec-head agreement.

12. Incidentally, the trace of *who* is not head-governed within the immediate projection of its governor: INFL cannot head-govern it, nor can *did* (in Comp), for reasons discussed in Rizzi (1990).

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Argumentation from acceptability to grammaticality

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0.0 The paradox of argumentation.

Aspects of the Theory of Syntax establishes a distinction between the knowledge and use of a language: *competence* and *performance*. Chomsky states that only under idealization can performance be a direct reflection of competence. The dichotomy between competence and performance corresponds to a second dichotomy, that between *grammaticality* and *acceptability*. This correspondence is explicit in Chomsky (1965, p. 11): "Acceptability is a concept that belongs to the study of performance, whereas grammaticalness belongs to the study of competence." In practice then, a theory of grammar that describes and explains a speaker's knowledge, one's competence, cannot be straightforwardly determined by the examination of actual performance.

It is a seeming paradox, and an intriguing one: claims about the nature of a theory of the competence of a speaker/hearer are in great measure based upon the (un)acceptability of sentences (or *strings*), a concept which "belongs" to the study of performance. Linguists gather only data about performance. For a crude analogy, imagine a psychologist studying an actor's personality only by viewing her performance in films. Because there is no research method that provides direct access to competence, the study of language *must* proceed from the study of "performances" of language, whether these are actual utterances or introspection about performable utterances. Viewed in another way, intuitions about acceptability provide "empirical evidence" upon which choices between competing theories of grammar are made; crucial evidence in constructing a theory of grammar is often the (un)acceptability of certain uttered or utterable strings. Consequently, the description of sentences as "(un)grammatical" or "(un)acceptable" can be found frequently in the work of linguists. Lack of a perspicuous analysis of these notions has resulted in some fast-and-loose interchange of the terms in the writing of even these specialists, as Newmeyer (1983) notes. Langendoen and Bever (1973) have said "Many contemporary proposals in linguistics derive critically relevant facts using the assumption that sentence grammaticality is equivalent to string acceptability," though as will

become evident, these researchers too appear to have an unclear notion of the relationship between the two.

This essay is an attempt to distinguish more effectively the definitional border between grammaticality and acceptability, and to investigate what type of arguments from acceptability qualify as evidence of principles of grammar. In Section 1 I attempt to define grammaticality and four factors that influence intuitions of acceptability. The proposal that some strings exhibit a degree of deviance from grammaticality or acceptability, and some ordering hierarchies for deviance that have been offered, are discussed briefly in Section 2. Section 3 examines the importance of isomorphism between grammaticality and acceptability in revealing the underlying grammar of language. A number of cases where this isomorphism breaks down are also reviewed, concluding with some observations about the use of such data in linguistic argumentation. Section 4 discusses the proposal to include selection restrictions in the grammar as an example of the failure to determine the proper domain of the grammar, thus serving to cloud the relation between grammaticality and acceptability. Finally, Section 5 gathers conclusions for using acceptability as the basis for insights about grammaticality.

1.0 Identifying grammaticality and acceptability.

Providing a definition of the theoretical notion *grammaticality* is unproblematic: a string is grammatical if and only if it is generated by the grammar. In other words, if the system of principles and rules that characterizes the competence of the speaker/hearer generates a string, it is grammatical, and otherwise not. As Chomsky (1965) points out, it may never be possible to give an operational definition to terms such as *grammaticality* (outside of specifying the grammar itself). Neither native speakers nor professional linguists are able to make final and conclusive grammaticality judgments, though the latter may have more finely-honed intuitions about grammaticality through their hypothesizing about the theory of grammar. An unstudied string, acceptable or not, is declared grammatical or not via a process of integration into a system of already known strings and the principles of grammar already concluded. Nonetheless, the grammaticality of a string derives from its adherence to the principles and rules of the grammar.

1.1 The intuitive notion of *acceptability* is less easily definable. Chomsky (1965) describes acceptable strings as “more likely to be produced, more easily understood, less clumsy, and in some sense more natural,” though this seems an unhelpful characterization both for its redundancy and for the use of a “frequency argument” (i.e., more likely to be produced). He does suggest that operational tests for acceptability might include “rapidity, correctness, and uniformity of recall and recognition [and] normalcy of intonation.” Perhaps *unacceptability* can be put more clearly in focus. Emonds (1976) indicates a set of conditions under which a string's unacceptability would be inexplicable: it is (a) relatively short and simple, (b) semantically clear, and (c) perfectly grammatical.

1.11 By and large, linguists have found unacceptable strings to be quite useful when theorizing about grammar precisely because a frequent cause of unacceptability is ungrammaticality. (1) illustrates some examples of strings for which ungrammaticality is assumed to directly correspond to unacceptability. (1a) violates the head parameter of English (though it would be perfectly grammatical in Korean). (1b) violates the subcategorization frame for *elapse* as listed in the lexicon. (1c) has [-AGR] as a feature of a matrix clause INFL.¹ (1d) displays the incorrect case assignment to the subject position of the matrix clause. (1e) violates Subjacency. (1f) violates Principle A of the Binding Theory and (1g) Principle B. *Grammaticality* is the first test a sentence must meet to be intuitively acceptable:

- (1) a. *Dropcloths the furniture covered
- b. *The timer elapsed the game
- c. *Pat and her friend is close
- d. *Them presented the gift for us all
- e. *Which tools did Pat assume what Terry repaired with
- f. *Pat_k asked her_i if Terry_i really loved himself_k
- g. *Pat_i asked him_i if he_i really loved Terry

¹ The status of AGR in other strings with conjoined subjects is less obvious; for example, *raw oysters and Thai chili sauce disagree(s) with my digestive tract*. Assuming that both singular and plural forms are grammatical, with [+AGR] in INFL, how can the string with a collective reading and singular verb be captured by the grammar while ruling out (1c)?

1.12 A second measure of acceptability might be termed *cognitive viability*; strings will be judged unacceptable in spite of being perfectly grammatical if they strain the cognitive limitations of the speaker/hearer. Though a five-million-word sentence surely would fail to be rapidly, correctly and uniformly recalled, even a run-on sentence of much shorter length can become unprocessable. Such unacceptability is assignable to limitations on short-term memory. Further types of strings that result in processing problems can be seen in (2).

- (2) a. ?The graceful grey mare raced over the field of sprouted wheat
and across the stream collapsed
- b. ?Pat took the pen that she purchased in Greece, gave to Terry to
pass on to her brother and then got back to write her thesis
with out for Jan
- c. ?The paper the ink the pen Pat bought leaked stained for the
thesis the professor assigned disappeared

In the first, the verb *raced*, being the first tensed verb in the string, is interpreted as the matrix verb, but proves to be contained in a reduced relative clause which has no complementizer to announce it. This demands reprocessing of the entire string by the hearer, thereby contributing to its unacceptability. Strings like these, not interpretable according to normal parsing strategies, are known as *garden path* sentences. In (2b) a long complementizer phrase, the complement of the noun *pen*, ends with an empty category that must be coindexed with the head noun. This string exemplifies a nested construction of the form $\alpha \dots \beta \dots \alpha$, where β is a long, complex phrase, in this case including an empty category. Such sentences are less acceptable because the decay of short-term memory prevents them from being rapidly and uniformly interpreted. Finally, (2c) results from multiple self-embedding of the same type of phrase—again, a reduced relative clause. Chomsky (1965) suggests a condition on perceptual mechanisms to account for this, that a processing mechanism ψ may not be applied while executing ψ . Repeated self-embedding appears to accelerate a string along the scale toward strong unacceptability most quickly among all processing problems.

1.13 Having identified grammaticality and cognitive viability as two characteristics of acceptable strings, a third might be termed *pragmatic plausibility*. Though these previous measures of unacceptability are relatively clear-cut if as yet incompletely formalized, pragmatic implausibility is much less

so, which becomes apparent when contrasted with another suggested cause of unacceptability—semantic anomaly. Perhaps Chomsky (1965) intends to conflate them when he describes the strings in (3) [= his (16 i, ii, iv, & v)] as having “purely semantic (or ‘pragmatic’) incongruity,” though he makes no effort to analyse them.

- (3) a. Oculists are generally better trained than eye-doctors
- b. Both of John's parents are married to aunts of mine
- c. That ice cube that you finally managed to melt just shattered
- d. I knew you would come, but I was wrong

In citing (3a), Chomsky may have intended to point out that *oculists* and *eye-doctors* refer to an identical set of individuals, the terms differing only in register, and that the “incongruity” (= unacceptability?) results from the assertion that a group can be better than itself in some respect—a logical impossibility. Alternately, if *oculist* is taken strictly to mean *ophthalmologist* and *eye-doctor* to mean *optometrist*, the incongruity dissolves; the proposition is conceivably true. The unacceptability of (3a) turns on the meaning assigned to the lexical items without reference to knowledge of the world. This may be contrasted with (3c), where the anomaly seems purely pragmatic. The NP *ice cube* is by definition H₂O in a solid state; *shatter* describes a process that solids undergo, and a string such as *that ice cube just shattered* is congruent with real world possibility. The NP *that ice cube that you finally managed to melt*, on the other hand, is a solid that has undergone a change of state and is now a liquid; liquids may not shatter, and (3c) is therefore incongruent with pragmatic knowledge about which forms of matter undergo which kinds of processes—a pragmatic impossibility. There is no need to discuss possible variability in meanings or clarify the intended meaning of each term, as was necessary for (3a).

The boundary between pragmatic and semantic knowledge is not clear, and in fact they may not be discrete; (3b) points up this fuzziness. Anticipating the analysis Chomsky might offer, the unacceptability of (3b) may lie in the interpretation of the main verb *married* and the NP/subject *both of John's parents*. Whether biological or adoptive, two parents of the same person must be a man and a woman; this could (tentatively) be necessitated by the semantics of *parent*. Similarly, in α *married* β , α and β could be required by the semantics of *marry* to be of different gender. Since 1965 however, manifest changes in social

institutions have led to the increasing acceptance of same gender marriages. It is now possible for John's mother as well as his father to marry the speaker's aunts. Pragmatic knowledge about changing social institutions may modify the semantics of *marry*, and consequently the apparent implausibility of (3b) lessens. Both the semantics of *parent* and *marry* and the pragmatic features of our social skein are changing. At the time of Chomsky (1965) then, should this string be ruled unacceptable by virtue of its semantic or pragmatic implausibility? It appears that in 1992 pragmatic considerations weigh most heavily on the perceived acceptability of this string.

The final borrowed example illustrates a type of semantic or pragmatic implausibility that may best be analysed using the modality framework of Kratzer (1981). Presumably, something that is *known* cannot turn out to be *wrong*. The boundary between *belief* and *knowledge* is notoriously imprecise, and the greater the study of what qualifies as knowledge, the less appears knowable. I may know my name, or what year I was born. I may know what year a painting was done by checking the date inscribed on it, or who the president of the Ukraine is by reading the newspaper or encyclopaedia. For each though, circumstances might be given that prove my knowledge wrong. The president may have been overthrown the day I spoke; the artist may have backdated the painting; the doctor may have miscompleted the birth certificate. A four-year-old may deny his name is William and insist it is Billy. What is known is always subject to what qualifies as proof. I know $2+2 = 4$ only if I know the statement is given in base 10. In base 3, $2+2 = 11$ is knowable.

Kratzer (1981) suggests that the proposition expressed in a sentence is subject to a conversational background (CB). A possible short list of these (though different from Kratzer's) might be: deontic, epistemological, alethic, stereotypical, realistic, etc. The unacceptability of (3d) can be explained by clarifying that *I knew you would come* and *I was wrong* have different CBs. The former may be true given that I had received an RSVP card from you and had spoken with you by telephone at t^1 —in conjunction with a stereotypical CB I can be said to *know* that you will come; the latter may be true given that a rail strike occurred and you never appeared at t^2 —in view of what is known, an epistemological CB, *I was wrong*. The suggestion that a string may contain constituents interpreted as propositions having clearly differing CBs is shown by commonly used contradictions such as

This table is solid, but it is not solid. The discourse force of these utterances is usually to point out a distinction between CBs (or underlying assumptions). (From the perspective of our perceptions) *this table is solid, but* (from the perspective of molecular physics) *it is not solid.* *I knew you were coming, so I baked a cake* or *I knew it would rain, so I brought my umbrella* exemplify the use of *know* in contexts that may be deemed inappropriate or unacceptable under a restrictive reading, one where an epistemological CB is forced, requiring that knowledge not be subject to change or modification. The former conjunct in (3d) would probably not be intended to have such a CB. (3d) is unacceptable only to the degree that a single CB is imposed—incidentally, the same one that would make *I know the sky is blue* false.²

Though this discussion hardly stands as a conclusive demarcation of semantic and pragmatic plausibility, it does point out a regular if not always determinable distinction between cases of strings whose unacceptability is traceable to the semantic incompatibility of certain lexical items within them, irrespective of pragmatic considerations, and others where it is the proposition expressed by the string that is incompatible with pragmatic knowledge. In both cases, it is the logical, physical (or sociological?) impossibility of the assertion that renders the string unacceptable, and hence all such unacceptable strings will be described here as failing the test of *pragmatic plausibility*.

1.14 During the heyday of generative semantics many “odd” sentences were declared ungrammatical, including some of those in (4).

- (4) a. ?I am lurking in a culvert
- b. ?Spiro's walk reminds me of a penguin
- c. ?Him and Pat are wittier than me
- d. ?Kare ni taikutsu
 he+OBL boring
 "It is boring to him"
- e. ?The harvest was clever to agree
- f. ?Misery loves company

² Adapting Wittgenstein's (1953) discussion of *pain* and knowing to this discussion, imagine someone saying *I felt pain but I was wrong*. How could two CBs be assigned to the conjuncts to give this string sense? It certainly looks grammatical, but we have a harder time finding a perspective where *feeling* could be wrong than where *knowing* turns out to be wrong.

- g. ?The academic liquid that fills the university's inkpot is underpaid

The unacceptability of these strings and many others can best be understood as the result of violations of the principle of *discourse viability*. Discourse has been fruitfully examined in early work by Austin (1962) on locutionary, illocutionary, and perlocutionary acts, Searle's (1969) theory of speech acts, and Grice's (1989) collection of work on conversational implicature. What concerns us here is the contribution of *context* to intuitions of acceptability. The "oddness" of (4a) has been attributed to the lack of a common or often reoccurring context in which it might be uttered, and contrary to the tendencies of generative semanticists, is not an indicator of ungrammaticality. One may not normally admit to lurking, a secretive act, but an undercover agent could informatively report back to a commander by radio with just such an expression. Likewise for (4b), whatever incongruity exists may result simply from confronting the string in isolation, and its proper contextualization dissolves the apparent discourse implausibility, and hence, its unacceptability.

In addition to context, *attitudinal restrictions* such as taboo and register can lead to unacceptability. Emonds (1986) has argued that the prescription of a nominative pronoun in place of the accusative *him* or *me* in strings like (4c) leads to an ungrammatical prestige construction, though it is (4c) that is often proclaimed unacceptable. (4d) further exemplifies attitudinal restrictions; its unacceptability is high—many native speakers find it "ungrammatical"—and arises from a social convention reflected in the Japanese language whereby one may not describe a person's feelings, but only their appearance of having a feeling. To attribute feelings to others requires explicit statement of an epistemological conversational background. Thus, *Kare ni taikutsu mitai*—It looks boring to him—is preferable, while (4d) is ruled unacceptable. However, in reference to oneself, or one's children, who are considered extensions of oneself, bare forms like (4d) are acceptable. This cultural disinclination to presumptuousness is an extragrammatical factor, an attitudinal restriction. Lastly, metaphoric and allusive uses of language, along with other *rhetorical* or *stylistic devices* can render a string unacceptable. The examples in (4e-g) are taken or adapted from Chomsky (1965) and Miller and Isard (1963), and will be discussed in conjunction with selection restrictions in Section 4.

1.2 Differences in acceptability can be accounted for by variation along a number of parameters: (a) grammaticality with respect to principles and rules of the grammar, (b) cognitive viability with respect to parsing strategies and limits on memory and recognition, (c) pragmatic plausibility with respect to logical, physical and sociological possibility, and (e) discourse viability with respect to contextual, attitudinal, rhetorical and stylistic factors. Moreover, they are not always transparently discrete. If far-fetched or nonsensical motivations for a declaration of unacceptability are culled out, a definition of acceptability minimally would embody the requirement that a string be grammatical, cognitively and discursively viable, and pragmatically plausible. If grammaticality is a factor in intuitions about acceptability, it is hard to see how the “belonging” relationship Chomsky proposes is a truly valuable demarcation—grammaticality is a concept that belongs to performance as well.³

2.0 Degree of deviance and idealized assignments.

Both grammatical and extragrammatical parameters of string acceptability have been viewed as matters of degree. In some intuitive sense (1c) is less unacceptable than (1a) or (1e). (4e-g) or (4c) seem to be less seriously deviant than (2c). Tentatively, deviations from acceptability could be organized along a scale such as *discoursal* < *pragmatic* < *grammatical* < *cognitive*. Each parameter of acceptability could in turn be organized on a hierarchy of deviance, though doubtless without illuminating very much. These or any hierarchies are certainly subject to counterexamples; how would the pair (1a) and (2a) be ordered in comparison to (1e) and (2c)? The important emphasis here is not the particular ordering, but the observation that the notion of differential acceptability is in some way tenable.

Grammaticality has also been graded. In *Aspects of the Theory of Syntax* Chomsky attempts to do so by utilizing the lexical entry of a morpheme. If the

³ As factors of acceptability, the distinction between the grammatical and extragrammatical is important for reasons that will be more apparent in section 2.1. However, viewed as constraints on acceptable strings, grammaticality and cognitive viability pattern together as structural constraints, while pragmatic plausibility and discourse viability pattern together as non-structural constraints, concerned with the proposition and speech act expressed by a string—its ideational content. From the point of view of the domain of these factors, all are intrasentential with the exception of discourse viability, which is (generally) intersentential.

entry is characterized as [phonetic information, category assignment, subcategorization frame, selection restrictions, semantic content], a dominance hierarchy is imposed that determines the "degree of deviance." Adapting his data, each example in (5) progresses down the dominance hierarchy, from a violation of phonetic information, to a category violation, one of subcategorization frame, and so on, until (5e), which simply requires the correct contextualization to be ruled acceptable, and may not be a violation of grammaticality in any sense.

- (5) a. *Sincerity may phratrip the boy
- b. *Sincerity may virtue the boy
- c. *Sincerity may elapse the boy
- d. ?Sincerity may admire the boy
- e. ?Sincerity may qualify the boy

A more contemporary principles and parameters approach has produced the suggestion that violations of a single principle will be viewed as less ungrammatical than multiple violations. For example, the grammatical and acceptable (6a) and (6c) become both ungrammatical and unacceptable if Principle A is violated as in (6b), or if Subjacency is violated as in (6d). The double violation of both Principle A and Subjacency in (6e) shows a higher degree of ungrammaticality and should produce stronger intuitions of unacceptability.⁴ In more recent work, Chomsky (1988) predicts that the degree of ungrammaticality increases not only in proportion to the number of principles violated, but the degree of violation of a single principle. A string that crosses successively more barriers for example, will become successively more ungrammatical, and have a higher perceived unacceptability. The distinction between the *core grammar* and a *marked periphery* of language-particular rules has been offered as yet another scale on which degree of ungrammaticality could be measured.

- (6) a. The film stars_i know some fans read gossip about them_i in the tabloids
- b. *The film stars_i know some fans read gossip about themselves_i

⁴ Some linguists suggest that the string *?In which periodicals do the film stars know some fans read gossip about them* is not a violation of Subjacency, and hence not ungrammatical. Rather, it is unacceptable as a result of its cognitive inviability; normal parsing strategy would interpret the wh-adjunct *in which periodicals* as a constituent of the matrix clause. This string contrasts with the starred (and ungrammatical) (6d), and is marked "?" here.

in the tabloids

- c. Do the film stars_i know who reads gossip about them_i in which periodicals
- d. *In which periodicals do the film stars_i know who reads gossip about them_i
- e. **In which periodicals do the film stars_i know some fans read gossip about themselves_i

The observation that grammatical and extragrammatical factors can impose a degree of deviance on some arbitrary string is important, but may be less than highly productive in revealing the nature of the grammar. While acknowledging the gradability of grammaticality and acceptability, it may be helpful to leave this observation aside and idealize these notions in order to examine their interrelation. Let me propose that every string can in principle be assigned to one of four classifications: [+g, +a], [-g, -a], [-g, +a] and [+g, -a].⁵

3.0 On argumentation.

Were there a direct matching of grammaticality and acceptability, the task of articulating the grammar that constitutes competence would be considerably simplified—intuitions about acceptability would be faultless indicators of grammaticality. [+g, +a] strings are useful to the linguist in minimal pairs with [-g, -a] strings. These contrasts give the best insights into the composition of the grammar once the effects of extragrammatical factors on acceptability have been eliminated. This is the core of Emonds (1976) observation that a “short and simple” (= cognitively viable) and “semantically clear” (= pragmatically and discoursally acceptable) string could not be unacceptable to any degree unless it was not “perfectly grammatical.” Marginally unacceptable or “erratic” instances can be assumed to be ungrammatical, according to Emonds, if they are not “semantically difficult” (= pragmatically and discoursally flawed) or not of “undue length or embedding” (= cognitively inviable). Postulating a degree of deviance is helpful in explaining intuitions of differential acceptability or grammaticality—mild and strong feelings of deviance.

⁵ No theoretical significance is intended for the features [\pm grammatical] and [\pm acceptable]. They are used only as a notational convenience for purposes of explication.

3.1 In citing intuitions of acceptability as empirical evidence about grammaticality, the first responsibility of a linguist is to filter out possible extragrammatical triggers of unacceptability. Having done this, a minimal [+g, +a]/[-g, -a] pair is strongly suggested, and will provide the empirical evidence needed to draw conclusions about the grammar.

Distributional arguments regarding category assignment of lexical items, diagnostics for constituency, evidence of asymmetries between complements and adjuncts, evidence such as *wanna* and *hafta* contraction which support the existence of phonologically null structural elements—these are just a few instantiations of the “minimal pair” approach to employing acceptability judgments to tease out grammatical information. For example, the categories of *verb* and *modal* are distinguishable by the former’s ability to appear initially in interrogatives, as shown in (7). Similarly, complements are distinguished from adjuncts by the former’s ability to prepose, and the latter’s to postpose. The minimal pairs (8b-c) and (8d-e) confirm the structural contrast between them.

(7) a. The prima donna | can | recall | the lyrics completely
should	interpret
will	memorize
may	discard

b. | Can | the prima donna | recall | the lyrics completely?
Should		interpret
Will		memorize
May		discard

c. | *Recall | the prima donna | can | the lyrics completely?
*Interpret		should
*Memorize		will
*Discard		may

- (8) a. We met a member [of the Senate] [with poor diction] last night
 b. [What legislative body] did we meet a member of last night?
 c. *[What kind of diction] did we meet a member with last night?
 d. *We met a member with poor diction last night [of the Senate]
 e. We met a member of the Senate last night [with poor diction]

Under ideal conditions, having ruled out the extragrammatical factors discussed in 1.12-1.14, observing minimal [+a]/[-a] pairs allows the linguist to postulate a minimal [+g, +a]/[-g, -a] pair and gain an insight into the underlying grammar.

3.2 Newmeyer's (1983) maxim, *in unclear cases let the grammar decide*, refers to the remaining two classifications, [+g, -a] and [-g, +a]. The enterprising linguist may be able to do more than simply defer to the grammar, however. If a given string is of marginal acceptability but consistent with the grammar and assumed to be fully grammatical, it is incumbent upon the linguist to provide a convincing explanation of the string's unacceptability in terms of the extragrammatical factors that have been enumerated in Section 1. Failing in this, the grammar itself must be reexamined and the theory refined to reflect the marginality of the string. In explicating the notion of acceptability, a small corpus of [+g, -a] data was presented; much more could be produced. A look back at the arguments for (4c-d) typify the method of argumentation. Emonds demonstrated that nominative case in strings like *Him and Pat are wittier than me* can be assigned only in the government domain of INFL, the case assigner, and that such strings pattern structurally with others having accusative case; this preponderance of evidence makes the analysis as grammatical likely. Furthermore, an attitudinal restriction can be offered to account for the string's unacceptability. Likewise with (4d), which patterns with other [+g, +a] strings of the form *NP-ga AP*, the unacceptability can be ascribed to attitudinal restrictions.

The so-called data disputes that have arisen between linguists usually revolve around the assignment of strings to [+g,-a] or [-g, +a]. An example of this type of dispute is discussed in Newmeyer (1983): the analyses by Chomsky and Lasnik (1977) and Bever (1970) of the pair in (9). Both agree that (9b) is unacceptable, but draw different conclusions about its grammaticality. At this intermediate stage of our analysis this string could be assigned $[\alpha, -a]$, with the value of α to be determined. Chomsky and Lasnik's approach is stipulative, a rule added to the grammar that addresses this type of structure directly. By contrast, Bever proposes a principle of processing that is essentially the same as that used to illustrate the unacceptability of garden path sentences in section 1.12. He states it in Langendoen and Bever (1973) as $NP^{\wedge}V \rightarrow NP_{actor}^{\wedge}V_{action}$.

- (9) a. That he left is a surprise
b. (*)?He left is a surprise

How can α be determined? Bever's analysis is superficially appealing because this processing principle is needed independently for strings like (2a), but if the unacceptability is explained with this principle, then no insight into the string's grammatical status is possible; the string remains $[\alpha, -a]$. A grammar may be chosen without reference to this string, letting the chips fall where they may. Chomsky and Lasnik have fine-tuned the grammar, and then "allowed the grammar to determine α ." Their strategy is objectionable because it targets the structure so precisely.

Nested constructions, garden path sentences and gargantuan strings have an important quality which (9b) lacks: their cognitive inviability can be unraveled with pencil and paper analysis. (9b) is the epitome of Emonds' description of "semantically clear and not of undue length or embedding," yet there is no satisfying way to unravel its seeming cognitive inviability. The examples in (2) are Chinese puzzles; (9b) is just a pair of scissors that won't cut. And upon deeper evaluation Bever's analysis fails on another count: perceptual mechanisms must be universal for all human languages. Not only is his principle language-specific and in need of modification for V-initial languages, but when applied to the Japanese string in (10) should, but does not, trigger unacceptability. Tensed relative clauses always precede NPs in Japanese; the language should be "processing resistant," but isn't.

- (10)
- | | | | |
|------------|----------------------|------------------|------------|
| O:ji ga | garasu no kutsu o | haita | |
| prince+NOM | glass slipper(s)+ACC | wear+PAST | |
| | | shinderera (o) | oikaketa |
| | | Cinderella(+ACC) | chase+PAST |
- "The prince chased Cinderella, who was wearing glass slippers"

There is a grammatical explanation that captures (9b), assigning it a $[-g, -a]$ status. Emonds (pers. comm.) suggests an empty head noun without obligatory complementizer is ill-formed, bracketed as in (11a). (9b) patterns with (11b); both violate a structural constraint. This analysis is consistent with current grammatical theory, and unlike the earlier Chomsky and Lasnik solution requires no ad hoc rules, it follows from general principles of the grammar.

- (11) a. * $[_{NP} [_N e] [_{CP} \emptyset [_{IP} \text{he left}]]]$ is a surprise

- b. * $[NP \text{ All } [N' e] \text{ raced over the field and across the stream}]$
collapsed

In this section examples of three strings illustrate the struggle to identify the possible effects of extragrammatical principles: in the first two they were found to be at work, in the second a grammatical account at little cost to the theory appears more attractive than a less supportable processing explanation. The following section addresses some data that have been described as $[-g, +a]$ in the literature.

3.3 The most fascinating string assignments, to which we have not devoted much attention, are those designated $[-g, +a]$; it is this class that complicates the linguist's task, and that this section addresses.⁶ Strings mentioned in Newmeyer (1983) that may be $[-g, +a]$ seem a rare breed: a clitic pronoun studied in a squib by Otero (1972) and the "not un-" APs discussed by Langendoen and Bever (1973). To these can be added the prestige construction examined in Emonds (1986).⁷ The similarity of the clitic pronoun data and the nominative object data of Emonds is obvious in Otero's observation that "...significant is the fact that utterances such as [the $[-g, +a]$ string with *se*] are heard almost exclusively among 'educated' speakers, while those like [a contrasting $[+g, -a]$ string] are common 'on the other side of the tracks'..." He adds "I have not found any who use the $[-g, +a]$ type exclusively...[and] it is not difficult to find...professional writers who frequently use the $[+g, -a]$ type 'by mistake'."

Both linguists characterize the unacceptability of the $[+g, -a]$ string in terms of attitudinal restrictions discussed in 1.14, which are subsumed there under discourse plausibility. For his $[-g, +a]$ strings, Emonds concludes that they are the result of "extragrammatical deviation imposed...through paralinguistic cultural institutions of the dominant socio-economic class." Following Newmeyer's maxim, the grammaticality assignment to these strings is not the result of argumentation from (un)acceptability to (un)grammaticality, but by the process of integration into a system of already known strings and the principles of grammar already concluded.

⁶I again stress that these "classes" are intended only for explicatory purposes.

⁷Chomsky (1970) also asserts that *John's criticism of the book before he read it* is $[-g, +a]$. Like these cases, I believe it should be ultimately shown to be $[+g, +a]$.

3.4 How the grammar will capture negation is overtly at issue in Langendoen and Bever's (1973) handling of "not un-" APs. Following the program outlined above, the first step in analyzing a string like *a not unhappy boy* is to evaluate possible extragrammatical factors that might influence its acceptability. Langendoen and Bever propose that cognitive viability plays a role here. Repeating their illustrative instantiations in (12) show that although a bare adjective in prenominal position co-occurring with *not* is unacceptable (and ungrammatical), modification by an intensifier (i.e., SP(A)) allows co-occurrence with *not*; (12b) appears acceptable and grammatical. They assert that the negative element *not* preceding an adjective containing a negative prefix results in ungrammaticality on analogy with (12a) but is acceptable according to the perceptual rule (13).

- (12) a. *A not happy boy entered the room
 b. A not very happy boy entered the room
 c. (*)A not unhappy boy entered the room

- (13) $DET^{\wedge}ADV_1^{\wedge}ADV_2^{\wedge}ADJ^{\wedge}N \rightarrow$
 $DET^{\wedge}ADV_{\text{modifier of } ADV_2}^{\wedge}ADV_{\text{modifier of } ADJ}^{\wedge}ADJ_{\text{modifier of } N}^{\wedge}N$

Contrast (13) with the processing mechanisms referred to in Section 1.12 and made explicit here as (14) and (15), following the discussion in Chomsky (1965). Apart from the primitive terms *constituent* and *category*, the statements are neutral with respect to the grammar, and are applicable universally to natural languages.

- (14) Conditions on nesting: Where α , β , and γ are grammatical constituents,
 i. recursive center embedding increases the degree of string deviance from cognitive viability:
 $[\alpha \dots \beta \dots \gamma] < [\alpha \dots \beta \dots \alpha] < [\alpha \dots [\beta \dots \gamma \dots \beta] \dots \alpha]$ and so on;
 ii. increased length or internal syntactic complexity of β and/or γ increases the degree of string deviance;
 iii. identical syntactic category assignment to α , β , and/or γ increases the degree of string deviance.
- (15) Condition on co-processing: Where α and β are grammatical constituents of the same syntactic category, a processing

mechanism ψ will find it difficult or impossible to operate on α while operating on β .⁸

The first criticism of Langendoen and Bever's perceptual account of (12c) is the same one made in Section 3.2 in connection with the processing of garden path structures; it appears to be an ad hoc rule, language-specific and very much grammatical rather than perceptual.⁹ In addition, unlike that argument from cognitive viability, which attempts to explain intuitions of unacceptability, this argument purports to explain *acceptability*. It asserts that an interpretation is made possible by "behavioral comprehensibility," independent of grammatical well-formedness. To see the danger in accepting this quite different form of argument, look at some data in (16) with quantifiers.

- (16) a. The two fans chased the film star
b. *The all fans chased the film star
c. The fans all/*two chased the film star
d. Fan ga minna/futari eigasuta: o oikaketa
+NOM all/two film star+ACC chase+PAST
"All/two the fans chased the film star"

All and *two* should have the same processability, they quantify (or "modify") the same head noun, and if one is ungrammatical in some structural position where the other is grammatical, it should nevertheless be behaviorally comprehensible. (16d) from Japanese verifies that postnominal modification is comprehensible for

⁸ This condition probably needs restatement. Upon encountering *with* or *in* in the following example, three identical constituents are in mid-parse, yet the string appears perfectly parsable.
Pat was sleeping [pp on the deck [pp of the boat [pp with the red sail]

anchored [pp in the moonlight]]]

However, I am not concerned with the accuracy of this condition but rather the type of formalization it represents. The exact formulation of conditions on processing is a topic for psycholinguistics.

⁹ Both the argument in 3.2 and this one might be countered by making some perceptual constraints subject to the canonical structure of the language, and in that way, language-specific.

floating quantifiers like *two*. These examples weaken the assertion that behavioral comprehensibility overcomes ungrammaticality.¹⁰

Langendoen and Bever's conclusion that (12c) is ungrammatical is drawn primarily by analogy to (12a), as shown in (17a) and (17b)¹¹; therefore an example that parallels the data in (16) and uses the prefix *un-* might be illustrative.

- | | | | |
|---------|----------|--|----------------------|
| (17) a. | *A not | happy
educated
frightening
sympathetic | boy entered the room |
| b. | (*)A not | unhappy
uneducated
unfrightening
unsympathetic | boy entered the room |
| c. | ?A not | (*nonhappy)
noneducated
nonfrightening
nonsympathetic | boy entered the room |

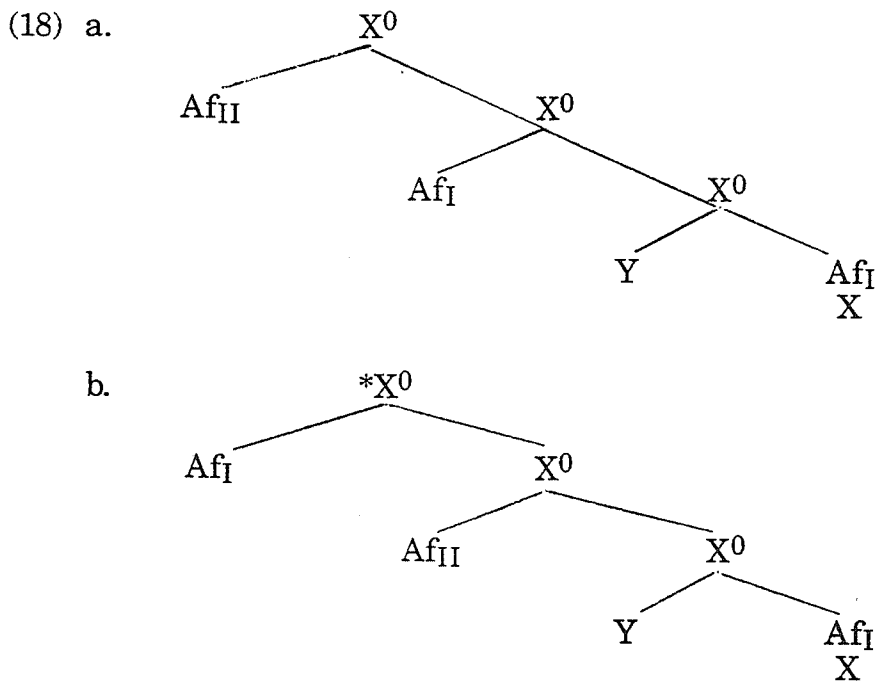
The negative prefixes *non-* and *un-* are usually if not always semantically equivalent, yet behavioral comprehensibility does nothing to rescue the examples in (17c) from at least marginal unacceptability, and seem to indicate ungrammaticality as well. Langendoen and Bever appear to be forced to apply the same explanation to the cases in (17b) and (17c), yet their argument does not yield the same results. In this data the behavioral comprehensibility of a string does nothing to ensure its acceptability. Parallel to the case of $[\alpha, -a]$ in Section 3.2, we are left with merely this same assignment for (12b) and no evidence that allows us to solve for α . In conclusion, Langendoen and Bever's notion of behavioral

¹⁰ An important problem that I skirt here is how many ungrammatical sentences are nevertheless understandable, while others appear "meaningless." Notions such as *full interpretation* are not within the scope of the present discussion.

¹¹ Their discussion of relative clause reduction and adjective preposing is not important here.

comprehensibility fails to account for acceptability intuitions about data similar to (12b), and is mute on the subject of the grammaticality of this data.

3.5 The negative prefix *un-* is known to have some peculiarities with regard to affixation constraints. Aronoff (1976) and Selkirk (1982) describe affixation in two classes. In the internal structure of a word, all Class I affixes must occur “below” all Class II affixes. (18a) is a possible structure, while (18b) is not. As Selkirk observes, *non-* is a Class II affix; *un-* is aberrant however—it appears to be both a Class I and Class II affix, combining with any adjective no matter what class of affixes are present below it in the phrase structure diagram. What could account for this peculiarity of *un-*?



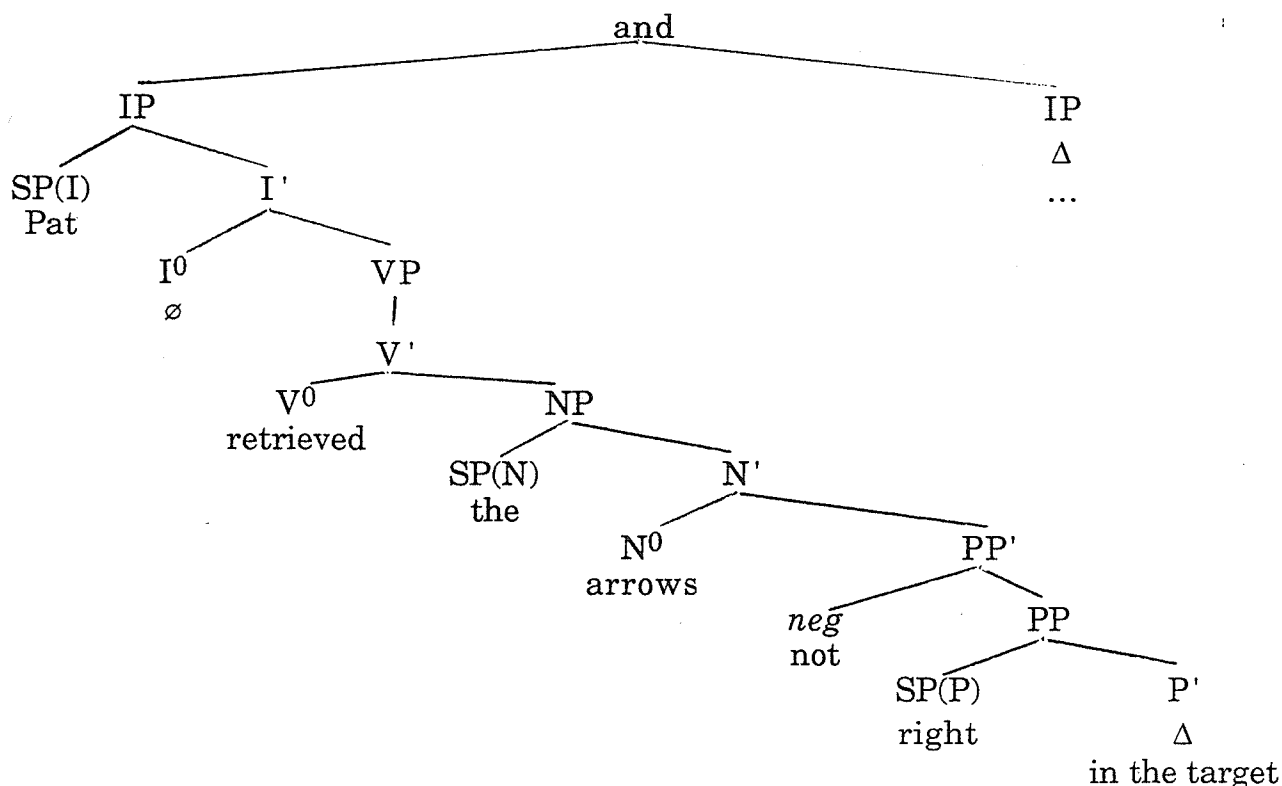
Providing an account of constituent negation that could plausibly lead to the facts in (12) without Langendoen and Bever's notion of behavioral comprehensibility would require a look at negation, a murky topic in generative grammar that still awaits a comprehensive analysis. Though this lies outside the focus of this essay, in what follows I sketch a short and speculative argument.

In their analyses of *neg*, neither Klima (1964) nor Jackendoff (1972) discuss its structural position. It could result from an adjunction to the maximal phrase; some recent work has suggested that *neg* be placed in a set of functional heads, {C, I, D}, in which case NegP would one of a number of heads replacing an

(“exploded”) INFL. Yet a third approach might be to locate *neg* in a SP(N) or SP(D) position, or allow iteration of SP(X). For this sketchy account I will not feel compelled to determine the structural position of *neg*.

Klima and Jackendoff isolated *sentence negation* and *verbal negation*, but the co-occurrence of negative elements and negation-bearing prefixes has yet to receive sufficient attention. If we assume that negation may operate not only on propositions expressed by a full clause, but is base-generable on either IP or VP, then *neg* is predicted to occur within other XP as well, on smaller phrases, for example the PP in (19), where the conjoined propositions are not contradictory. For NP negation, consider the string *The cans and not the cartons require a deposit*. This type of approach would predict that *neg* is also base-generable at some position within AP.

- (19) Pat retrieved the arrows not right in the target, and those right in the target (too)



In sentence negation, *neg* appears alternately as an overt morpheme S-initially or on the head of S, INFL. (20), the *Invisible Category Principle* of Emonds (1985),

captures this alternation if we assume that *neg* is a feature of SP(I) or a closed category adjoined to IP.

- (20) a. Invisible Category Principle: An obligatory closed category B (such as a SP(X) or P) with a feature C may remain empty throughout a derivation if C is morphologically transparent in a phrasal sister of B.

The late insertion of *neg* proposed by Monaghan (1981), conforming to the ICP, would help to explain why S-negation may occur in an S-initial position or on the “head of S”, INFL. If *neg* is inserted “on the way to phonological form” in strings like those in (21), constraints must apply that determine when one of the set of *neg* morphemes {not, no, -n't, un-, etc.} appears in SP(X) or on X⁰.

- (21) a. *Not the arrows hit the target
b. (*)Many arrows didn't hit the target (* as S-negation)
c. No arrows hit the target
d. (*No) the/many arrows [vp (*not) hit the target]
e. *The arrows hitn't the target

If the characterization of negation sketched here holds in some form, *un-* may a late insertion of *neg* that occurs freely on any A⁰. This would explain its apparent dual nature as both a Class I and Class II affix. The many recent discussions of *SPEC-head agreement* postulate interactions between the two. I suggest that *neg* can appear at the edge of XP (position undetermined) or on X⁰, subject to at present unformulated restrictions.

For S-negation, it appears that the default insertion is I⁰ when no quantification appears to the left, while generally for V-negation no V⁰ insertion is possible, and that furthermore, judging from *not*-contraction, V-negation can appear within I⁰.¹² This is not always the case, as can be seen from the fact that (22a-b) shows V-negation in strings where I⁰ is filled with S-*neg*, (if we trust interpretation as a contradiction as a diagnostic). Whether *neg* in (22a) is in SP(V) or V⁰ is not

¹² Obsolete forms such as *they went not* seem to indicate that V⁰ negation was grammatical at one time.

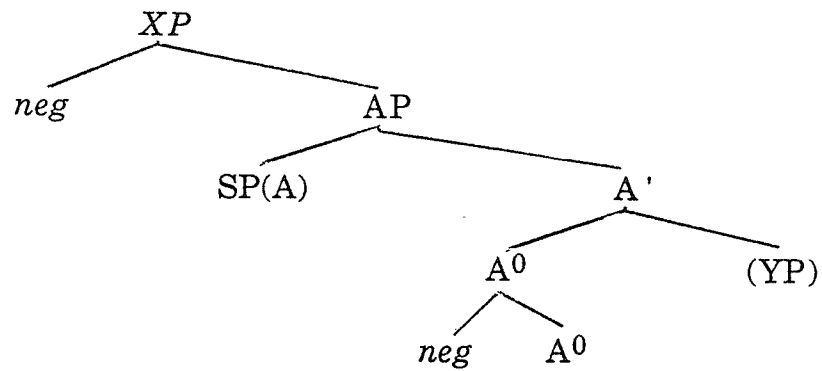
immediately apparent. Moreover, in (22c) it seems that V-negation can fill both an I⁰ slot and some VP-internal (presumably V⁰) slot simultaneously (if *merely* is within VP). Although far from clear, that the morphological facts of *neg*-placement within X⁰ can be determined will be assumed. Perhaps in principle, *neg* is inserted on the smallest projection that contains all phonological material sensitive to scopal relations.

- (22) a. All the arrows didn't *not* hit the target, and all the arrows didn't hit the target (V-negation = no contradiction)
- b. All the arrows didn't not hit the target, and all the arrows did [juncture] not hit the target (S-negation = contradiction)
- c. Not many arrows didn't merely not hit the target, but not many arrows did merely not hit the target (V-negation = no contradiction¹³)

If S-negation is obligatory on I⁰ unless scopal material occurs above I⁰, double negation nonetheless appears to “push” a second insertion onto SP(I), into an adjunction position—or perhaps even into SP(N), where it blocks other morphemes from SP(N), as shown in (24a-b). The crucial leap is to assimilate the examples in (12) to these examples, using a structural template something like (23). If the insertion of *neg* occurs obligatorily within A⁰, then (12a) is ungrammatical. The presence of the intensifier *very* above A⁰ in (12b) requires *neg* to be inserted at a higher sight. If a second instance of *neg* is “pushed out” to the SP(A) or adjunction position, as shown by (24c-d), (12c) will be grammatical. A single *neg* appears obligatorily as a bound morpheme on A⁰, and double negation requires insertion at both positions. In this way, the ungrammaticality of (12a) and the grammaticality of (12b-c) would be predicted according to grammatical principles. This account, not worked out in any detail and admittedly quite tentative, provides a possible structural analysis of *neg* that places **a not happy boy* squarely within the set [-g, -a] and *a not unhappy boy* within [+g, +a].

¹³ The difficulty of processing this exceedingly negated string made be due to the co-processing condition, (13). Perhaps in principle *neg* is iterable, and processing conditions restrict strings like *?Not not not many not unhappy boys didn't not enter the room.*

(23)



- (24) a. The arrows didn't hit the target
b. No (*the) arrows didn't hit the target
c. An [A₀ unhappy] boy entered the room
d. A [AP not (very) [A₀ unhappy]] boy entered the room

3.7 We have seen that an account of the strings in (12) that depends on behavioral comprehensibility is not compelling, and that furthermore it does not support any conclusions about the grammaticality of (12c) beyond the rudimentary observation that *neg* + A is unacceptable. In fact, Langendoen and Bever never provide a grammatical account for moving from the unacceptability of (12a) to its ungrammaticality. The preliminary analysis of *neg* given here, while certainly beset with its own problems, is meant to exemplify the *type* of argument that could successfully account for the acceptability judgments and provide a grammatical basis for these judgments. Most importantly, the notion that cognitive mechanisms can *overcome* ungrammaticality to render a structure acceptable has been seriously questioned.

Section 3.0 has developed a protocol of argumentation from acceptability to grammaticality. Though performance and competence, acceptability and grammaticality are not in an isomorphic relationship, it is isomorphism that linguists strive to establish—minimal pairs that reveal the underlying grammar. The first step in constructing such pairs should be to evaluate the strings for extragrammatical factors of acceptability: cognitive viability, pragmatic plausibility and discursal viability. If these factors influence the judgments of native speakers, researchers should be hesitant to move past a [α , +a] or [α , -a] assignment to conclusions about grammaticality. In cases where there are no extragrammatical factors that result in judgments of deviance, one must still be

alert to "imposed extragrammatical acceptability" and the corresponding appearance of grammaticality.

4.0 The domain of grammar

Of course not every fact related to language performance can or should be captured within the grammar. Langendoen and Bever exhort linguists to "treat linguistic phenomena as the result of interactions among different systems of linguistic knowledge." Against this view, it seems clear that cognitive limitations are not peculiar to language—try riding a bicycle with hands reversed on the handlebars. Primates without linguistic ability have pragmatic knowledge; "discoural anaphor" is not a phenomenon most linguists would argue should be within the domain of grammar. Jackendoff (1983) presents a modular framework that admits of interactions among different systems, but would hardly lump them all into linguistic knowledge. It is an empirical question as to what role the grammar should play in a theory of linguistic performance.

In a burst of ambitiousness Chomsky (1965) struggles to establish an isomorphism between the unacceptability of the strings in like those in (26) and their ungrammaticality by postulating *selection restrictions* in the lexicon. He provides good counterarguments to his own characterization, and takes up the question of whether the unacceptability of these strings should be accounted for in the syntax or in the semantics.

- (26) a. ?The harvest was clever to agree
- b. ?Misery loves company
- c. ?The academic liquid that fills the university's inkpot is
 underpaid
- d. ?The boy may frighten sincerity

Briefly, Chomsky's proposal is to list a selection restriction frame within the lexical entry of a verb which will have the effect of ruling out certain NPs as its arguments. In these examples, the feature [+animate] is part of the frame of the predicates *clever*, *agree*, *love*, *underpaid*, *frighten*, either as subject or object (i.e., external or internal argument); the result for Chomsky is the ungrammaticality of these strings. It is worth observing that while speakers may find "oddness" in (26a and c), (26b) is a timeworn expression that I predict few would feel is odd. In

an extended analogy, (26c) would certainly be plausible and not at all disconcerting. No matter what the acceptability assignment to these strings, comparable ones in (27) trigger no such similar intuitions.

- (27) a. A harvest is never clever and can't agree to anything
- b. Pat believes misery can love company
- c. No one has ever considered such a thing as underpaying a liquid
- d. It is impossible for a boy to frighten sincerity

Chomsky is forced to “maintain that base strings that deviate significantly from grammaticalness [by violating selection restrictions] are nevertheless constituents of sentences that receive nondeviant interpretations, by virtue of the semantic properties of certain lexical items and certain constructions.” Should for example belief contexts like (27b) be formally represented in the grammar? The burden on the grammar becomes tremendously greater, and its explanatory power increases dramatically. How many of the semantic properties of an item need be included in the grammar as syntactic features? My answer would be “as few as possible.” Following our protocol, any unacceptability assignment for strings in (26) should be given on the basis of extragrammatical factors before assuming an isomorphic relation [-g, -a]. The subtle and indirect insights into the grammar which are available to linguists should result in a healthy wariness of loading the grammar with mechanisms to handle every instance of unacceptability. History seems now to argue against listing selection restrictions in the lexicon. Chomsky himself concluded at the time that “the syntactic and semantic structure of natural languages offers many mysteries...any attempt to delimit the boundaries of these domains must certainly be quite tentative.”

5.0 Limits on argumentation

Little has been said about *strategies of interpretation*. In the short comment of Emonds (1976) often taken up in this discussion, strategies of interpretation are “expected” of an intelligent language user to make a slightly ungrammatical sentence acceptable. What degree of grammatical deviance becomes too great for these strategies to compensate for? **?Me brother eat yesterday pizza on a restaurant* is certainly interpretable, yet neither grammatical nor acceptable. How are strategies of interpretation different from those like “behavioral

comprehensibility," and how can these strategies be delineated? This is a question outside the purview of this essay, but one that must certainly be sensitive to the dangers that have been noted in allowing extragrammatical factors to override ungrammaticality in determining acceptability. A formal scale of deviance from grammaticality would seem to be a necessary component in determining when strategies of interpretation can or cannot affect acceptability judgments. Problems with formalizing such a scale were touched upon in Section 2.

Work on a theory of language performance is certainly needed, and may significantly aid the delimitation of the boundary between the grammar and other systems that determine performance. However inadequate our current understanding of performance, insights into the theory of grammar can be bought only by carefully determining the causes of (un)acceptability. Establishing the degree of isomorphism between acceptability and grammaticality is mandatory for linguistic argumentation, and a better understanding of cognition, semantics and discourse will make this possible.

While acknowledging degrees of deviance, idealized assignments of $[\pm g, \pm a]$ have been productive in examining the issues here. Strings which fall into the isomorphic categories $[+g, +a]$ and $[-g, -a]$ make up the bulk of performances of language, and it is this assumption that fuels argumentation from acceptability to grammaticality. The host of factors that determine acceptability include grammaticality; ungrammaticality is frequently the cause of unacceptability. The class of strings in $[+g, -a]$ is also large; as Section 1. demonstrated, extraneous factors have a strong influence on acceptability. The volume of strings assignable to $[-g, +a]$ is predicted to be quite small. Usually a pairing with a contrasting $[+g, -a]$ string should be possible, and the extragrammatical factor(s) influencing the lack of isomorphism should be identifiable. That linguists need to develop a sensitivity to isomorphism as the basis for argumentation and a protocol for identifying strings that should be assigned to non-isomorphic categories on the basis of extragrammatical factors is the major theme this essay stresses.

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**A Comparison of Parsers:
DCG A Shift-Reduce Parser Based on a Definite-Clause
Grammar and M, a Parser Based on a Categorical Grammar**

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INTRODUCTION

The purpose of this paper is to compare two methods of processing natural language on a computer: 1) a shift-reduce parser using DCG (Definite-Clause Grammar) and 2) a logic program, M, based on a categorical grammar and the axioms and inference rules of the Lambek-Gentzen sequent calculus.

In this paper I will refer to the Prolog versions of these two natural language processing methods as DCG and M. I will not go into the internal workings of Prolog, how it proves by refutation the goals given it, how proofs proceed with the data provided, etc. (for details see Chapter 9 of Gallier, 1986). For the sake of convenience, I will gloss over the computational significance of the symbol :-, using it simply as if it meant "if."

I will not consider, furthermore, the grammatical formalism called the Recursive Transition Network (RTN) and the related Augmented Transition Network (ATN). An RTN parser can describe the same languages that can be described by a CFG (Context Free Grammar) (Allen, 44), or DCG. Roughly speaking, then, the comparative strengths and weaknesses we discover about the DCG in relation to M should apply to an RTN as well. Due to space restrictions, however, I will not attempt to confirm this here.

A grammar of language based on phrase-structure rules can be expressed in Prolog via DCG. We will begin by discussing DCG in terms of depth-first vs. breadth-first exploration of the parse tree, then in terms of a top-down versus bottom-up parsing strategy. Charts will be identified as a useful tool in saving time and space when backtracking becomes necessary. A shift-reduce parsing strategy will be identified as a bottom-up parser with top-down prediction. Finally, the shift-reduce strategy will be compared with the categorical-based parser M.

DCG

A context-free grammar generates or recognizes a context-free language.¹ A context-free grammar of a particular language can be expressed in Prolog by converting its phrase-structure rules to "definite clause" form. Terminal symbols in a context-free grammar are those which cannot be further decomposed in the grammar; they are the last node on the parse tree to which is attached a word of the language being parsed. This word will be one to which the terminal symbol is assigned in the lexicon.

The non-terminal categories such as NP, VP, S are categories "higher up" in the parse tree than the terminal categories of N, V, A, and P on a phrase structure tree. They are described in DCG rules as entities ranging from a Position zero (P0) to another Position (the right-edge of the constituent) **IF**, (recall that the **IF** connective is expressed in Prolog by :-), the sub-constituents of this non-terminal constituent can be found in the positions specified. For example, the rule $S \rightarrow NP VP$ will be $s(P0, P) :- np(P0, P1), vp(P1, P)$. The non-terminal or terminal on the left of the :- sign we will call the "head" of the clause and the material on the right side of the clause, the "body." This rule says that the parser will find an S (sentence) from P0 to P **IF** there is an NP which immediately precedes a VP, and if, after the VP, there are no more constituents to account for in the data string input.

In processing an input string using the data (grammar rules or axioms) the Prolog proof procedure is *top-down, depth-first*. (As we will see, a *breadth-first* strategy is theoretically possible but not practical.) Let's see what is meant by depth-first and top-down, taking each of these terms one at a time.

The Depth-First Parsing Strategy

A depth-first parser pursues a single path down the parse tree until it meets with failure. Only if it meets with failure will it backtrack to try a different path. The depth-first approach is the most common search strategy because it is generally the most efficient; the possibilities list remains much smaller than in parsers using the alternative, the breadth-first strategy (see p. 6 below). There is a problem with depth-first parsing methods, however, and that is that they are not "complete." They will not necessarily prove the goal S in a finite number of steps even if S is provable. For a system to be complete, it must find a solution if

there is one to be found. Because a depth-first parser can go into an infinite loop, where it repeats over and over an attempt to match the input constituents with the same rule, it may never find a successful path down the parse tree, even if one exists. Let's see briefly how this can happen.

Infinite Loops with Depth-First Parsers

When a rule (or clause, in PROLOG terms) is *left recursive* it means that the head of the clause and the first constituent of the body "match" - i.e. they are identical. There are many instances of this sort of rule in context-free phrase-structure grammars. In the following sample grammar, the rule in bold is an example of a *left-recursive* rule:

- (1)
1. NP -- N
 2. NP -- DET N
 3. NP -- DET ADJ N
 4. **NP -- NP PP**
 5. PP -- P NP
 6. VP -- V
 7. VP -- V PP
 8. S -- NP VP

It appears to be most efficient to characterize NPs which contain prepositional phrases in terms of an internal NP, rather than repeating the internal structure of NP in several additional rules. In other words, we think we want to have rule number 4 (in bold), NP -- NP PP in our grammar in place of the several rules that would be necessary to identify all the different ways of combining an NP with a PP to get an NP in as in (2) below:

- (2)
- NP -- N
 - NP -- DET N
 - NP -- DET ADJ N
 - PP -- P NP
 - NP -- N PP
 - NP -- DET N PP

However, what appears to be an efficient rule, enhancing the readability of the grammar by eliminating unnecessary redundancy, turns out to be a problem, forcing us to abandon this desirable "short-cut." Why? Let's assume the grammar rules apply in the

order listed in (1). Assume also that the parser is trying to parse the string "the dog by the door." If the parser has identified "the dog" as an NP it now attempts to follow the rule S -- NP VP, but cannot find a constituent or set of constituents to match a VP rule. It will then backtrack in order to reattempt an analysis of the data. It will not reparse the NP it has already found, rather it backtracks only as far up the tree as necessary to find a new path; it tries at this time from following the rule NP -- NP PP.

In fact, intuitively, this is what we want the parser to do, since backtracking and reanalyzing the first two words will entail more time and space, i.e. it is less economical. At this point, however, instead of the parser finding the PP "by the door," the depth-first parser will get stuck on rule number 4. Since the parser tries rules one at a time, nothing, except a fortunate order of rules in a given situation or a very careful avoidance of rules that are left recursive, prevents it from entering an infinite loop by trying to follow the rule NP -- NP PP again and again. To summarize, the problem is that "a left-recursive rule applies to itself indefinitely without ever checking the input sentence" (Allen pg. 57).

Given this well-known problem with depth-first parsers, what are the solutions? Pereira and Shieber suggest transforming a left-recursive grammar "into one without left-recursion that is weakly equivalent to the original one, that is, that accepts exactly the same strings even though it assigns them different structures (pg. 81)." Grammars without left-recursion will, obviously, contain a much larger set of rules than would otherwise be necessary. The more rules there are in a grammar, the longer the processing time of the parser as it tries to apply all these additional rules to strings of input. Thus, the grammar without left-recursion will be much larger and therefore much less economical. What about the alternative to depth-first parsing, namely breadth-first parsing?

The Breadth-first Parsing Strategy

As we have seen, in a depth-first strategy, the parser selects a rule, and continues to parse the input string until a failure occurs, at which time it will backtrack only as far as it has to in order to discover an alternative path down the parse tree. In a breadth-first strategy, however, each rule that **can** be followed from a given point **is** followed, one step at a time. Each time a word is assigned a

terminal symbol, all the rules in which that terminal symbol appear as the left-most element of the body are explored by the breadth-first parser. In other words, if we are trying once again to build an NP from the string "the dog" we will try all three of the rules in (1) above. The parse will proceed considering the input one word at a time, attempting to match the input to each rule in (1).

In a breadth-first approach, the problem of infinite loops resulting from left-recursion is avoided. Because all rules are tried, one at a time, the parser won't continue to try to apply the same rule over and over again.

Although this approach has the advantage of avoiding infinite loops and always finding a solution if one exists, breadth-first parses have a very high cost in time and space consumed by the parser. All rules are applied regardless of the success or failure of the other rules tried by the parser. This results in many rules being tried needlessly; once a potentially successful path is identified, the parser doesn't plunge down that path, rather is continues down all the other possible paths, each path being followed at the same pace as all the other paths. The further one gets down the parse tree, the greater the explosion of paths that must be considered at each step down the tree.

As noted in by Gallier (445): "If one wants to retain completeness, the kind of tree traversal chosen must be a breadth-first search, which can be very inefficient. Most implementations of PROLOG sacrifice completeness for efficiency, and adopt a depth-first traversal strategy." We must, therefore, avoid the problems associated with depth-first parsers by carefully eliminating rules involving left-recursion and by looking for ways to enhance the depth-first parsing strategy. One such enhancement strategy used in a shift-reduce parser is to combine the strengths of top-down and bottom-up parsing strategies. Before describing the shift-reduce parser, let us examine what is meant by top-down versus bottom-up.

Top-Down Parsers

Top-down processing methods start with a goal. In the case of natural language this is an acceptable sentence, or S, as defined by the grammar.² The top-down parser proceeds by attempting to decompose the input string into constituents that match the grammar rules which define acceptable sentences. If more than one

rule matches, one rule is selected and the others are put into a back-up state. (As we have seen, the order in which rules in the back-up state are applied will depend on whether the parser is using a depth-first or breadth-first strategy.

A characteristic (usually an advantage) of top-down parsers, (most clearly seen when compared with bottom-up parsers), is that they approach the parsing project with an bias toward the goal. Because the parser is trying to prove that the natural language input is a grammatical sentence S, the parser expects an NP as the first phrasal constituent, and will only identify the first words encountered in terms of constituency in an NP. In other words, if one of the first words in an input string is lexically ambiguous between an element in an NP and an element in a VP, a top-down parser will only consider the NP interpretation. The verbal interpretations and the rules that could be matched (i.e. VP -- VP PP) with that interpretation are never considered - a savings in time and memory space compared to bottom-up approaches.

Bottom-up Parsers and Charts

We have seen that a top-down parser proceeds by identifying the larger constituent S as a goal and trying to match the input string to the goal constituent by means of the grammar rules. A bottom-up parser, on the other hand, takes the input, one word at a time, left to right, and attempts to match the input to a phrasal constituent by means of the grammar rules. In other words, if we are parsing "the dog" we begin by identifying "the" as an article and checking to see which rules have ART as the left-most constituent of the body of the clause, or right-hand side of the rule.

A "chart" is used to keep a record of the state of the parse (Allen , 60-67). Recorded in the chart are the positions of the words (or atomic constituents), along with the rules that have so far been matched but are not yet complete, as well as the new structures derived from the rules that have been matched.

The advantage of a bottom-up parser is that it does not ever have to re-parse a phrase in the way a top-down parser does. While a top-down parser may operate for a long time, rewriting rules from a complex grammar before any terminal symbols are matched with actual words, the bottom-up parser has recorded all the structure it

has built as it has proceeded, so that no work is ever repeated. The disadvantage of a bottom-up parser is that it must consider all the senses of each word, and since natural language is replete with lexical ambiguity, this can be a major problem.

What would be ideal is a parsing strategy for DCG that had all the advantages of a bottom-up parsers with charts, but none of the disadvantages. A method that may fit these criteria is the shift-reduce parser. It combines top-down prediction in the form of an oracle with the bottom-up strategy's ability to avoid repeating previous work.

Shift-reduce Parsing of DCG

A shift-reduce parser is a bottom-up parser which Peireira (1985) considers for context-free parsing. A shift-reduce parser has two stacks, an input stack, which contains input and grammar symbols, and a parse stack, which contains parse states and grammar symbols, as well as an oracle, which is able to tell the parser what to do, given the grammar rules and all possible states of the parse.

A shift-reduce parser has two kinds of moves: shift and reduce. There is a reduce move for each rule of the grammar; this essentially identifies the parsed words with the phrasal constituent on the left-hand side of the grammar rule. "A reduce move consists in taking a grammar rule whose right-hand side matches the top of the stack, and substituting the matched string on the stack by the left-hand side of the rule" (Pereira 1985, 309).

The shift move simply "shifts" a word from the input stack onto the parse stack. It inserts a parse state identifier between each input word so that the parse state can be matched with the oracle and the action dictated by the oracle for that parse state can be taken.

The oracle blocks any moves that will not lead to success. In an unambiguous language, an oracle can be "exact," which means that for any given parse state, the oracle will allow at most one move. This results in a deterministic parsing procedure.

Natural language, however, is not unambiguous. Therefore, an oracle for a natural language parser may allow more than one move at any parse state. The oracle may allow a shift and reduce move at the same point, or two distinct reduce moves at a given point. Pereira suggests that preference strategies can be invoked to instruct the parser which of the allowable moves to make. These preference strategies are based on the empirical claim that, in the absence of semantic information which would indicate otherwise, certain readings of structurally ambiguous sentences are preferred over others. Two preference strategies that have been investigated are *right association* and *minimal attachment*.

Right Association

Right association, also known as late closure, says that a constituent will be interpreted as part of the constituent currently under construction rather than as a sister to a node higher up on the parse tree. Given the sentence "The artist painted the scene in the park," this principle will place the prepositional phrase "in the park" under the NP, interpreting the sentence as meaning the scene was in the park, but the painting did not necessarily take place in the park.

Pereira proposes that "Right Association corresponds to solving all shift-reduce conflicts in favor of shifting" (Pereira, 313). In the case of failure of the parse along this path, the other reading of this sentence, where the painting took place in the park and what was painted was not necessarily the park, would be tried after backtracking.

Minimal Attachment

Minimal attachment shows a preference for the syntactic analysis which creates the least number of nodes in the parse tree. In the sentence above, "The artist painted the scene in the park," the principle of minimal attachment would place the PP under the VP node.

According to Pereira, "Minimal attachment corresponds to solving all reduce-reduce conflicts in favor of the reduce move that pops the most symbols from the stack (Pereira, 313)."

"...a word is only given a lexical category when it is needed for a reduction," (Pereira, 317) allowing the parser the luxury of looking

ahead at rightward data which may indicate which of several possible lexical category assignments is the correct one in a particular instance.

As we will see, in System M, the count invariance and the degree of complexity evaluation metrics play a role similar to RA and MA in selecting the appropriate lexically-assigned categorial type for a given word (Moortgat, 44).

Lexical ambiguity

A shift-reduce parser will encounter instances when it will be necessary to shift a word without committing to a choice of rules. This will happen in cases of lexical ambiguity, where, in order to resolve the ambiguity, it will be necessary to examine more of the input string. As we will see, this is comparable to instances in the system M when two (or more) distinct atomic types appear one after the other and it is not possible to define a constituent type for the combination of them because function application does not apply, nor do either of the recursive laws. These are the instances when it is necessary to resort to an Product Axiom: $X, Y \rightarrow X \circ Y$.)

To summarize, in a shift-reduce parser a "shift" can be viewed as simply the contemplation of a word of the input. A "shift" puts the word on the stack for consideration in relation to the words before and after it. A "reduce" occurs when the string of input on the stack constitutes the needed input for a rule. The effect of a "reduce" is to replace the given string of words with the constituent title (e.g. NP or VP or S) which is applicable according to the rule applied. In cases where there is no ambiguity, the shift-reduce parser constitutes a deterministic parsing process; through use of an oracle, no rule of the grammar is tried incorrectly, and no constituent that is not part of the final analysis is constructed. In order to deal with the structurally ambiguous sentences of natural language, the shift-reduce parser and its oracle can be augmented with the two preference strategies described above: right-association (RA) and minimal attachment (MA). These principles are used so that the preferred reading of the possible readings is the one processed first. Other readings can be obtained by backtracking.

SYSTEM M

In a categorial system categorial types are assigned to words in the lexicon. Examples of types are NP, (NP\S), (VP/NP), (PP\VP), etc. Those of these types with a / or \ such as x/y or y\x are called "incomplete" since they are seen as an expression of category x in combination with a category y. A transitive verb, for instance will be assigned category VP/NP; it is a VP which combines with an NP to yield a VP. The verb *put*, for example, would be assigned PP\VP; when combined with a PP, *put* yields a VP. NP\S is thus assigned to intransitive verbs, and so on. Thus, the equivalent of the grammar rules in a DCG can be found in the types assigned to words in the lexicon.

The "rules" in system M are of a free combinatory type only; there are no grammar rules. Functional application is a reduction law that enables to do the canceling of types which allows us to assign types such as S' to a combination of words. In other words, if we combine a proper name such as *Kate*, which is assigned the type NP in the lexicon, with a verb of type NP\S such as *snores*, the two NPs cancel and the type assigned to the natural language input *Kate snores* is S.

System M has, in addition to the reduction law described above, two additional inference rules: M1 and M2. M1 is recursion on the range subtype: $Z, X/Y \Rightarrow W/Y$ if $Z, X \Rightarrow W$ and

$$Y \setminus X, Z \Rightarrow Y \setminus W \text{ if } X, Z \Rightarrow W.$$

M2 is recursion on the domain subtype: $X/Y, ZZ \Rightarrow X/WW$ if $Z, WW \Rightarrow Y$ and $Z, Y \setminus X \Rightarrow$ if $W, Z \Rightarrow Y$.

The reduction move in a shift-reduce parser is the equivalent of functional application in a flexible categorial system. There is no equivalent of the shift move in word-by-word left, associative parsing as done by M; with the exception of instances when it is necessary to use the product axiom (i.e. where it is not possible to apply either functional application or the recursion reduction laws M1 and M2 of M), every reduce is a shift, and vice-versa. The role of the oracle is played in a categorial grammar by the type instantiations in the lexicon and the role they play in conjunction with the search space pruning devices in determining the assignment of types to polymorphic constituents.

I will now look a little closer at the parsing strategy employed by the flexible categorial grammar implemented as M in Prolog by

Moortgat (1988). The following can be only a brief summary; please see Moortgat (1988) for details.

The Lambek-Gentzen calculus (L) consists of one axiom, the reflexivity axiom, and two pairs of rules of inference: elimination and introduction. Types, defined as atoms of the type NP, VP, S, ADJ, etc. and combinations of these atoms by the type-forming connectives /, ., \, are combined, or cancelled, when two arguments are "looking" for each other in the required direction.

As Gentzen has shown, this calculus is decidable for ground sequents (which are sequents which do not contain variables). While this system is decidable, it is not deterministic; the elimination inferences require an active type be chosen, and when there is more than one possible active type, there is no algorithm for choosing the one which will lead to a successful proof (unfolding of proof tree via inference rule to the level of axiom leaves, which is the equivalent of finding a path in the search space which leads to identifying the natural language input with the non-terminal symbol S).

Using a meta-level interpreter for the Horn Clause version of L which treats the Prolog program as data, we are able to unfold proofs that a given sentence is derivable or not. We have the usual problems of depth-first non-termination, or incompleteness (see page 6 above), but this problem can be solved by "switching to a consecutively bounded depth-first regime" (pg. 166, Moortgat) which is equivalent to a breadth-first strategy and comes with the associated lack of efficiency.

We have, moreover, the problem of undecidability when we introduce polymorphism, or variables. There is a logical infinity in the system because for a given non-ground sequent goal, a valid lifting of types produces an infinite set of non-equivalent correct answer substitutions. To summarize, there are two types of infinite regress possible in this system: an infinity of search branches resulting from a depth-first strategy, and an infinite number of success branches resulting from a breadth-first strategy. A finite solution space is needed.

We are interested in left-incremental parsing. By "left-incremental" we mean a process which starts on the left (at the first word) and proceeds one word at a time, processing as it goes. The Gentzen proof trees do not offer us this. We also want a system

that can assign constituent status to sequences conjoined by Boolean particles. The requirements for a parser that can account for Boolean conjoinability and that can proceed left-incrementally include 1) that it be "associative." That is, that bracketing and rebracketing is free. 2) the parsing algorithm must not explore the logically infinite set of valid answer substitutions for a variable in a non-ground sequent, and 3) no more of the search space than is necessary should be explored (Moortgat, 182-183).

The Cut inference is defined by Moortgat (32) as $U, T, V \multimap Y$ if $T \multimap X$ and $U, X, V \multimap Y$. Lambek's Cut Elimination Theory proves that any theorem provable in $L + \text{CUT}$ is provable in L , showing that the two calculi are extensionally equivalent. Moortgat's system M is a "bottom-up inference engine" consisting of Application and two derived rules of inference which decompose types either to those on which Application can apply or to atomic types. Combined with the Cut inference, M is equipped to give us the incremental left-associative parsing which we require.

As a parse in M proceeds, it assigns types to non-ground sequents solely on the basis of surrounding types. This ability of the system to assign types to any combination of words is a result of the flexibility of the categorial combinatory system; the system is able to assign types to strings of words that are not normally considered constituents. For example,

This flexibility does, however, have a cost, and that is the possibility of infinite regress or the sort we described above - there can be an infinite number of non-equivalent substitutions for a given non-ground sequent. This problem is mitigated by the power of the count-invariance and degree complexity metrics to prune away part of the search space. (See Moortgat, 154-163.)

Allen points out that people do not perform a complete search while parsing. It makes sense to eliminate that portion of the search space that will not succeed, where possible, before it is explored. As Moortgat shows, much of the quite considerable search space generated by this approach can be pruned away by means of Count Invariance (which reduces the horizontal expansion of the search space), and the degree complexity evaluation metric (which limits the depth dimension of the search space). As I have mentioned, the Cut Inference is also used to avoid exploring areas of the search space that would lead to non-termination of the parse.

Cut turns out to be crucial as a tool for this parsing strategy. It is used to reduce the complexity of the search, to ensure a left-associative incremental parse, to find a solution for Boolean Polymorphism, and to prune away portions of the proof that could lead to infinite regress. In this role, the CUT serves as an abbreviation for small sub-proofs.

AN EXAMPLE

In hope of making this discussion clearer, I present an example of the DCG and M parsers in action on the (very simple!) sequence *Sue worried because John left*. For the purposes of this example I will ignore the tense of the verbs.

Assume the following grammar for the shift-reduce parser:

- (3)
- 1) S -- NP VP
 - 2) VP -- V
 - 3) VP -- V S
 - 4) S -- because S
 - 5) NP -- ProperN

John -- ProperN
left -- V
Sue -- Proper N
worried -- V

Assume also an oracle, which contains the information "after such and such phrases have been found, and given that the next few words are such and such, we are building such and such phrase, and therefore such and such shifts or reduces are required" (Pereira, 317). For concrete examples of oracles, see Allen (170) and Pereira, (312).

Given the above grammar and a suitable oracle as prescribed, the shift-reduce parse would proceed as follows. (The symbol # denotes the empty stack. # means the move is as prescribed by the oracle.)

State	Stack	Move# (Rule)	Remaining input
A	#	shift	Sue worried because John left
B	ProperN	reduce (5)	worried because John left
C	NP	shift	worried because John left
D	V	*reduce or shift?	because John left

(*At this point in the parse, we can either reduce by rule 2 or we can shift, anticipating that an S will follow, meaning we should be waiting until the criteria for reduction by rule 3 are met. This is a shift-reduce conflict, which we will resolve by appealing to the principle of right association, which tells us to resolve the conflict in favor of shifting. It has not been necessary to appeal to a look-ahead device here.)

E	because	shift	John left
F	because ProperN	reduce (5)	left
G	because NP	shift	left
H	because NP V	reduce (2)	#
I	because NP VP	reduce (1)	#
J	because S	reduce (4)	#
K	S		#

Notice that the word "because" is not processed (used in a reduction) until the very last move of this sequence. It takes seven moves before "because" is processed.

Assume the definition of M as R1 (Functional Application) and M1 and M2 as defined above (from Moortgat, 187). Assume lexical type assignments as follows:

because - s\s/s
 John - np
 left - np\s
 Sue - np
 worried - np\s

The same sentence would be processed by M as follows. We begin by stating our goal, which is to show that the combination of these words constitute an "s."

We use the tool of count invariance to ensure that we have chosen types that can combine together to make an s. For example, we do not choose the possible type instantiation s/s for "because." Not only will this not combine with the other words to form an s, but we can find this out in advance using count invariance, avoiding the time and trouble of attempting a parse with this type assignment for "because" which would be doomed to failure. The types we have chosen below have the same "count" on the left-hand side of the clause as they do on the right-hand side. If we use s/s for "because," we would have an s-count of 2 on the left side and an s-count of 1 on the right. Assigning "because" the type s\s/s yields an s-count of 1 on both sides. (See Moortgat, 156 for the details of calculating the count of sequences.)

Sue worried because John left

np	np\s	s\s/s	np	np\s	-- s	
		because John left				
	s	s\s/s	np	np\s		Functional Application
		s/s	np	np\s		Functional Application

At this point we cannot apply Functional Application, and must appeal to M2 and Cut to lift the np to a type that can combine with s/s.

(s/s), np	- *	(s/np\s)	= type of "because John"
			derived via M2 and Cut
(s/(np\s))	np\s		
s	-- s		Functional Application

Note that as each word was processed by M, a type was assigned to the resulting sequence of words. In contrast with the shift-reduce parser, "because" did not have to "wait" to be interpreted. (For the semantics associated with M, see Moortgat (189 - 191).

M COMPARED TO SHIFT-REDUCE

Let's begin with the similarities between the two parsing systems. First of all, they are both bottom-up parsers; both begin by matching the type (M) or category (DCG) of the first word in the natural language input with type of the next word (M) or the grammar rules containing that category as the left-most constituent of the body of the rule (DCG). Both M and DCG have top-down prediction; the top-down prediction which the oracle gives the

shift-reduce parser DCG is equivalent in M to the type-assignments to words in the lexicon. Although the number of type assignments for a single lexical item is much greater in system M (there is a distinct assignment for every possible combination of this word with words of other types), count invariance and the degree complexity evaluation metric serve to narrow the choices to one or only a few (mostly) correct choices. Thus, the use of MA and RA by the shift-reduce parser, and in particular, its ability to wait until the appropriate "reduce" to assign a lexical category to a lexically ambiguous word is equivalent to restrictions on the search space by the pruning devices, particularly "count invariance" as demonstrated above.

As was noted, in resolving lexical ambiguity, the two systems seem to be equivalent. And in accounting for the different interpretations of structurally ambiguous sentences, they appear to give similar results. M yields different proof trees for the different interpretations (see Moortgat, 213-214 for an example), while the shift-reduce parser we have looked at selects a preferred interpretation and offers backtracking as a way to obtain other interpretations. A similar preference hierarchy could be added to M, and the two systems would yield the same results.

Differences in Constituent Assignment - DCG and M

Both of the parsers examined here process language in a left-to-right fashion, modeling, in part, the mental processing of expressions by humans. However, while both of these parsers proceed in a left-incremental fashion, only the categorial parser is able to assign every combination of words processed a "type," or constituent title. That is, the system M, after each word processed, regardless of whether it would trigger a "shift" or a "reduce" for the shift-reduce parser, will assign a syntactic type, as well as the related semantic type, to the sequence of words processed up to that point. The shift-reduce parser, on the other hand, is able to assign constituency status to a group of words only on reduce moves; recall that reduce moves are those where the criteria for the application of a phrase-structure rule are met.

This constitutes a major difference between M and shift-reduce parsers: every move, every word processed, by M is the equivalent of a reduce move (in shift-reduce terms), whereas, as we have said, moves are of two types in shift-reduce parsers - either

"shift" or "reduce." Sequences of words that would not receive constituency status, in the traditional sense, therefore **do** obtain constituency status in categorial grammars. This is desirable for two reasons - Boolean Coordination and Semantic Interpretation of non-traditional constituents:

1) Boolean Coordination (such as "and", "not" & "or")

"Boolean particles can conjoin subsequences of grammatical expressions" (Moortgat, 1988, pg. 215). The set of constituents that can be conjoined by the Boolean particles is much larger than the set that contains sequences of words which are conventionally considered to be constituents. For example, in "Mary heard, and Joe saw, the concert" the subject and verb of the two conjoined elements are clearly constituents, but not constituents for which we have any traditional phrasal label. They are composed of NP and VP, but they are not S. What are they? A DCG would have no phrasal category to assign them, while a categorial grammar would assign these conjoined constituents the type which is looking for an NP on the right to yield an S: "S/NP."

Given that we wish to assign sequences conjoined by Boolean particles constituent status, we have noted that only M has this capability. To give another example, we might want to conjoin sequences like "Bill loves and John hates Mary." The transitive verbs "loves" and "hates" require an object. Given a grammar

S- NP VP

VP - Vtrans NP

no constituent status is assigned to the sequences "Bill loves" and "John hates." M, however, can assign these sequences the type S/NP. Given that we wish to say that only constituents are conjoined by Boolean particles, this gives us support for preferring M over the shift-reduce parser considered here. For the purposes of explaining the syntactic behavior of the Boolean particles, M is clearly superior to any DCG-based parser. Furthermore, given that we assign an interpretation to incomplete expressions of this type, the system which assigns them constituent status is to be preferred.

2) Semantics

As seen in the example and discussion above, the shift-reduce parser is dependent on grammatical rules for the assignment of constituent status, and there is no rule which assigns a phrasal category label to the sequence "because John." But "because John" receives an interpretation as we, as humans, process it. The shift-reduce parser does not appeal to semantics at all, and gives no semantic results. M, on the other hand, automatically processes the semantics of words as they are combined syntactically. This results in all syntactic constituents having a semantic interpretation, "thus offering an attractive *competence-based processing theory*" (Moortgat, 174).

Universality of M versus Language-Specific DCG

There is another major difference between M and a shift-reduce parser. This is that the phrase-structure rules of the DCG with which the shift-reduce parser operates must be language-specific, whereas, the system M is a universal system. Assuming that there is a unique lexicon associated with each distinct language, the type assignments for every word are in the lexicon. The system M serves only to parse the given types (using techniques such as count-invariance and the complexity-degree evaluation metric to help select which of the types associated with a word is applicable in the given sequence of words), while the shift-reduce parser operates by applying language-specific grammar rules to a given sequence of words. Because M is the more universally applicable system, all other things being equal, it will be preferred over the shift-reduce parser.

CONCLUSION

We have compared the shift-reduce parser using DCG and M, a categorial-grammar-based parser, noting their similarities and differences. Both are "bottom-up" parser with "top-down" prediction. The source of the prediction for the shift-reduce parser is its oracle and the principles of MA and RA. The source of M's prediction is the instantiation of types in the lexicon, and the search-space pruning tools, particularly "count invariance."

One of the advantages of M over the shift-reduce parser lies in its ability to treat any combination of words as a constituent. This

capability allows M to account for the constituency of sequences conjoined by Boolean particles, and to offer a left-to-right processing theory that accounts for our capability to provide semantic interpretations non-traditional constituents.

Another advantage of M is that it is a universal parser, one that can parse any language, provided that language has been encoded in a lexicon and the words of the language have been assigned categorial types. Any shift-reduce parser must rely on the language-specific rules of a DCG.

ENDNOTES:

1) A formal definition of a context-free grammar (Sudkamp, 47) follows: "A context-free grammar is a quadruple (V, Σ, P, S) where V is a finite set of variables, Σ is a finite set of terminal symbols, S is a distinguished element of V called the start symbol, and P is a finite set of rules. The sets V and W are assumed to be disjoint."

2) Note that it is traditional but not uncontroversial to specify S as the goal (or in the case of context-free grammars, as the distinguished element called the start symbol). As Brame (1979) points out, in addition to well-formed sentences (S_s), well-formed phrases (CP- Complementizer Phrase, NP- Noun Phrase, VP- Verb Phrase, PP- Prepositional Phrase, AP- Adjective Phrase) can also be grammatical. Any parser will have to be able to recognize all these phrasal types, perhaps, as Brame suggests, on a footing equal to S . However, exploring this issue would take us too far afield. Because M and DCG share the assumption that S is somehow a primary phrasal category and our aim here is to discover differences between M and DCG, it is not necessary to explore here this issue further.

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Verbal Syntax in English and Tamil
Jeff Roper

0. Introduction

Chomsky (1987) characterizes Grammar as a set of independent modules whose interaction determines linguistic structure. The goal of linguistic theory is to construct a model of the language faculty present in the mind/brain of a speaker (Universal Grammar or UG) from which the properties of any human language (Core Grammar) may be derived, subject to parametric variation of a minimal number of maximally general modules. However, the point at which Core Grammars diverge is not apparent a-priori. Specific claims regarding the source of cross-linguistic variation must be evaluated relative to the explanatory power they bring both to a theory of UG, and to theories of structure within the Core Grammars themselves. This paper examines English and Tamil, a Dravidian language spoken in southern India. Its goal is to explore the parameters which distinguish English and Tamil verbal syntax, and ultimately, to shed light on the broader characteristics shared by both languages.

1. V-Raising and I-lowering

Section 1 discusses I-lowering and V-raising languages. English is classified as I-lowering on the basis of the surface order of V in relation to VP-adjoined adverbs and Neg. While these tests are inconclusive in Tamil, other evidence supports a V-raising analysis of this language.

1.1. V-Raising and I-Lowering

Consider (1-3). The English main verbs (MV) follow the italicized elements in (1-2); French V precedes them. English auxiliaries (3) have the distribution of French V:

- (1) a. John often kisses Mary.
b. Jean embrasse souvent Marie.
- (2) a. *John likes not Mary.
b. Jean (n') aime pas Marie.
- (3) a. John has often kissed Mary.
b. John has not kissed Mary.

Emonds (1978) derives this contrast from obligatory V-raising past VP-adjoined adverbs and Neg to Infl in French. English V-raising is restricted to auxiliaries as in Emonds (1976). Thus, (1a-b), and (3a) may be assigned the rough D-structure in (4):

- (4) [_{IP}NP [_IAGR] [_{VP}Adv [_{VP}V...]]

French V and English auxiliaries raise past the adverb in (1b) and (3a) at S-structure. The English MV in (1a) cannot.

1.2. V-Raising in Tamil

The contrasts in (1-3) establish French as a V-raising language. A language in which MV cannot raise, such as English, is termed an I-lowering language here. Contrasts of this type fail to establish Tamil as either V-raising or I-lowering because of the complex nature of Tamil negation (see section 2) and because Tamil is head-final. Consider (5)¹:

(5) Jaan aTikkaTi Meeri-ye paa-kkr-aan
 John often Mary-acc see-pres-3sm
 "John often sees Mary."

(6) a. [_{IP}John [_{VP}often [_{VP}Mary [_vsee+AGR]] [_{rt}]]
 b. [_{IP}John [_{VP}often [_{VP}Mary [_{vt}]] [_rsee+AGR]]

(5) may have either of the structures in (6). However, the absence of post-verbal adverbs in Tamil suggests V-raising (Zagona, p.c.). This analysis is confirmed by the nature of Tamil auxiliatation, complementation, and binding.

1.2.1. Auxiliation and Complementation

The first argument for V-raising in Tamil is provided by the structure of Tamil auxiliatation and complementation. In Tamil, auxiliaries, complementizers, and certain lexical V's adjoin to their verbal complement at S-structure, producing (7):

(7)

$$\begin{array}{c}
 X^{\circ} \\
 / \quad \backslash \\
 V^{\circ} \quad \quad X^{\circ} \\
 \downarrow \quad \dots \quad \downarrow \\
 V \quad \quad \quad X
 \end{array}$$

Here, X = auxiliary, COMP, or the lexical V en "say". If (7) is produced by lowering, a marked option, lowering must occur on an improbably large scale.

The structure in (7) is from the analysis of Tamil Auxiliary Verb Constructions (AVC's) in Steever (1983). Aspectual auxiliaries combine with a preceding verbal participle. Modal auxiliaries combine with an infinitive. AVC's contrast with another complex verbal construction (CVC), composed of an MV preceded by a verbal participle specifying direction or manner. Components of a CVC may be disassociated within a clause by scrambling (8), components of an AVC may not (9) (examples from Lehmann (1989))²:

(8) a. kumaar naarkaali-(y)il nimir-ntu uTkaar-nt-aan
 Kumar chair-loc be upright-vbp sit-past-3sm
 b. kumaar nimir-ntu naarkaali-(y)il uTkaar-nt-aan
 Kumar be upright-vbp chair-loc sit-past-3sm
 "Kumar was sitting upright on the chair."

- (9) a. kumaar ippootu va-ntu iru-kkir-aan
 Kumar now come-vbp be-pres-3sm
 "Kumar has come now."
 b. *kumaar va-ntu ippootu iru-kkir-aan
 Kumar come-vbp now be-pres-3sm
 c. kumaar ippootu var-a veeNT-um
 Kumar now come-inf want-fut+3sn
 "Kumar must come now."
 d. *kumaar var-a ippootu veeNT-um
 Kumar come-inf now want-fut+3sn

The MV *va* "come" cannot separate from the aspectual auxiliary *iru* in (9b) or the modal *veeNTu* "must, should" in (9d). This follows if AVC's have the structure in (7), given a "weak" version of the lexicalist hypothesis which disallows movement of an element non-exhaustively dominated by X° (Baker 1988). Once the auxiliary and its verbal complement have merged at S-structure, the resultant complex X° may not be broken up by scrambling.

Like auxiliaries and modals, the lexical verb *en* "say" and its functional counterpart *enru* (Spoken: -N_{Nu}) form a complex X° at S-structure with their verbal complements. Though formally identical to the verbal participle of *en*, *enru* functions purely as a complementizer (Schiffman 1979). Both *en* and *enru* must immediately follow the V of the preceding clause at S-structure (R. Kothandaraman 1984). Lexical *en* (10) (Lehmann 1989) is then subject to a distributional constraint which does not generally apply to heads and their complements in Tamil (11):

- (10) a. kumaar [appaa neerru va-nt-aar] en-r-aan
 Kumar father yesterday come-pst-3sh say-pst-3sm
 "Kumar said that father came yesterday."
 b. *[appaa neerru va-nt-aar] kumaar en-r-aan
 father yesterday come-pst-3sh Kumar say-pst-3sm
- (11) a. anta puttakatt-ai naan paTi-tt-eeen
 that book-acc I read-pst-1s
 "I read that book."
 b. varu-v-eeen-N_{Nu} naan con-n-eeen
 come-fut-1s-comp I say-pst-1s
 "I said that I would come."

This follows if *en* fuses with its verbal complement beneath X° .

1.2.2. V-Raising to C and Binding

Fusion of auxiliaries and *en* with their verbal complements argues against an I-lowering analysis of Tamil. If the resultant complex X° 's are produced by marked syntactic lowering, lowering must occur on an improbably large scale. Evidence from binding theory confirms fusion of *enru* and its verbal complement at S-structure. More crucially, it confirms a raising analysis of Tamil.

Consider (12) (R. Vasu, p.c.)³:

(12) [Meeri tann-e patti nene-kka-lle-NNu] jaan nene-kkr-aan
 Mary self-acc about think-inf-Neg-C John think-pres-3sm
 "John thinks that Mary is not thinking about him/herself."

(see section 2 for a discussion of illai "be not") The third person reflexive taan refers to *Mary* or *John*. However, binding theory requires an anaphor to be bound in its governing category where, simplifying Chomsky (1981) slightly:

(13) β is the governing category for α iff β is the minimal category containing α , a governor of α , and a subject accessible to α .

As expected, the English equivalent of (12) does not allow *himself* in the embedded clause. However, suppose (12) has the rough structure in (14):

(14) John [_{CP}[_{IP}Mary [_{NEG}P[_{VP}[_{vt}] self] [_{NEG}t]] [_{it}]]
 [_Cthink+Neg+I+C]] thinks

(13) may be altered to require that a governing category contain all the governors of α (Baker 1988). Raising V to C then expands the governing category of *taan* to the next higher clause, allowing it to be bound by *John*. This correctly predicts (15):

(15) * [_{IP3}[_{IP2}[_{IP1}Meeri tann₁-e patti nene-kka-lle-NNu]_{IP1}
 Mary self₁-acc about think-inf-Neg-C
 jaan nene-kkr-aan-NNu]_{IP2} kumaar₁ nene-kkr-aan]_{IP3}
 John think-prs-3sm-C Kumar think-pres-3sm

"Kumar thinks that John thinks that Mary is not thinking about him (Kumar)."

taan cannot be bound by *Kumar* since its governing category is IP2. An I-lowering theory of Tamil has no account for this.

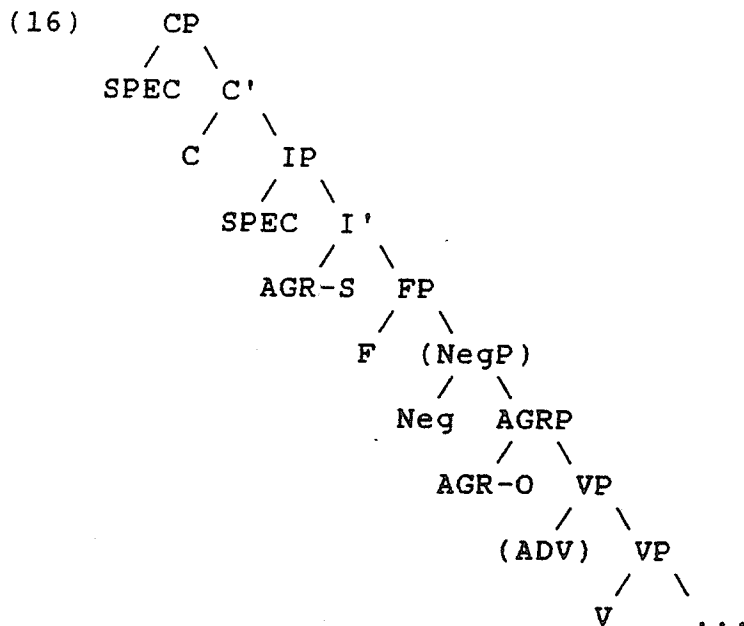
2. Clause Structure

Section 2 discusses the theory of structure in Chomsky (1988) and proposes a revised structure on the basis of evidence from Tamil negation. Contrary to Chomsky (1988), NegP is argued to dominate FP. This structure is shown to be consistent with English in section 4.

2.1. Chomsky (1988)

Following Pollock (1989), Chomsky (1988) derives the availability of V-raising from a parameter [\pm Strong]. English AGR is [-Strong]; it does not allow adjoined MV's to transmit θ -roles to their arguments. French AGR is [+Strong]. Raising MV

to AGR in English violates a Θ -criterion requiring arguments to bear a Θ -role (Chomsky 1980). Auxiliaries raise since they assign no Θ -role. Chomsky proposes the clause structure in (16):



AGR-S=subject agreement, F={±Finite}, and AGR-O=object agreement.

The theory of V-movement in Chomsky (1988) is based on the structure in (16). Traces left by movement are subject to an Empty Category Principle (ECP) which requires them to be properly governed. Roughly, a trace must be governed by a coindexed element, where α governs β iff α m-commands β , and no barrier intervenes between α and β , and:

- (17) α m-commands β iff α does not dominate β and every γ , γ a maximal projection, that dominates α dominates β . (Chomsky 1986b)

Consider (18a) with the relevant structure in (18b):

- (18) a. *John not saw Bill
 b. [_{IP}[_{It}] [_{FP}[_{Ft'}] [_{NegP}[_{Negneg}] [_{AGRP}[_{AGrt''}]
 [_{VP}[_{VV+(AGR-O)+F+AGR-S}]]]]]]

Lowering in (18) violates the ECP and must be "reconstructed" by raising at LF. Assume that Neg is a barrier. Raising to I leaves a V-trace in AGRP which cannot be properly governed across Neg, triggering an ECP violation. French V and English auxiliaries raise past Neg at S-structure, leaving an AGR-O trace in AGRP. Adapting Lasnik and Saito (1984), this trace may properly govern a trace beneath VP at S-structure and be deleted at LF since it plays no role at that level. Since English MV cannot raise at S-structure, do must be inserted in the modal position of (18b) if this structure is to satisfy the ECP.

2.2. Tamil Negation and Clause Structure

While (16) is consistent with English, Tamil negation supports an alternative structure in which NegP dominates FP. This alternative accurately predicts the relative order of morphemes expressing tense, negation, and agreement in Tamil. In addition, it provides an explanatory account of *il*-insertion, and the distribution of overt and non-overt tense and negation in Tamil negative constructions.

2.2.1. A Brief Typology of Tamil Negative Constructions

Following Lehmann (1989), negation is expressed in one of three ways. The first is by affixation of a negative verbal suffix = 0/-aa(t). Null Neg appears in the future negative animate (19a) with the modal *maaTTu* "will" marked for the appropriate person, number, and gender (PNG). -aa appears after an infinitive in the future negative neuter (19b):

- (19) a. naan var-a-maaTT-*een*
I come-inf-will-1s
"I won't come."
b. bassu mature-kki poo-k-aa-tu
bus Madurai-dat go-inf-Neg-3sn
"The bus won't go to Madurai."

-aa(t) also occurs in verbal participles, imperatives, adjectival participles, and verbal nouns.

The second type of negative construction contains the lexical verb *il* "be not":

- (20) a. kumaar vakkiil
Kumar lawyer
"Kumar is/was a lawyer."
b. kumaar vakkiil illai
Kumar lawyer be not
"Kumar is/was not a lawyer."

il may be past or present and bears the remnant of a no longer productive 3pln marking (-ai, spoken: -e).

Finally, negation may be expressed by auxiliary *il* following an infinitive:

- (21) avan var-a-lle
he come-inf-be not
"He didn't come/isn't coming."

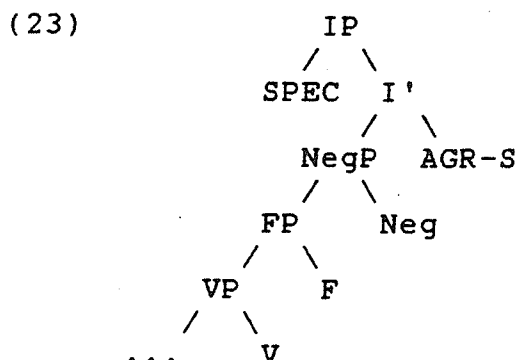
Like auxiliaries, *illai* must immediately follow V and appears to be fused with V beneath X⁰ at S-structure (Lehmann 1989).

2.2.2. Future Negatives and Clause Structure

Assuming with Baker (1985) that morphological derivations directly reflect syntactic derivations, the position of Neg in the future negative animate (22a) and inanimate (22b) should provide an indication of the position of NegP in a clause:

- (22) a. vara-maaTT-0-een "(I) won't come"
 come-will-Neg-1s
 [V+F+Neg+AGR]
- b. pook-0-aa-tu "(It) won't go."
 go-F-Neg-3sn
 [V+F+Neg+AGR]

The infinitive is analyzed as a combining form rather than a true infinitive. (22a) contains null Neg. (22b) contains a null modal or future tense. Since *maaTTu* attributes volition to its subject it generally does not occur with inanimates (Lehmann 1989). Assuming with Chomsky (1955-) and Pollock (1989) that modals are generated within F, (22a-b) support (23):



where, contrary to Chomsky (1988), NegP dominates FP.

2.2.3. Tamil Negation and Morphological Subcategorization

The structure in (23) is consistent with analysis of the Tamil future negative animate and inanimate in (22). In addition, it allows an explanatory account of the distribution of overt and null morphemes in Tamil negatives and of *il*-insertion. Here, *illae* is assigned the structure [V+F+Neg+AGR]. *il* is an "empty" V inserted in F to satisfy morphological requirements of Neg and AGR. Thus, auxiliary *il* has the distribution of tense; it occurs after V and modals which are productively inflected for tense. Like a modal, it triggers the infinitival form of V. "Lexical" *il* is discussed below. Note that the purely syntactic requirements which trigger *do*-insertion in Chomsky (1988) cannot trigger *il*-insertion since Tamil is a V-raising language.

Following Baker (1989), Lieber (1983), and Marantz (1984), affixes are distinguished from full words by the addition of a morphological subcategorization frame in their lexical entries.

This frame specifies the elements to which an affix may adjoin and its position relative to these elements. Tamil tense, Neg, and AGR are assigned the frames in (24):

- (24) a. Tense: V _____
 b. Negation: V _____
 c. P-AGR: F _____

V = V, modal or *il* and the items in (24) must be overt. (24) assumes a division of Tamil AGR into P(roductive)-AGR and D(efault)-AGR, where D-AGR = neuter agreement. D-AGR is allowed broader distribution than P-AGR.

Given (24), consider (25):

- (25) a. [V+F+Neg+AGR]
 b. [V+Modal+Neg+AGR]

In (25a), Neg must adjoin to V, but cannot. AGR must adjoin to F, but cannot. Adapting a proposal in Emonds (1985), this conflict may be resolved by morphological subcategorization across a single null element. In (25a), there are two solutions: 1) F may be null, or 2) *il* may be inserted in F. If F is null, D-AGR adjoins to Neg, yielding the future negative animate (26a). If *il*-insertion occurs, *il* may select the PNG *-ai* across null Neg yielding the past/present negative (26b). Modals which productively bear tense show similar contrasts in (27):

- (26) a. pook-0-aa-tu
 go-F-Neg-3sn
 b. vara-ll-0-e
 come-il-Neg-ai
 (27) a. vara-muTiya-lle
 come-be able-il-Neg-3sn
 "(x) was not able to come."
 b. vara-muTiy-aa-tu
 come-be able-Neg-3sn
 "(x) can not come. (habitual)" (Schiffman 1979)

Failure of *il*-insertion in the future habitual (27b) must follow from aspects of the future not captured here. (25b) contains a modal not productively inflected for tense. This structure produces the forms in (28):

- (28) a. vara-maaTT-0-eeen
 come-modal-Neg-1s
 b. vara-kuuT-aa-tu
 come-join-Neg-3sn
 "X must not come."

In (28a) *maaTTu* selects P-AGR across null Neg. The modal *kuuTu* "join" in (29b) never selects P-AGR. Thus, overt Neg occurs and combines with D-AGR.

Insertion of "lexical" *il* in (20b) and negative adjectival participles like (29) follows:

- (29) ... *ill-aat-a uur*
 il-neg-adj town
 "A town which is not ..."

Since these structures do not contain overt V, *il* must be inserted to meet the requirements of Neg. The adjectival element (-a) occupies C in the embedded clause (R. Vasu, p.c) and triggers null AGR in negated and non-negated structures.

3. Constraints on Auxiliary Order and Tense Construal

Section 3 discusses constraints on auxiliary order and tense construal noted in Zagona (1988). Contrary to Zagona's analysis, auxiliary order is derived from aspectual properties of individual V's. Constraints on tense construal follow from scope relations at LF.

3.1. Zagona (1988)

In contrast to section 2, Zagona (1988) assumes a dual-headed I dominating Tense and AGR. Infl assigns Temporal roles corresponding to basic temporal entities of Reichenbach (1947). Infl may assign the T-roles (S(peech time)) and (E(vent time)) to the SPEC of CP and VP respectively, or Infl may assign the T-role (R(eference time)) to an indirect object headed by *have*. *Have* then assigns its complement the T-role (E). VP must be licensed by predication and subcategorization. Zagona's proposal is based on the theory of government in Chomsky (1986b), where:

- (30) α governs β iff α m-commands β and there is no γ ,
 γ a barrier for β , such that γ excludes α .

"Barrier" is defined as in (31):

- (31) ϕ , ϕ a maximal projection, is a blocking category
 for β , iff ϕ dominates β , and ϕ is not L-marked.

- μ , μ a maximal projection, is a barrier for β iff:
- a. μ immediately dominates a blocking category for β , or
 - b. μ is a blocking category for β , $\mu \neq IP$

and:

(32) Where α is a lexical category, α L-marks β iff β agrees with the head of γ , that is \ominus -governed by α .

A category agrees with itself and its head, The condition on \ominus -government is in (33):

(33) α \ominus -governs β iff α is a zero-level category that \ominus -marks β , and α , β are sisters.

In addition, Zagana proposes (34):

(34) A non-defective V^0 does not T(emporally)-agree with its maximal projection.

(34) assumes, roughly, that non-defective VP bears the index of a series of discrete events denoted by V. By (34), lexical V may not L-mark its VP via agreement. As a result, English MV cannot raise past VP. In V-raising languages, [+Tense] \ominus -marks its X^0 sister [V+AGR] after V-raising rather than its XP sister. VP is L-marked by Agreement with the nominal features of AGR.

3.1.1. Auxiliary Order

The appeal of Zagana's proposal lies in its ability to predict a broad range of empirical data relating to verbal syntax which is frequently ignored. Her theory derives constraints on auxiliary iteration which do not clearly follow from either Pollock (1989) or Chomsky (1988). In addition, it provides a syntactic basis for tense construal and cross-linguistic variation in tense construal discussed in 3.1.2.

Auxiliary order is constrained by the same principles which constrain movement. Consider (35):

(35) [X_1 [$VP_1 V_1 \dots$]]

The head-head agreement rule (35) applies obligatorily to aspectual auxiliaries. As in Chomsky (1986b), feature assignment is taken as a form of indexation. X and V may be coindexed provided that no barrier intervenes. Consider (36):

(36) a. that book has [VP_2 been [VP_3 being [VP_4 read]]]
b. *that book is [VP_2 having [VP_3 been [VP_4 read]]]
c. *that book has [VP_2 been [VP_3 being [VP_4 been [VP_5 read]]]]

(36a) has the rough structure in (37):

(37) [IP [I has $_1$] R [VP_1 t $_1$ E [VP_2 been $_1$ [VP_3 being $_j$ [VP_4 read $_j \dots$]]]]]]

VP_1 is licensed and L-marked by the T-role (R) assigned by I. Have may raise past VP_1 and coindex with I. Have assigns the role (E) to VP_2 , licensing VP_2 and allowing coindexation of have and be. Assuming that indirect \ominus -assignment is possible if both

assigner and assignee are dominated by the same lexical projections, coindexation of *have* and *be* allows *have* to indirectly \ominus -mark VP3. Affixation of the passive participle to MV produces a temporally-defective VP, permitting passive *be* to coindex with the head of VP4. VP3 is interpreted as segment of VP4 and the entire complex is licensed by indirect \ominus -assignment. In (36b), VP2 cannot be L-marked since *be* assigns no T-role or agreement features. Coindexation of *have* with *be* cannot apply across VP2, and the structure is ruled out. In (36c), *be* in VP2 cannot L-mark VP3. Since the heads of VP2 and VP3 cannot coindex, VP4 cannot be indirectly \ominus -marked.

3.1.2. Tense Construal

In addition to constraining auxiliary order, Zagana's theory provides a syntactic basis for tense construal. Following Partee (1973) and Eng (1987), Zagana characterizes times as entities. Thus V, like N, requires a \ominus -role. The relational feature [\pm Past] restricts binding relations between S(peech time) in the SPEC of CP and other temporal arguments of Infl (Zagana 1990):

(38) [+PAST] = [-Anaphor], [-Pronominal]

(39) a. [-PAST] = [-Anaphor], [+Pronominal]

b. [-PAST] = [+Anaphor], [-Pronominal]

c. [-PAST] = [-Anaphor], [-Pronominal]

Following Chomsky (1981), Binding Principle A requires an anaphor (39b) to be A-bound in its governing category. Principle B requires a pronoun (39a) to be A-free in its governing category. Principle C requires an R-expression (38, 39c) to be A-free (in the domain of the head of its chain). An element is A-bound if it is co-indexed with a c-commanding element in an argument position, otherwise it is A-free.

Consider (40) and (41):

(40) a. John sings (Generic present; *present-moment event)

b. Juan canta (Generic present; present-moment event)

(41) a. John is singing (Present-moment construal)

b. Juan está cantando (Present-moment construal)

(40a) and (40b) have the respective structures (42a) and (42b):

(42) a. [_{CP}S [_{IP}John [_IINFL] [_{VP}V]

b. [_{CP}S [_{IP}Juan [_IV+INFL] [_{VP}t_j]

In (42a), VP's governing category is IP since IP contains a governor of VP (Infl), and a subject (*John*). VP cannot be bound in IP and is assigned the features [-Anaphor], [+Pronominal]. Since VP cannot be bound by S, (42a) fails to provide a present-moment reading. V-raising in (42b) expands VP's governing category to CP. VP may either be bound by S in accordance with

Principle A, or be free in CP in accordance with Principle B. The present moment interpretations of (41a-b) follow. Like Spanish, Tamil allows a present-moment interpretation of the simple present (Lehmann 1989). [+Past] VP is an R-expression which satisfies Principle C by preceding speech time. [-Past] VP is assigned the features in (41c) when A'-bound by modals or adverbial elements, producing a future reading.

3.2. Auxiliary Order and Tense Construal Revisited

The theoretical framework in Zagana (1988) provides a syntactic basis for constraints on auxiliary order and tense construal. However, it fails to account for the effects of the aspectual properties of individual verbs on the distribution and interpretation of auxiliaries. The remainder of section 3 outlines an initial attempt to capture these effects in a manner which retains Zagana's insights. The theory offered here is consistent with the structure presented in section 2 and the theory of movement in section 4.

3.2.1 Tamil "iru"

The effect of the aspectual properties of individual verbs on the interpretation of auxiliaries is particularly clear in the case of the Tamil auxiliary *iru* "be". The discussion of Tamil auxiliaries here is restricted to their temporal properties. Its examples and analyses are from Steever (1983). Its intent is to provide a foundation for the alternative theory of auxiliary order which follows.

Consider the contrasts in (43):

- (43) a. kamalaa taTi-ttu iru-kkir-aaL
 Kamala be fat-vbp be-pres-3sf
 "Kamala is fat."
 b. kumaar tiNNai-(y)il uTkaar-ntu iru-kkir-aan
 Kumar porch-loc sit-vbp be-pres-3sm
 "Kumar is sitting/has sat on the porch."
 c. avan ceNNai-kku(p) pooy iru-kkir-aan
 He Madras-dat go(vbp) be-pres-3sm
 "He has gone to Madras."

In (43a), *iru* combines with the stative verb *taTi* "be fat", producing a present progressive. In (43b), *uTkaar* "to sit" is either stative or an accomplishment. The former reading produces a present progressive, the latter produces a present perfect. In (43c), *iru* combines with an accomplishment *va* "come". The result is a present perfect. Steever notes that these interpretations follow if *iru* requires a process to be regarded over an interval. In the case of accomplishments and achievements, this interval extends past an implied change of state. The result is an interval in which an activity prior to the present culminates in

a change of state, or the present perfect. Since states and activities do not imply a change of state, combination with *iru* produces a progressive reading.

The structure *MV+koL+iru* produces a progressive reading regardless of the aspectual characteristics of *MV*:

- (44) kumaar tiNNai-(y)il uTkaar-ntu koN-Tu iru-kkir-aan
Kumar porch-loc sit-vbp hold-vbp be-pres-3sm
"Kumar is sitting on the porch."

Steever argues that auxiliary *koL* "hold" focuses on an activity or process prior to a change of state implied by *MV*. This analysis is supported by examples like (45):

- (45) avan kuLi-ttu(k) koN-Tu paaT-in-aan
he bathe-vbp hold-and sing-pst-3sm
"While bathing, he sang."

where *MV+koL* produces an imperfective participle (however, see Schiffman 1979:41).

Finally, auxiliary *iru* contrasts with the "completive" auxiliary *viTu* "leave" in (46):

- (46) a. avar oru taTavai va-ntu iru-kkir-aar
he one time come-vbp be-pres-3sh
"He has come here once."
b. avar oru taTavai va-ntu viT-T-aar
he one time come-vbp leave-pst-3sh
"He has come here once."

Both produce a perfective reading, however, (46a) is used to refer to a visit by an important person, implying current relevance of a past event. (46b) does not imply current relevance; it is used to describe an unwanted visit.

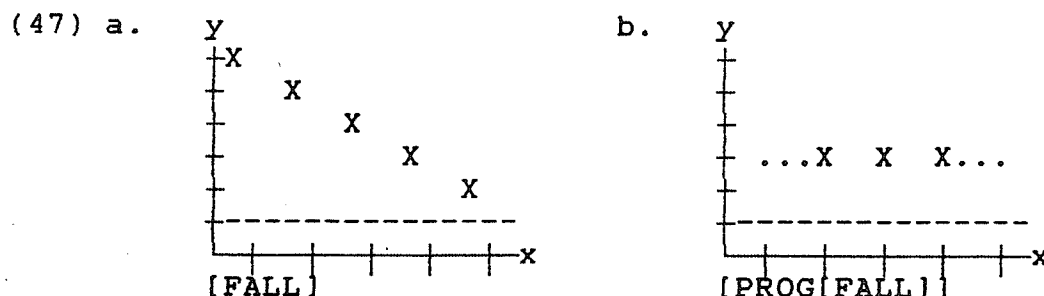
3.2.2. Deriving Auxiliary Order in English

In Steever's analysis, the output of *V+Auxiliary* is dependent on the aspectual properties of *V*. Following Langacker (1979), structures like **John is resembling Bill* may be ruled out if the aspectual properties of *resemble* do not fall within an appropriate domain for progressive *be*. Langacker's theory is adapted here to predict the constraints on auxiliary order noted in Zagona (1988). The primary departure from Langacker's analysis is based on the similarity of the perfect and progressive implied by Steever's analysis of *iru*.

Langacker divides verbal predicates into three broad aspectual classes: 1) "imperfective processes", 2) "perfective processes", and 3) "states". On a time line these are represented as: 1) a full line extending indefinitely in either

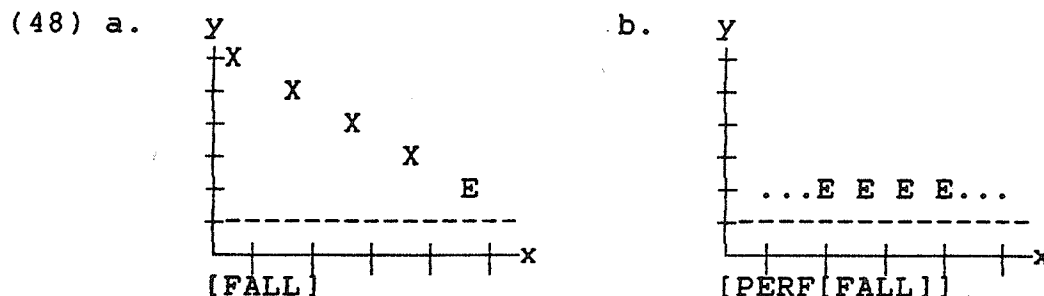
direction, 2) a line segment with boundaries and finite length, and 3) a point with zero length. Perfective processes involve a change through time along a second dimension(s) on a y-axis. This dimension may be space (hit), or a more abstract dimension such as cognition (examine). Imperfective and stative predicates have 0-extension along the y-axis.

Roughly following Langacker, be V-ing (PROG) provides indefinite temporal extension to an arbitrary point within V:



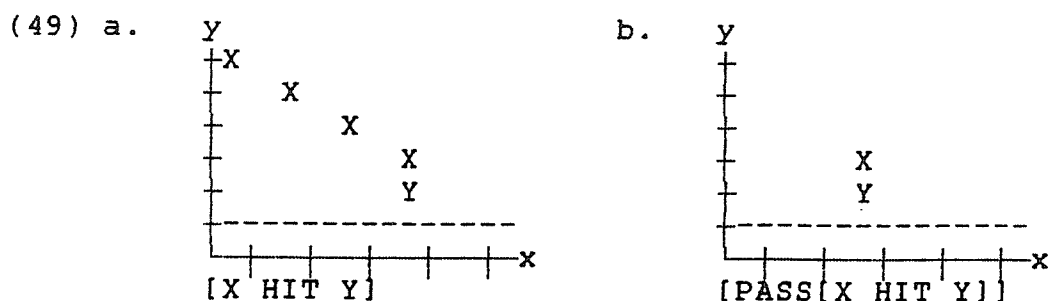
The x-axis is time, the y-axis represents vertical position. "Iterative" interpretations of PROG, for ex: *someone is falling out of that window every day*, follow here from "temporal perspective": the output of PROG need only be continuous at some value for the divisions along the x-axis.

Langacker argues that the perfect (PERF) produces a state with 0 temporal extension. Here, PERF provides the end point of a perfective process with indefinite temporal extension as in (48):



E = end-point. (48b) is similar to the progressive in (47b). Tamil *iru* and English *have operate* as in (48). However, *iru* simply provides indefinite temporal extension to an arbitrary point within an imperfective process, producing the progressive. *Have* identifies this point as an end-point (or, following Zagana (1990), [+complete]). This analysis captures the "current relevance" of the perfect noted in Zagana (1990) and illustrated with *iru* in (46).

Following Zagana (1988), the passive participle (PASS) forms a derived state:



where x-axis = space. *Be* provides indefinite temporal extension to the state in (49b).

Given this analysis, reconsider the contrasts in (36):

- (50) a. that book has [_{VP2}been [_{VP3}being [_{VP4}read]]]]
 b. *that book is [_{VP2}having [_{VP3}been [_{VP4}read]]]]
 c. *that book has [_{VP2}been [_{VP3}being [_{VP4}been [_{VP5}read]]]]]

In (50a), *PASS* reduces *read* to a state which is given temporal extension by *be* in *VP3*. *PROG* gives temporal extension to a point internal ([-complete]) to *VP2*. Note that *PROG* cannot occur in structures like **John is being fat*, or **John is resembling Bill*. This follows if temporal extension of inherently stative elements produces a line of [+complete] points; *PROG* must select a point which is [-complete]. Finally, *have* gives temporal extension to an arbitrarily selected end-point within *VP2*, producing a result state. *PROG* cannot apply to *VP2* in (50b) since the output of *PERF* is [+complete]. The addition of *be* in *VP3* of (50c) is vacuous; it redundantly provides temporal extension to *VP2*.

3.2.3. Tense Construal and Raising at LF

The preceding theory of aspect derives constraints on auxiliary order and iteration from aspectual properties of individual V's. In addition, it provides constraints on possible auxiliary+MV constructions which cannot follow from Zagana (1988). However, this theory should also be consistent with properties of tense construal which follow from Zagana's theory. Recall that Zagana attributes contrasts like (51) to the expansion of V's governing category by raising (Lehmann 1989):

- (51) a. kumaar ippootu tuunku-kir-aan
 Kumar now sleep-pres-3sm
 b. *Kumar sleeps now

This contrast follows here from the availability of quantifier movement at LF.

Following Higginbotham (1987) and Speas (1990), F binds an event position (e) within the lexical entry of V. The event position is parallel to the argument position in nouns which must be bound by a determiner (D). The similarity between events and

nominals in Zagana (1990) follow if F, like D, determines the referentiality of an event (IP). [+Past], like [+Def] in D, produces a referential expression. Binding of e by a modal produces a future reading. Binding of e by non-modal [-Past] gives a present reading. (51) follows if C acts as an existential temporal quantifier. Here, C assigns the T-role (E) to its complement, asserting that the event IP holds at some time. Specific tense readings occur in LF structures in which F has scope over (c-commands) C (52a). Constructions in which C has scope over F receive generic interpretations (52b):

- (52) a. [[V+F+AGR][C]]_c
 b. [[C][V+F+AGR]]_c

Following Pesetsky (1985), quantifier scope applies beneath X⁰. C may bind a variable by adjoining to itself at LF. (52a) asserts that there is at least one event [V+F+AGR] which holds at a specified value for C. (52b) asserts that for some value of C, there is an event [V+F+AGR]. In the English simple present, a specific reading (52a) cannot be obtained since [V+F+AGR] cannot raise to C. As in Hornstein (1984), referential expressions ([+Past]) always have wide scope. Thus [+Past] expressions always receive a specific interpretation.

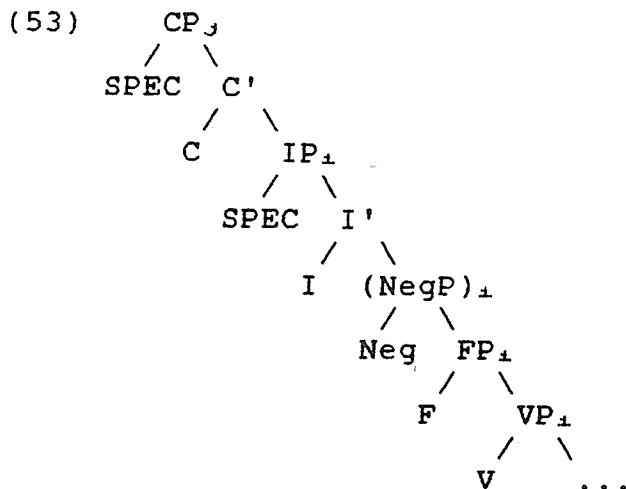
4. Deriving Constraints on Movement

Section 2 proposes a revision of the clausal structure in Chomsky (1988) in which Neg dominates FP. Section 3 proposes a theory of auxiliiation which derives auxiliary order and interpretation from aspectual properties of individual V's. Section 4 attempts to construct a theory of government and V-movement which is consistent with these proposals.

4.1. Indexation and the [\pm Strong] Parameter

The characterization of movement developed here rest crucially on the theory that the features of a lexical category percolate up through the functional categories which dominate it. This theory is advanced in Abney (1987) and Di Sciullo and Williams (1987). Abney argues that functional categories, unlike their lexical counterparts, are licensed by "passing on" the descriptive content of a complement via f-selection. Di Sciullo and Williams posit an element *f* (functor) in argument structures of functional elements which indicates that these elements "inherit" the argument structure of the elements with which they combine.

Given this theory, reconsider the structure proposed in section 2:



The index of V percolates to IP, but not CP since C is a Θ -assigner which does not pass along the descriptive content of V; it expresses a proposition rather than an event. This structure is problematic since it does not allow deletion of an AGR-O trace beneath Neg in V-raising languages as in Chomsky (1988). However, movement past Neg may be permitted if coindexation with V somehow renders Neg "indistinct" from V. Index percolation also allows the [\pm Strong] parameter of Pollock (1989) to be associated with a head's ability to pass along L-marking via agreement.

In the framework here, C Θ -marks IP. Indexation of [\pm Strong] AGR with VP and intervening functional categories results in L-marking. [-Strong] AGR cannot pass along L-marking. Note that this theory avoids the apparent circularity of the association of [\pm Strong] with a head's ability to pass along the Θ -roles of an adjoined head. Recall that in Tamil, V may raise through F, Neg, I, and C. In the Pollock (1989)/Chomsky (1988) framework, all of these heads must be [\pm Strong]. However, the only motivation for this assumption is the fact that these elements allow adjunction of lexical V. If [\pm Strong] AGR L-marks VP and intervening categories, V-raising may occur in languages with [\pm Strong] AGR. Still, this theory does not allow auxiliary raising in languages with [-Strong] AGR, or in infinitival constructions which bear [-Strong] AGR. This problem is resolved here by a revision of the theory of government in *Barriers* (Chomsky 1986b) discussed in section 3.

4.2. An Alternative Notion of "Barrier"

The theory of indexation outlined in 4.1. potentially allows the association of the [\pm Strong] parameter with a functional head's ability to transmit L-marking via agreement. Functional heads inherit the index of their complements. A [\pm Strong] category passes on L-marking to a category whose index it receives. A [-Strong] category cannot. This predicts the availability of V-raising in structures with [\pm Strong] AGR; C L-

marks IP and, via transmission, VP and any intervening functional categories.

The problem with this theory is that it does not allow auxiliary raising in constructions with [-Strong] AGR, since VP cannot be L-marked. This is resolved by the definition of "Barrier" in (54):

(54) Φ , ϕ a maximal projection, is a blocking category for β , iff ϕ dominates β and ϕ is functionally distinct from β .

μ , μ a maximal projection, is a barrier for β iff μ is a blocking category for β and:
a. μ is not L-marked, or
b. μ immediately dominates γ , γ a blocking category for β .

where:

(55) Φ , ϕ a maximal projection, is functionally distinct from β iff:
a) ϕ is a \ominus -position,
b) the head of ϕ does not discharge a \ominus -role in β , and
c) β does not agree with a \ominus -position γ ,
 γ functionally non-distinct from ϕ .

A \ominus -position is any position which either assigns or receives a \ominus -role. Following Rizzi (1987):

(56) A non-pronominal empty category must be
(i) canonically head-governed, and
(ii) antecedent governed or \ominus -governed.

By (55), only \ominus -positions are relevant in constraining movement.

Consider the predictions this theory makes in (57):

(57) who_1 does John think [_{CP}(that) [_{IP}Mary [_{VP}likes t_1]]

t_1 is \ominus -governed by like. However, the reference to \ominus -government in (56ii) may be eliminated given (54). VP cannot block movement of who since it assigns a \ominus -role to who . Who may then raise to the SPEC of CP. Since C L-marks IP, IP is not a barrier for movement to the SPEC of CP. However, movement across CP is barred since CP would inherit barrierhood from IP which is functionally distinct from who . CP is L-marked by $think$, and is not a barrier. By SPEC-head agreement, who agrees with C. C is not functionally distinct from V, and so the matrix VP is not a barrier for who . The matrix IP is L-marked, and thus not a barrier. The ungrammaticality of (58) follows:

(58) * how_1 did John know [_{CP}which car [_{IP}to fix t_1]]

Assuming with Rizzi (1987) that manner adverbials are generated within VP, how must adjoin to VP. Given adjunction only to non-arguments (Chomsky 1986b), how must raise across CP, which inherits barrierhood from IP. The resultant structure violates the ECP. Note that these contrasts follow regardless of the number of functional categories intervening between IP and VP. Following Rizzi (1987), *that-t constructions are ruled out by the exclusion of that from the set governing heads.

Consider the predictions this theory makes regarding V-movement in a language with [-Strong] AGR. Recall that [-Strong] AGR cannot L-mark another category via agreement. Raising lexical V violates the ECP since VP is functionally distinct; its head does not discharge a Θ -role in V. Auxiliaries may raise since they do not assign or receive Θ -roles; their projections cannot be barriers or blocking categories. Adapting proposals in Emonds (1985) and Zagana (1988), unmoved V may be marked for tense and agreement by a morphological reflex of coindexation between IP, FP, and VP. Do-insertion is triggered by the intervention of NegP between IP and FP. Realization of phrasal indexing on V obeys a constraint similar to that imposed on affixation; it requires adjacency (immediate domination).

5. Final Remarks

The preceding sections attempt to construct a theory of verbal syntax which derives contrasts between English and Tamil from a minimal set of parameters. These contrasts are argued to follow, primarily, from differing morphological subcategorization requirements and a [+Strong] parameter associated with AGR. In order to minimize parametric variation, revisions in theories of structure and structural relations which are required by Tamil have been adopted for English. For example, Tamil is argued to require a clausal structure in which NegP dominates FP. Since this structure is shown to be consistent with English, it is assumed to be common to both languages. It should be noted, however, that many of the specifics of this theory require further refinement. For example, the definition of barrier in section 4 is clearly redundant in some sense. The requirement that an element be functionally non-distinct and, in addition, be L-marked in order to allow movement presumably follow from a broader generalization not captured here.

Notes

1. Glosses in this text contain the following abbreviations:

acc	= accusative	neg	= negation
C/comp	= Complementizer	pl	= plural
dat	= dative	pres	= present
f	= feminine	pst	= past
fut	= future	s	= singular

h	= honorific	vbp	= verbal participle
inf	= infinitive		
loc	= locative	1	= first person
m	= masculine	2	= second person
MV	= main verb	3	= third person

2. This text contains examples from Literary (LT) and Spoken Tamil (ST). Examples from Steever (1983) and Lehmann (1989) are from LT. All others are from ST. While LT and ST may vary in form and interpretation, the general observations made here hold in both. Elements whose forms differ significantly in the examples provided are identified within the text.
3. The binding relations in (12) do not require that the matrix and embedded V be identical. Thus (i) has either of the interpretations in (ii) (Lehmann 1989):
- (i) kumaar [raajaa tann-ai parri(p) peec-in-aan enrul
Kumar Raja self-acc about talk-pst-3sm that
ninai-tt-aan
think-pst-3sm
- (ii) a. "Kumar_i thought that Raja talked about him_i."
b. "Kumar thought that Raja_i talked about himself_i."
- (iia) is the favored interpretation of (i) (R. Vasu, p.c.). Addition of the "reflexive" auxiliary koL to the embedded V unambiguously produces the interpretation in (iib). There are other constraints on binding in Tamil which are not treated here. See Mohanan (1984), Williams (1984), and Speas (1989) for a discussion of similar constraints in Malayalam.
4. Note, however, that I do not claim that Zagona (1988) cannot be adapted to a structure of the type proposed either in Chomsky (1988) or in this paper. The alternative theory proposed here is motivated by a desire to provide a unified account of the phenomena noted by Zagona and apparently related phenomena discussed in 3.2.1 and 3.2.2.

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A Feature Geometry for ASL

Lorna Rozelle

1. Introduction

This paper proposes a partial feature geometry for signs in American Sign Language (ASL) following the feature geometries for spoken languages developed by Clements (1985) and Sagey (1986). Special attention is paid to the representation of "two-handed" signs, especially the signs labeled Type 2 in Battison's (1978) typology. I emphasize that this feature geometry is partial; many aspects of the geometry will be undeveloped, but the nodes proposed will be defended on the basis of known phonological processes.

1.1 Elements of phonological representation

Stokoe, Casterline and Croneberg (1976) proposed three aspects in which an ASL sign can minimally contrast with another sign: *handshape*, *movement*, and *location*. Battison (1978) and Frishberg (1975) suggested a fourth aspect: *orientation*. Signs can also contrast in a fifth aspect: *number of hands*.

- (1) Handshape: the configuration of the hand or hands
- Movement: the movement of the hand or hands during the formation of a sign
- Place: the location where the sign is made, either in space or on the body
- Orientation: the orientation of the hand or hands
- Number of hands: whether a sign is made with one or both hands

Note that it does not matter whether a sign made with only one hand is made with the right hand or the left hand. If a sign is made with two hands, one hand will be strong, or dominant, and the other weak, or non-dominant. The strong hand is the right hand for right-handed people and the left hand for left-handed people.

Examples of contrast in the five aspects noted in (1) are given in (2).

(2)	a.	Handshape:	BECOME CHANGE	B handshape X handshape
	b.	Movement:	SHORT NAME	side to side movement up and down movement
	c.	Place:	POLITICS PHONOLOGY	temple ear
	d.	Orientation:	NAME CHAIR	palms facing each other palms down
	e.	Number of hands:	LIKE INTERESTING	one hand two hands

1.2 Phonological processes

1.2.1 Handshape assimilation

The elements of phonological representation participate in phonological processes. Handshape can assimilate from one hand onto the other hand. According to Frishberg (1975), signs historically made with one handshape on one hand and a different handshape on the other tend to evolve into signs made with the same handshape on each hand. For example, according to Long (1918), the sign *DEPEND* used to be made with the strong G-hand articulated on the weak B-hand, that is, the strong hand had the same handshape as the letter G in the ASL alphabet, and the weak hand had the same handshape as the letter B.¹ The handshape of the strong hand spread onto the weak hand, so that the sign is now made with the G handshape on both hands.

Handshape can also assimilate from one part of a compound onto another. The sign *HOME* is a compound of the signs *FOOD*, which has the O handshape articulated at the lower cheek, and *BED*, which has the B handshape articulated at the upper cheek. The compound *HOME* touches first the lower cheek and then the upper cheek but uses the O handshape at both points of articulation. Thus the O handshape spreads from the first part of the compound to the second part.

¹ ASL and many other sign languages have a manual version of the alphabet that consists of a different handshape and/or movement for each letter. The handshapes used in ASL are usually denoted by the name of the letter with that handshape. Diacritics are used if the handshape is a variant of a letter's handshape. If a particular ASL handshape corresponds to the sign for a numeral in ASL rather than to a letter, that numeral denotes the handshape, e.g., 3 or 5. The number of basic handshapes used in ASL is controversial; Stokoe, et. al. (1976) lists nineteen. Since this paper does not address the internal configuration of the Handshape, Orientation, Place, or Movement nodes I use Stokoe's symbols as a convenient and well-known notation.

1.2.2 Movement assimilation

Movement can spread from one hand onto the other hand. For example, in the sign TRUCK, both hands have the same handshape and orientation, but the strong hand moves while the weak hand remains still. According to Battison (1978), children often make a mistake when learning this sign. Instead of moving only the strong hand, they move both hands.

1.2.3 Place of articulation metathesis

Place of articulation participates in an example of metathesis (Battison, 1978). DEAF is signed by first touching the upper cheek and then the lower cheek with the G-hand. When this sign is preceded by a sign articulated on the lower part of the face, such as MOTHER, the metathesis occurs, so that the G-hand first touches the lower part of the face and then the upper.

1.2.4 Orientation assimilation

Orientation can also assimilate from one part of a compound onto another. TOMATO is a compound of RED, which is made with the palm toward the body, and CUT, which is made with the palm away from the body. In TOMATO, the palm faces away from the body for both parts of the compound, so that the orientation of the second part of the compound spreads to the first part of the compound. For another example of the spreading of orientation, consider the two synchronic forms of SISTER, which is also a compound. The formal sign consists of the feminine morpheme, in which the palm faces left, and the sign for SAME, in which the palm faces down. The more colloquial sign consists of the same feminine morpheme but with an altered form of the second sign: the handshape of SAME has been retained, but the orientation has assimilated to that of the feminine morpheme so that the palm faces left. (There is an accompanying change in the contact between the hands.)

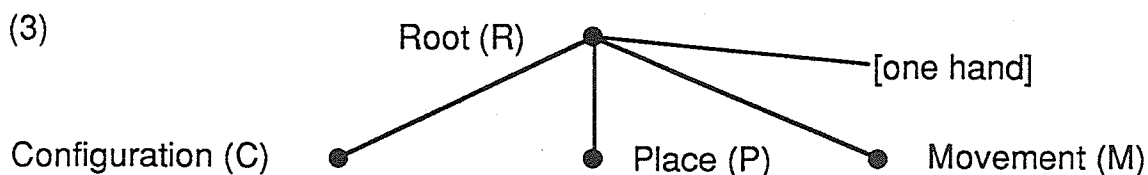
1.2.5 Number of hands assimilation

Finally, the number of hands used participates in phonological processes. According to Frishberg (1975), signs using only one hand tend to evolve into signs using two hands. For example, HURRY used to be made with only one hand (Long, 1918), but now HURRY is made with both hands having the same handshape, orientation and movement. Another example is an optional sandhi rule which makes a two-handed sign into a one-handed sign when it follows a one-handed sign. For example, in the sentence DOG † I HAVE, 'I have a dog', DOG and I are one-handed signs.² HAVE is a two-handed sign which can be one-handed in this environment.

² DOG is underlined and marked with a subscripted † to indicate it is a topic with the appropriate non-manual topic marker.

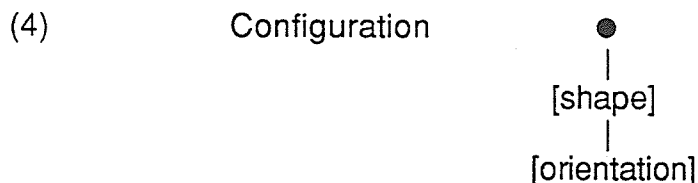
2. Major class nodes

From the above discussion of the phonological elements that participate in phonological processes I propose the following feature geometry. Note that the Configuration node subsumes both the handshape and the orientation elements.³



2.1 Configuration node

The Configuration node contains specifications for the exact orientation and shape of the hand. Sandler (1991) reasons that the Configuration node dominates features for handshape and orientation, with orientation features being directly dependent upon handshape features, as in (4).



Sandler (1991) provides evidence for the dependence of orientation upon handshape from the spreading processes that occur in compounds. It is possible for orientation to spread alone or for both orientation and handshape to spread, but it is impossible for only handshape to spread. For an example of the first spreading process, consider the two synchronic forms of *SISTER*, presented in 1.2.4. In the colloquial sign, the orientation of the palm in the first part of the compound spreads onto the second part, but the handshapes remain distinct. For an example of the second spreading process, consider the diachronic change in the sign *REMEMBER*, which was originally a compound composed of *KNOW*, formed with a B-hand at the forehead with palm facing body, and *SEAL*, formed with two A-hands in neutral space with the palm of the strong hand facing left. Now the first part of *REMEMBER* is formed with an A-hand at the forehead

³ In this paper I will argue for the existence of the nodes Configuration, Place, Movement, Handshape, Orientation, Hand, and [one hand], but I will offer no argument for the Root node. Perhaps the Configuration, Place, Movement, and [one hand] nodes are directly attached to some other prosodic unit.

with the palm facing left, the same configuration it assumes for the second part. Thus the existence of a Configuration node is confirmed, as well as part of its internal structure: it must contain orientation features capable of spreading independently and also handshape features capable of spreading only when the entire Configuration node spreads. There is probably more internal structure to the Configuration node, but this level of complexity is all that is necessary for the present purpose.

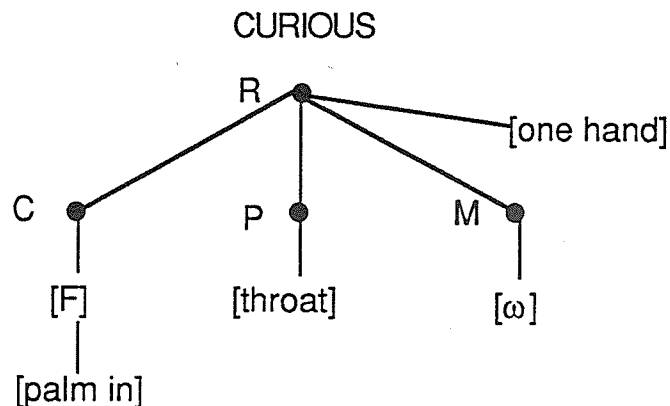
2.2 Movement node

The contrasts in (2b) and the process noted in 1.2.2 justify the existence of a movement node. As I do not have a featural system for movement, this node is not elaborated upon and no internal structure is proposed. Note that some signs, such as I and HAVE, below, do not move. They are position segments (see Perlmutter, 1991); as such, they have no Movement node.

2.3 Place node

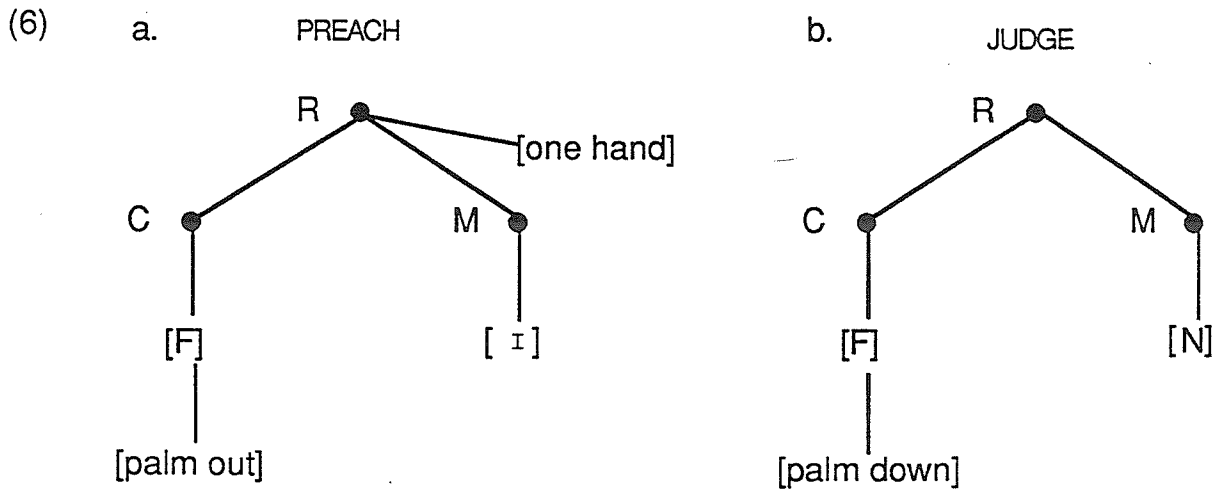
The Place node is justified by the contrasts in (2c) and the process in 1.2.3. Under the Place node are specifications for the various places where a sign can contact the body. I have no evidence for the organization of the structure under the Place node (except for a Hand node, the existence of which will be motivated below). Therefore I represent a sign such as CURIOUS, which contacts the throat, with the place of articulation [throat], as is shown in (5), until further organization can be justified. Likewise [ω] symbolizes twisting motion, and [F] symbolizes the F handshape.

(5)



If there is no contact with the body, the sign occurs in neutral space, that is, in front of the mid-section of the torso, and the Place node is absent. Redundancy rules implement the phonetic realization of an absent Place node. This case is illustrated in (6a) for the one-handed sign PREACH and in (6b) for the two-

handed sign JUDGE. ([I] is Stokoe, et. al.'s (1976) symbol for to-and-fro movement. [N] is his symbol for up and down movement.⁴)



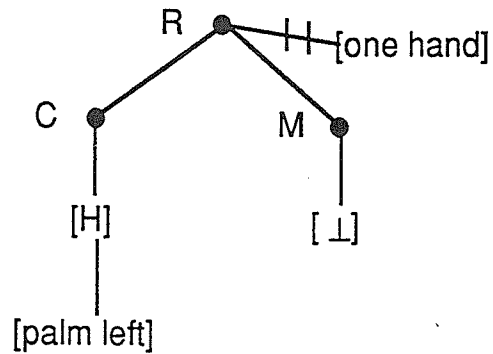
2.4 [one hand]

The node [one hand] depends directly upon the root node because the phonological processes affecting the number of hands used in a sign as noted in 1.2.5 do not affect the other elements of the representation. It is a privative feature, that is, it is either present or absent. When the node [one hand] is absent, the sign is executed with both hands having identical handshapes, identical or opposite orientations, and identical simultaneous or alternating movements. When the node is present, only one hand is used. (The various types of one-handed signs will be discussed in 3.) With this node it is possible to account for the phonological processes noted in 1.2.5.

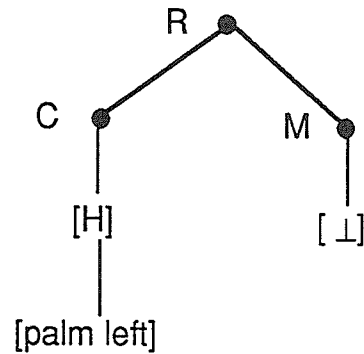
(7) illustrates the feature geometry of both the old and modern forms of the sign HURRY. The new differs from the old in that it is made with two hands instead of one. This change can be explained as the delinking of the node [one hand] from the representation of the old, one-handed sign in (7a) to form the representation of the current, two-handed sign in (7b). Note that this change results in a simpler representation. ([L] symbolizes movement away from the signer.)

⁴ Stokoe, et. al. (1976) lists twenty-four different movements. Like the basic handshapes, these also are controversial but are not addressed in this paper.

(7) a. HURRY (old)

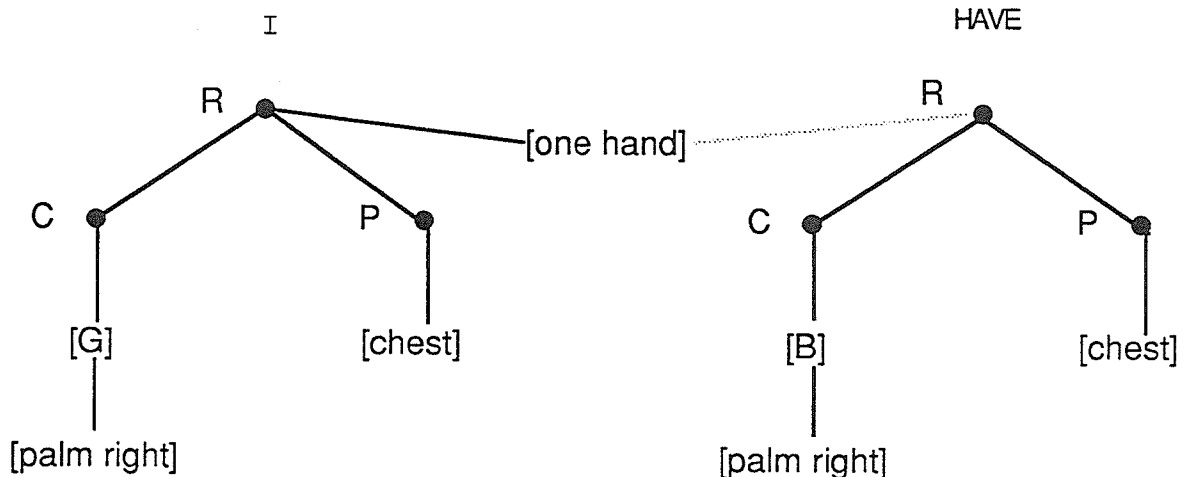


b. HURRY (modern)



Similarly, the optional sandhi process whereby a two-handed sign HAVE becomes one-handed after the one-handed sign I can be explained as the spreading of the node [one hand] from the first sign onto the second, as is illustrated in (8).

(8)



It is important to note that the opposite sandhi process does not occur: one-handed signs do not become two-handed in the environment of a two-handed sign.⁵ I HAVE does not have a variant in which both signs are made with two hands. Likewise, the opposite historical change does not happen: two-handed signs do not become one-handed.⁶ If the privative feature [one hand]

⁵ It is possible for one-handed signs to be made with two hands, but the conditions for this alternation are syntactic rather than phonological. For example, if there are two people each with a separate home, HOME, which is a one-handed sign articulated on the cheek, might be made with two hands.

⁶ This is true of signs articulated anywhere but the face, according to Frishberg (1975). Signs articulated on the face undergo the opposite change, which I cannot explain on structural grounds. It is possible that since the face carries non-manual, grammatical markers, using only one hand obstructs the view of the face to a lesser degree. Indeed, signs formerly made along

were instead represented as a binary feature with values [+one hand] and [-one hand], either the attested sandhi process would not be predicted (if it is said that this feature does not spread), or both the attested and the unattested sandhi processes would be predicted (if this feature is allowed to spread). Likewise, the opposite, unattested historical change would be predicted to occur. Thus the feature must be privative. Also, the value must be [one hand] rather than [two hands]. If it were [two hands], the unattested sandhi and historical processes would be predicted to occur, and the attested processes would be predicted not to occur.

3. An account of Battison's typology of signs

3.1 Battison's typology

Battison (1978) presents the following pre-theoretic typology of signs:

- (9) Type 0: One-handed signs articulated in neutral space (in front of the torso, not contacting the body), e.g., PREACH; see figure (10 a).
- Type X: One-handed signs contacting the body anywhere but the hand, e.g., CURIOUS; see figure (10 b).
- Type 1: Two-handed signs in which both hands have the same handshape and perform the same movement, either simultaneously or in alternation, e.g., JUDGE; see figure (10 c).
- Type 2: Two-handed signs in which both hands have the same handshape but in which only one hand moves, e.g., POSTPONE; see figure (12 a).
- Type 3: Two-handed signs in which the two hands have different handshapes but in which only one hand moves, e.g., COUNT; see figure (12 b).
- Type C: Compound signs comprising more than one of the above types.

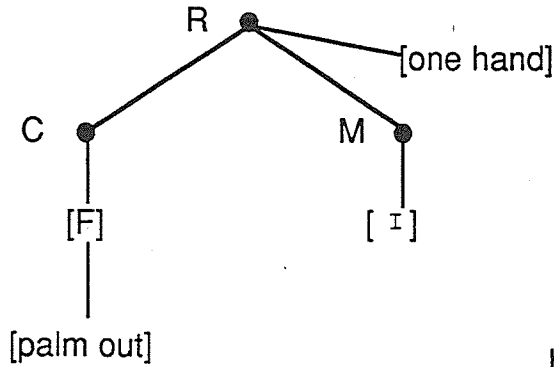
3.2 The representation of Type 0, X, and 1 signs

Signs of Type 0, X, and 1 are represented in the above feature geometry in a straight-forward way. The Type 0 sign PREACH is repeated as (10a). It is a one-handed sign, so the node [one hand] is present. It is articulated in neutral

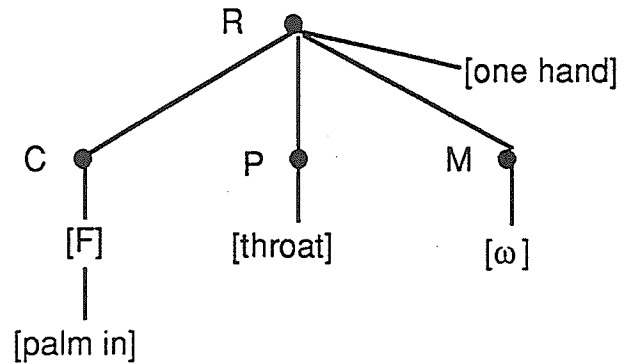
the central vertical line of the face are now made at the side of the face, again offering an unobstructed view of the face.

space, so the Place node is absent. The Type X sign CURIOUS is repeated as (10b). The node [one hand] is present since it is a one-handed sign. Because it is articulated at the throat the Place node contains the specification for this location. The Type 1 sign JUDGE, repeated in (10c), is a two-handed sign articulated in neutral space, hence the node [one hand] is absent, and the Place node is absent.

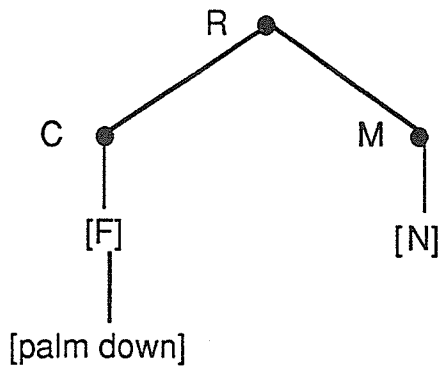
(10) a. Type 0: PREACH



b. Type X: CURIOUS



c. Type 1: JUDGE



3.3 The representation of Type 3 signs

Signs of Type 3 are more complicated to represent. (Type 2 signs will be discussed later.) The handshake and orientation of the weak hand in the case

of Type 3 signs is unpredictable. For example, in the sign LEARNING, the weak hand has the B handshape with the palm facing upward. If the palm of the weak hand faces downward but all other aspects of the sign remain the same, the sign is SWEDEN. Similarly, SIGNATURE and SIT differ only in the handshape and orientation of the weak hand: a B-hand with palm facing upward in SIGNATURE and an H-hand with the palm facing downward in SIT. Thus the handshape and orientation of the weak hand must be specified. Previous phonological representations of signs (e.g., Liddell and Johnson, 1986 and 1989) have included separate representations for both the strong and weak hands in order to accommodate this fact.

Separate representations for the strong and weak hands predict that the two hands can function independently, yielding a tremendous number of possible signs. However, examination of the typology given in (9) reveals several generalizations that reduce its complexity and that indicate that the weak hand is not entirely independent of the strong hand. When only one hand is used it is the strong hand. When only one hand moves, it is the strong hand; the weak hand remains passive. When two hands are used with different handshapes, the weak hand does not move and can only assume a limited number of handshapes.⁷ In this type of sign, the weak hand can only assume seven different handshapes, far fewer than the number it can assume in a Type 1 or Type 2 sign, in which both hands have the same handshape.⁸ Entirely separate representations for the strong and weak hands fail to account for these facts and allow the representation of impossible signs in which strong and weak hands operate independently.

In order to account for the massive dependency of the weak hand on the strong hand, Perlmutter (1991) identifies the weak hand not as a separate articulator requiring its own representation on par with that of the strong hand but as a place of articulation, just as the chin or the throat is a place of articulation. He uses the feature [+two hands] to specify Type 1 signs and [-two hands] to specify Type 0, X, and 3 signs. In the feature geometry system I propose here, the node [one hand] is absent for Type 1 signs, while it is present for Type 0, X, and 3 signs. These three types are further distinguished by their places of articulation: Type 0 signs are articulated in neutral space (an absent Place node), whereas Type X and Type 3 signs are articulated on the body -- Type 3 on the hand and Type X elsewhere on the body.

Phonological evidence I adduce to support this classification as well as this geometry comes from the sandhi process noted in 1.2.5 in which a two-handed sign optionally becomes one-handed following another one-handed sign. For example, MONEY is a Type 3 sign. In this sign the strong flat O-hand repeatedly touches the palm of the weak B-hand, which does not move. Thus, the weak B-hand is the place of articulation for the strong flat O-hand. In a

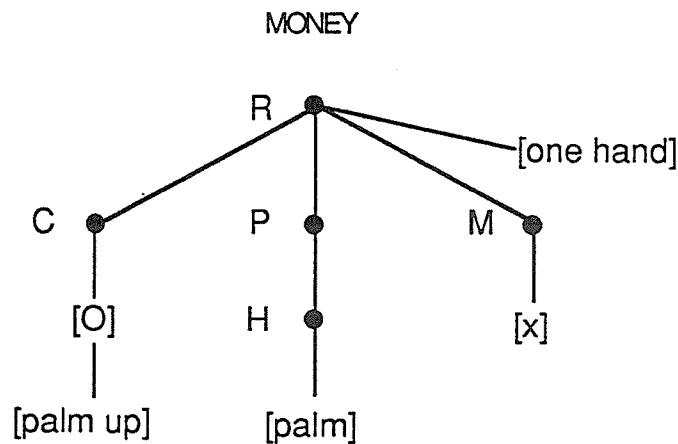
⁷ There are a few signs such as HELP (inflected form of the verb), GUIDE, and SPECIAL that apparently violate the claim that when the weak and the strong hands have different handshapes the weak hand cannot move. Perhaps this violation can be explained phonetically. In all these signs the weak and strong hands are in contact. In HELP and GUIDE the weak hand is in the path of the strong hand's movement and so is pushed along. In SPECIAL, in order to maintain contact, the weak hand is pulled along by the strong hand.

⁸ As was noted before, the strong hand can assume nineteen different handshapes according to Stokoe, et. al. (1976).

sentence MONEY † HAVE, '(I) have money,' HAVE, a two-handed sign, can be made with one hand. Therefore, MONEY patterns with one-handed signs like I, a Type X sign, in triggering this sandhi process. The node [one hand] is present in the representation of MONEY and spreads to the representation of HAVE.

One way in which the hand can be represented as a place of articulation is to have a Hand node (H) under the Place node. Beneath the Hand node would be the specifications necessary for distinguishing the seven handshapes that the weak hand can assume in Type 3 signs, perhaps [fist], [finger], and so on, as Perlmutter (1991) suggests.⁹ The representation of MONEY is given in (11). ([x] symbolizes approach and contact.)

(11)



3.4 The representation of Type 2 signs

The proposal that Type 3 signs are in fact one-handed signs articulated on the hand does not account for Type 2 signs, in which both hands have the same handshape, but in which only the strong hand moves. Should they be considered two-handed signs like Type 1 signs since they are made with identical handshapes on each hand or should they be considered one-handed signs like Type 3 signs since only one hand moves? Evidence indicates that they also are one-handed signs like Type 3 signs.

As was noted in 1.2.1, diachronically, Type 3 signs often evolve into Type 2 signs. For example, according to Long (1918), the sign DEPEND used to be made with the strong G-hand articulated on the weak B-hand. The handshape of the strong hand spread onto the weak hand, so that the sign is now made with the G handshape on both hands. Therefore, DEPEND changed from a Type 3 sign to a Type 2 sign.

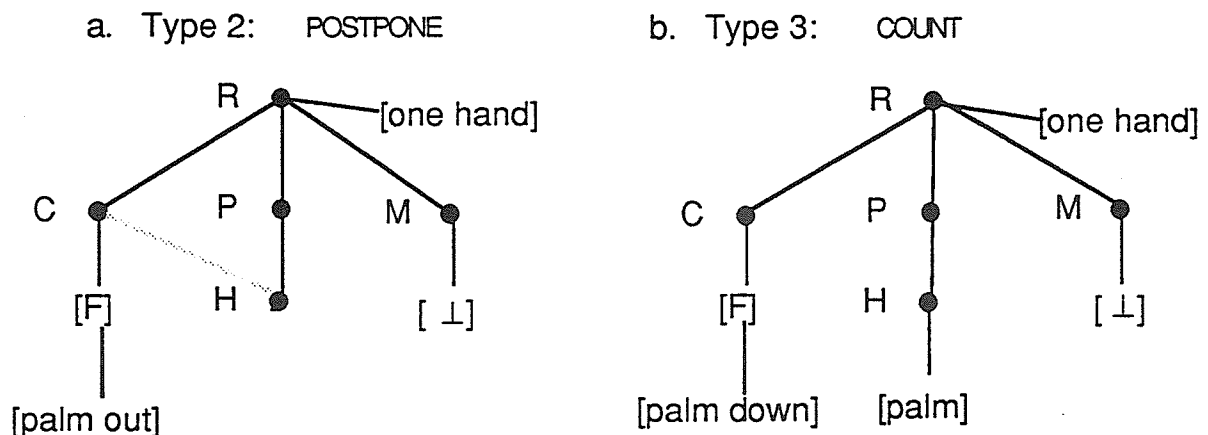
Additional evidence that Type 2 signs pattern with Type 3 signs instead of with Type 1 signs, i.e., that they are one-handed signs with the weak hand as

⁹ Again, I have not articulated the contents of these proposed nodes, so I tentatively adopt this suggestion. Note that Perlmutter (1991) does not claim these places of articulation are grouped together under a Hand node as I have represented them here. Instead he says they depend directly upon the Place node.

their place of articulation instead of being actual two-handed signs, comes from the strategies signers use to compensate for the occasional unavailability of the weak hand. For example, this can occur in casual signing when the signer is holding something in the weak hand. A true two-handed sign, that is, a Type 1 sign, can often be adequately made with only one hand when the other hand is occupied.¹⁰ For example, the Type 2 sign SIGN (i.e., 'to converse in a sign language'), which is made with two G-hands, both performing an alternating circular motion, can be made with only one G-hand performing this motion. A signer will avoid this option with a Type 2 sign. The sign CURL is a Type 2 sign also made with two G-hands. The index finger of the strong hand circles around the index finger of the weak hand, which remains still. The index finger of the strong hand must encircle the index finger of the weak hand, even if the situation is awkward; it cannot be made with only the strong hand. Similarly, RIGHT, a Type 2 sign articulated by the strong G-hand on the weak G-hand, cannot be made with only the strong hand. An alternate place of articulation is found if the weak hand is unavailable, such as the leg or a table top. This evidence suggests that Type 2 signs are like Type 3 signs in that they are one-handed signs articulated by the strong hand on the weak hand.

Signs articulated on the hand, that is, Type 2 and Type 3 signs, include the Hand node under Place. Type 2 signs are only specified for Hand and have no further specification. They receive the necessary information on the configuration of the place of articulation by association to the Configuration node, as shown in (12a) for the sign POSTPONE, thus assuring identical handshape and orientation for both hands. (I assume that the linking of Hand to Configuration is automatic and that an empty Place or Hand node cannot be interpreted.) However, Type 3 signs, in which the two hands have different handshapes, must be further specified as to the particular configuration of the place of articulation as is shown in (12b) for the sign COUNT. ([⊥] means movement away from the body.)

(12)



¹⁰ I think that a necessary condition for a sign that is normally made with two hands to be made with one hand is for that sign to be Type 1. This condition might not be sufficient. In particular, contact, or the lack thereof, perhaps plays a role in determining when a Type 1 sign can be adequately made with only one hand. There is no contact in either SIGN or CURL.

Thus we see that signs of Type 0, X, 2 and 3 are all alike except for their specifications under the Place node, reflecting the fact that these four types differ only in their place of articulation. Type 2 signs exceptionally have their unspecified Hand node filled by association with the Configuration node, reflecting the fact that these signs have identical handshapes.

3.5 Account of other processes involving Type 2 signs

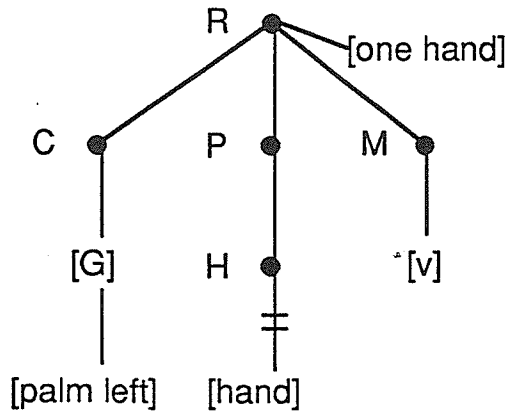
3.5.1 Prohibition against branching Place nodes

Perlmutter (1991) observed that Type 3 signs cannot contact the body in any place other than the weak hand. This observation can be extended to Type 2 signs as well. His explanation is that these signs have the hand as their place of articulation and hence cannot have anywhere else on the body as a place of articulation. This observation can be explained in the proposed feature geometry as a prohibition against branching Place nodes, a common constraint in oral languages. (For example, many languages do not permit labio-velars, coronal-velars, etc.)

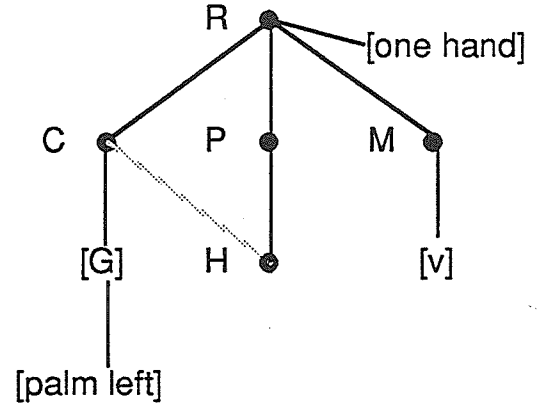
3.5.2 Assimilation of handshape

This representation of Type 2 signs can account for the spreading of handshape from the strong to the weak hand that was noted in 1.2.1. (13) illustrates the feature geometry of both the old and modern forms of the sign *DEPEND*. The new differs from the old in that the configuration of the place of articulation of Hand is specified by association with the Configuration node rather than being specified independently. The change of a Type 3 sign into a Type 2 sign can be explained as the delinking of the feature [hand] from the representation of the old sign in (13a) to leave an empty Hand node. By convention, an empty Hand node automatically associates with the Configuration node to form the representation of the current sign in (13b).

(13) a. Type 3: DEPEND (old)



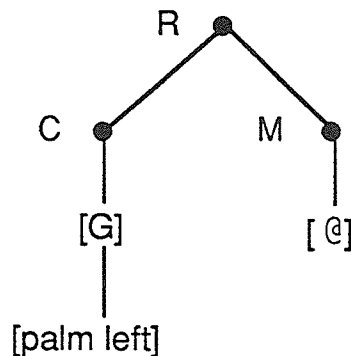
b. Type 2: DEPEND (modern)



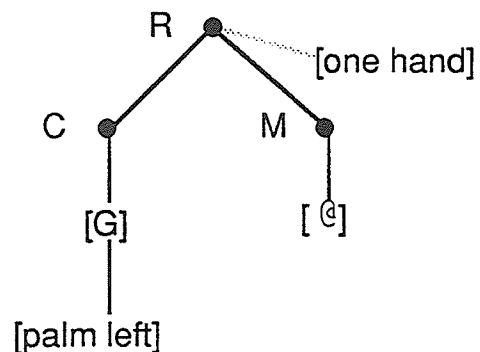
3.5.3 Unavailability of the weak hand

In real-life situations, a signer sometimes will not have his weak hand available for signing because he is holding something in that hand. There are different strategies for coping with the unavailability of the weak hand. Sometimes a sign will be made with only one hand. Other times an alternate place of articulation is found. Although more observation on these strategies is necessary, preliminary observations suggest that these differences can be accounted for by the proposed feature geometry. The Type 1 sign SIGN is shown in (14a). It is a two-handed sign, so the node [one hand] is not present. If the weak hand is unavailable to participate in the formation of this sign, the sign simply becomes one-handed by the addition of the node [one hand], as is shown in (14b). ([@] symbolizes circular motion.)

(14) a. Type 1: SIGN



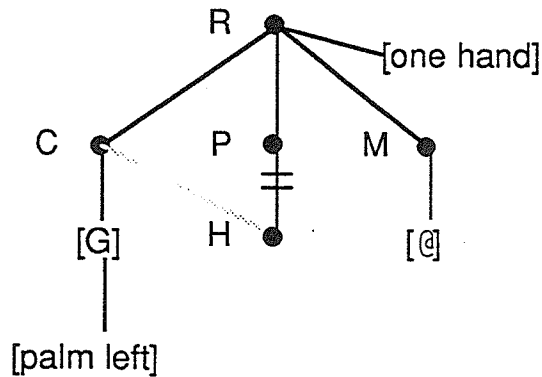
b. Type 0: SIGN (altered)



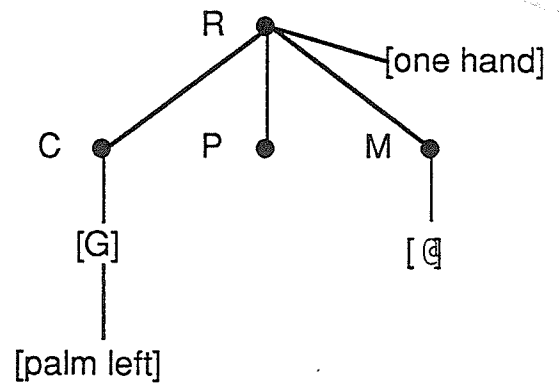
This option is unavailable for CURL since CURL is already a one-handed sign articulated on the weak hand, i.e., the weak hand is the place of articulation. The

sign cannot be saved by the strategy used above. The node [one hand] cannot be joined because it is already there. After the weak hand becomes unavailable, the sign has no place of articulation, as is shown in (15b). Since the Place node is empty, (15b) is an impossible sign. The representation in (15b) contrasts with that in (14b) in that the representation in (14b) has no Place node, which is interpreted as neutral space, while the representation in (15b) has an empty Place node, which cannot be interpreted (See 3.4.).

(15) a. Type 2: CURL

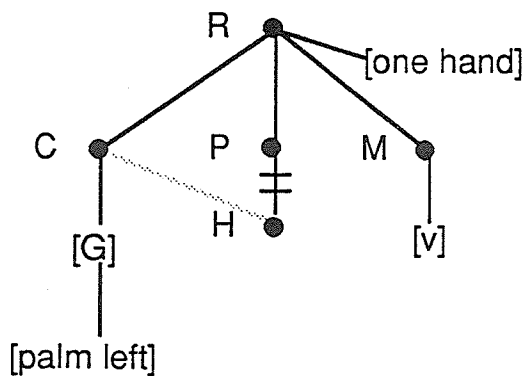


b. *CURL (altered)

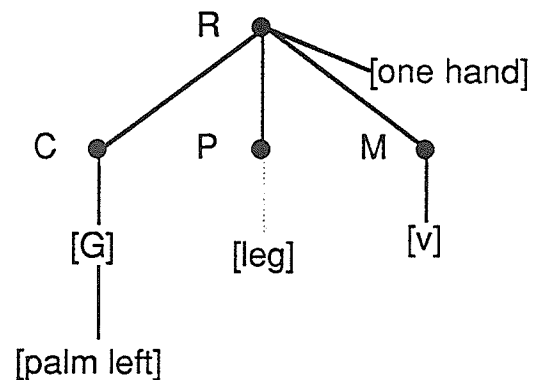


Similarly, in another Type 2 sign such as RIGHT, when the place of articulation, the weak hand, is otherwise occupied, it is impossible to simply omit the weak hand. Signers see the resulting incorrect sign as an amusing error. Instead, signers substitute some exceptional place of articulation in order to salvage the sign.

(16) a. Type 2: RIGHT



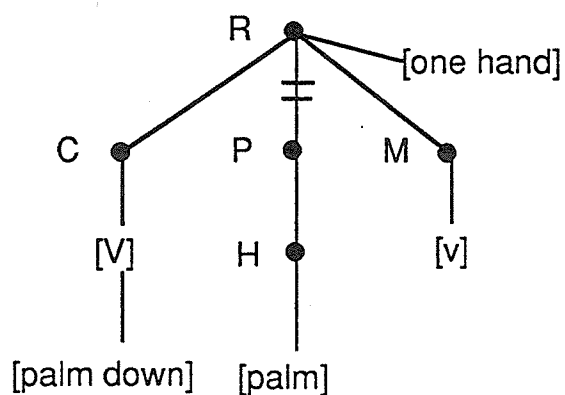
b. RIGHT (altered)



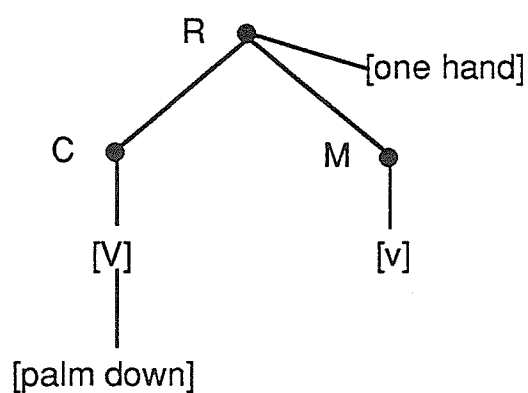
3.5.4 Weak Drop

Finally, the last phonological process that can be accounted for with this feature geometry is called "Weak Drop" by Padden and Perlmutter (1987).¹¹ By this process, the weak hand in a Type 3 sign such as READ is dropped, and the sign is produced with only the strong hand. This process can be described as the delinking of the Place node. The resulting sign is articulated in neutral space.

(17) a. Type 3: READ



b. Type 0: READ (Weak Drop)



4. Conclusion

To conclude, I propose a partial feature geometry within the framework in which the weak hand is just another place of articulation. The major class nodes are Configuration, Place, Movement and [one hand], which is a privative feature. In particular, Type 2 signs are integrated as one-handed signs that obtain their place of articulation by association with the Configuration node. This feature geometry can account for various phonological processes, such as the direction of historical change of two-handed signs, assimilation in compounds, the sandhi rule in which two-handed signs become one-handed signs, strategies used when the weak hand is unavailable, the rule of Weak Drop, and the impossibility of body contact in Type 2 and Type 3 signs (aside from contact with the weak hand). Further investigation should develop the content and internal structure of the proposed nodes, determine the existence of the Root node, investigate the status of the Movement node, and try to account for other phonological processes. Although many parts of this feature geometry are undeveloped, the

¹¹ Padden and Perlmutter (1987) discuss another rule call "Weak Freeze" whereby a Type 1 sign becomes a Type 2 sign: the input is a two-handed sign in which both hands move; Weak Freeze "freezes" the weak hand so that only the strong hand moves. It is possible to represent this process as a feature changing rule using this feature geometry, but the representation is inelegant and unenlightening, indicating another area for improvement.

basic framework is motivated and can be a foundation upon which further organization is built.

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Assigning Primary Stress in Aleut
Alice Taff
January, 1992

Aleut is one of the languages in which primary stress is too regular to have generated much analytical interest. Investigators have simply noted the predominately penultimate primary stress as well as some relationship between long vowels and stress.

The stress in an Aleutian word generally falls on the penult.....In a polysyllabled word where more than one accent sign (marking nonpenultimate stress) is used there is no appreciable difference in stress between the accented syllables. There is a slight prolongation of sound of such stressed vowels. [Geohegan 1944, p10]

Stress is neither distinctive nor fixed. It may be a configurational feature depending on rhythmic factors, length of the syllabic nucleus and on the sonority of the consonants. It is usually penultimate if the final V is short. [Bergsland 1956, p39]

...accent...is put automatically on the penult, whether short or long, unless the vowel of another syllable - especially the last one - is long and accented...[Bergsland 1990, p 36]

This paper will account systematically for both the regular stress patterns as well as the apparent exceptions in Pribilof Aleut, a subdialect of Aleut.^[1]

Pertinent morphology here is that number is singular, dual and plural.^[2] The vowels are either short or long; long vowels are written double.^[3]

1) saĝa+tu+lix 'sleeping late' and saĝa+atu+lix 'being sleepy'.

[Bergsland and Dirks 1978]

ilan [locative] 'in it, there' and ilaan [ablative] 'from it, from there'

[Bergsland and Dirks 1990]^[4]

Aleut is a quantity sensitive language as suggested by the anecdotal descriptions quoted above and evidenced by the fact that words with the same number of syllables but different syllable structure have different stress patterns (˘ marks primary stress in the orthographic representations. ˙ marks secondary stress. ˆ separates syllables). Example 2) shows the orthographic rendering with syllable breaks and stress, then the morpheme breaks followed by the gloss. These data provide evidence that the underlyingly long vowels are the cause of stress assignment, not its result.

2)	sú·da	su+da	'take it'
	su·kuún	su+ku+Vn	'you take it'
	sis·mí·kun	sismi+ku+n	'we are helping him'
	sis·mi·kúun	sismi+ku+Vn	'you two are helping him'
	sis·mi·kúu	sismi+ku+V	'we two are helping him'

The syllable weight system is marked [McCarthy and Prince, 1991], weight being as-

signed at the nuclear level, i.e. consonants in the coda have no weight. A light syllable has a short vowel and a heavy syllable has a long vowel. In other words, light syllables are C_0VC_0 while heavy syllables are C_0VVC_0 . If a word has only light syllables, primary stress falls on the penult as the examples in 3) show.

3) á·wa	'over there'
ám·giâ	'night' (after midnight)
sú·kung	'I take it'
tá·nang	'my land'
ta ná·nging	'our land'
a·ká·kuâ	'he is coming'
a máx·sìx	'to spend the night'
a·sxi·nú·ngin	'their daughters'
sìs·mìl·gá·kux	'we are helping those two'
sìs·mì·kuâ·txí·dix	'you two are helping him'

Final syllables are stressed when heavy as in 4),

4) su·kuún	'you take it'
sìs·mì·kuú	'those two are helping him'
sìs·mì·kuún	'you two are helping him'

unless the penult is also heavy as in 5).

5) a·daá·daa	'their father'
braá·taan	'his brother'

Stress assigned to a penultimate heavy syllable shows up on a penultimate light syllable with additional suffixation on the same word showing the two syllable 'window' for stress assignment at the right of a word:

6) la·kaá·yam	'boy' relative case
la·kaa·yá·ngin	'his boys'

nii gû·gin 'Atkan Aleut'
 a·kii·sá·lix 'to pay a fee'

When words are contracted by deletion of the final rime (RD), a frequent phenomenon in Aleut, primary stress is assigned one syllable to the left of its place in the undeleted word, maintaining penultimate stress. When the final rime is deleted, its onset becomes coda for the preceding syllable (without changing syllable weight since both codas and onsets are weightless):

7) a·sxi·nú·ngin 'their daughters' → a·sxi·nung'
 a1·qú·tax̂ 'what?' → ál·qut'

Rhythmic organization of secondary stresses provides evidence for iteration:

8) à·nga·là·mi·kí·lix. (no gloss)
 sis·mi·kú·chin 'you (pl.) are helping him'

I will analyse the Aleut primary stress system using Hayes's (1991) framework where X marks stress and · marks stressless foot members. Grouping the two e.g. (X ·) indicates foot constituency. ˘ = a light syllable. ˉ = a heavy syllable and μ = a mora.

Since primary stress hovers around the right two syllables I will assume right to left foot construction and that End Rule Right takes effect. This will put primary stress on the rightmost strong stress conforming to the Continuous Column Constraint. Because the penult is usually stressed regardless of an odd or even syllable count in words, I will assign feet from the right to left. The long and short vowels are definitely contrastive by duration but the stress on light syllables is marked by intensity as is the contrast between two neighboring long vowels. If we select iambic foot assignment starting at the right with X on the final syllable, the penults will be ·, making penultimate stress impossible. (Derivations are written from the top down in the following examples.)

9) sīs mī kūn
 · (· X) iambic foot assignment
 X End Rule Right
 *sis·mi·kún

(° Weak stress is not assigned to a single light syllable; degenerate light feet are not allowed.)

If the final syllable is extrametrical, a possible solution otherwise motivated by RD, and foot assignment starts with X on the penult, then the penult can eventually gain primary word

stress, but, an additional mechanism to stress long ultimas will be needed.

10) sĭs mĭ kŭn
 <///> extrametricality
 (· X) iambic foot assignment
 X End Rule Right
 sis·mĭ·kun

If feet are moraic trochees (MT), the other possible foot type for quantity sensitive languages, the final syllable need not be extrametrical.

11) sis mi kun
 μ μ μ
 (X ·) trochaic foot assignment
 X End Rule Right
 sis·mĭ·kun

I find the MT approach more appealing for two reasons: first, an extrametricality rule would not be necessary, and second, since the final syllable is sometimes stressed there would, in an iambic analysis, have to be some mechanism to constrain the extrametrical rule to light syllables only or to stress long final syllables.

Let us contrast the two analyses. I will write the extrametricality rule required by an iambic analysis, in terms of rime instead of the whole syllable in order to conform with segmental phenomena, i.e. RD. The Light Rime Extrametricality Rule (LRE) is:

12) LRE ǒ
 R → <R> / _____ *

The derivation for stress assignment to a word with a final heavy syllable using the iambic analysis is given in 13).

13) IAMBS
 sĭs mĭ kŭu
 ---- LRE
 (· X) assign iambs
 X End Rule Right
 * sis·mĭ·kuú

(Note that no stress can be assigned to *sis* as it is not heavy.)

Using the moraic trochee approach, assigning trochees from R≠L on moras, a strong degenerate foot appears on a final heavy syllable:

14) TROCHEES

sis	mi	kuu	
μ	μ	μμ	
(X	·)	X	trochaic foot assignment
		X	End Rule Right

sis·mi·kuú

Both primary and secondary stress are accounted for in this example.

Trochees, then, make the stress assignment simpler. MT, coupled with End Rule Right, accounts for the stress patterns of examples 2) - 4) as well as 6) and 7) if final rime apocope applies before stress assignment in 7).

If there are two neighboring strong feet, penult and antipenult, as in 6), End Rule Right will give the penultimate word-level stress:

15) lakaáyaχ				'boy'
lakaayáŋgin				'boys' possessed by 3s
la	kaa	ya	ŋin	
μ	μμ	μ	μ	
	X	(X	·)	trochaic foot assignment
		X		End Rule Right

la·kaà·yá·ŋgin

But when both penult and ultimate are heavy, as in 5) (repeated below) the penult again gets the primary stress:

5) a·daá·daa	'their father'
braá·taan	'his brother'

End Rule Right cannot save us here. Hayes's (1991) clash reduction mechanism for Turkish is a foot extrametricality rule that eliminates the rightmost peripheral foot when it forms a clash. For MT, then, we could formulate a Heavy Foot Extrametricality rule (HFE):

16)	HFE	ō	ō
		F → <F> / F	_____*

The derivation for words with both penult and ultimate heavy syllables is given in 17).

17) a	daa	daa	
	μ	μμ	μμ
	(X)	(X)	trochee (here as heavy degenerate feet)
	(X)	<X>	HFE
	(X)		End Rule Right
	a·daá·daa		

The iambic approach would require a HRE in addition to the LRE in order to derive words of the structure of 17).

The best solution for assigning stress to Aleut words in citation form is 18):

- 18) a. Assign moraic trochees from R→L iteratively
- b. with HRE (triggered by two final neighboring strong stresses)
- c. and application of End Rule Right.

To imply that this is the full story for Aleut stress, however, would be far from the truth. Secondary stress is not a simple matter of alternating rhythm and even primary stress on the penult may shift as words are uttered in a sentence. These more elusive cases, especially 'floating' stress and vowel length described by Bergsland and Dirks (1978), yearn for analysis.

NOTES

[1] Aleut, a branch of the Eskimo-Aleut language family, is indigenous to the Aleutian Chain, Alaska Peninsula and Pribilof Islands, Alaska. Major extant dialects are Eastern and Western. Pribilof Aleut is a subdialect of Eastern Aleut.

[2] Open class Aleut words are formed by suffixation on a base by both derivational and inflectional postbases. Around 2,000 stems and 150 derivative suffixes have been recorded so far. [Bergsland, 1986 p 66-67, 102] Bergsland, Aleut's most productive linguist, considers derivational potential 'virtually unlimited.'

base	nuusi-	'knife'
derived forms	nuusilgu ^h	'a big knife'
	nuusilguuku ^h	'a mighty big knife'
	nuusiklu ^h	'the rugged knife'
	nuuchaada ^h	'a small knife'
	nuusichxisa ^h	'a wonderful knife'
base	awa-	'work'
derived forms	awaakaku ^h	'can work, is able to work'
	awaatuku ^h	'wants to work'
	awada ^h g <ul style="list-style-type: none">ux	'never works'

awaduukalaka \hat{x} 'he will probably not be working' [Examples are from Bergsland, 1978 p 44-46]

[3] The data used here are from transcriptions of tape recordings of Pribilof Aleut unless otherwise noted. The orthographic symbol for the voiceless uvular fricative / χ / is \hat{x} ; the voiced uvular fricative / γ / is \hat{g} ; the voiceless uvular stop is q ; the voiced interdental fricative / θ / is d . Other symbols are phonetic.

[4] There is a vowel lengthening rule (VL) that causes the final vowel of a stem to lengthen underlyingly when followed by certain postbases. In ¹⁾ and ³⁾ below VL does not apply to the post base -tu- meaning 'have much'. In ²⁾ and ⁴⁾ VL does apply to the postbase --Vtu- meaning 'tend to'. (V indicates lengthening of the preceding vowel.)

¹⁾ sa \hat{g} a tu lix → sa \hat{g} atulix 'sleeping late'
sleep have much

²⁾ sa \hat{g} a Vtu lix → sa \hat{g} aatulix 'being sleepy'
sleep tend to

³⁾ kilma tu ku \hat{x} → kilmatuku \hat{x} 'he has a big belly'
belly have much pres ³s

⁴⁾ ichi ngu Vtu uza → ichinguutuza 'I tend to feel chilly'
cold tend to (examples here from Bergsland, 1978)

Other long vowels are the result of synchronic continuant deletion between two vowels i.e., ilaan, related to ila+a 'part of it', cf. rel. ila- γ a-n. Proto-Eskimo is reconstructed as *ila- η a from the Siberian Yupik and Inupiat ila η a (Bergsland 1986, p 68), so the long vowel in ilaan is probably the result of syncope of the η . Additional historical changes in the language as well as diachronic phonological rules have also affected vowel length.

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Syllable Theory and Inflectional Morphology in Japanese

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1. Introduction

As a recent advancement in Japanese phonology, Itô's (1986) syllable-based analysis on the Sino-Japanese compounds demonstrated a radical reorganization of underlying forms of the Sino-Japanese morphemes.¹ The present study is an attempt to expand the application of her syllable theory into Japanese inflectional morphology, to which any syllable-based argument has not been attempted until now. It will be shown that, unlike traditional analyses which essentially depend on 'linear' segmental rule, the syllable theory provides a more elegant account of the phonological changes in Japanese inflection, as it identifies more plausible forms of underlying components. Particularly, the present study denies the syncope rules dominant in the analysis of verbal inflection and replaces them primarily with the application of epenthesis. The analysis of adjectival inflection is furnished by some new assumptions on the morphological components proposed in Uchida (1991).

In the first section, I will introduce a summary of Itô's (1986) syllable theory and the results of its application on the Sino-Japanese compounds, in which I will present some modification on her treatment of morpheme-final /t/. As I establish the relevant phonological rules in Japanese phonology, I will propose, most importantly, that the regressive consonant assimilation rule (RCA) has the voice-matching constraint. I will then introduce the results of the syllable-based analysis of the verbal inflection of various categories, in comparison with those of the previous analyses. Here, I will argue for the existence of the obligatory onset condition in Japanese lexical phonology. This argument hinges crucially on my assumption of the existence of default consonants in Japanese, most prominently, /r/. The subsequent analysis of the adjectival inflection is based on some new assumptions on the morphological components; particularly, that -k-, which is crucially involved in Japanese adjectival inflection, is an independent adjective-formative morpheme; and that the Japanese adjectival inflection basically requires -ar- ('be') -support. In summary section, I will tabulate the newly identified underlying components of the verbal and adjectival inflection to demonstrate how the syllable-based argument could unveil the systematicity of the Japanese inflectional morphology.

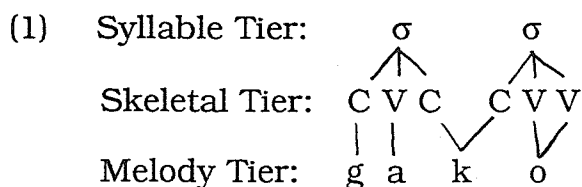
The present study does not employ the theory of underspecification whose explanatory power in Japanese phonology has been demonstrated in Itô and Mester (1986). All the sonorants and other obstruents are

consistently assumed to be specified as to [±voice] throughout the lexical derivation.

2. The Syllable Theory of Itô (1986)

Itô's (1986) syllable theory is based on the templatic approach in which syllabification is conceived as continuous template matching governed by syllable well-formedness conditions and a directional parameter (p.2). During the syllabification process, segments which do not fit the particular template of the language (a well-formedness condition defining possible CV sequences) fail to be syllabified. These stray segments will be either erased under the mechanism of Stray Erasure, or rescued by a newly created well-formed syllable by Stray Epenthesis. Itô argues that in Japanese Stray Epenthesis is parametrically selected.²

In Itô's analysis, the phonological string *gakko*, for example, is represented as (1). Note that the geminate consonant /k/ is doubly-linked to the skeletal tier (p.15):



Itô proposes that the following syllable template and coda condition constitute the parametrical component of syllable-wellformedness condition in Japanese.(p.26):

(2) Japanese Syllable-wellformedness Condition:

Syllable Template: [C V V C]

Coda Condition: * C] σ
 |
 [-nasal]

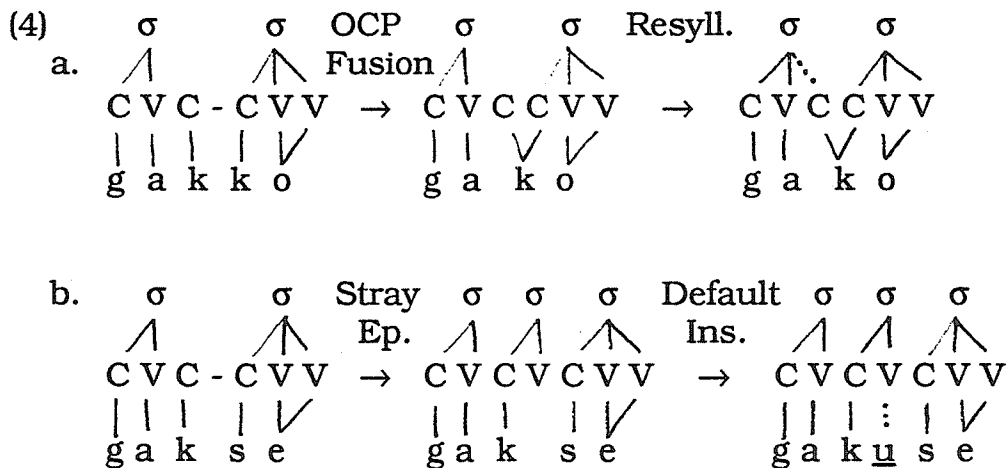
The syllable template, represented by the maximal possible syllable, in Japanese is CVVC, as in /tootte/ ('passing'). The coda condition, which specifies the terminal edge of closed syllable, is negatively defined in Japanese as: no syllable-final consonant is allowed unless it is [+nasal].³ The structural description of the coda condition in (2) also specifies a single association line between the skeletal and the melody tier, thus

successfully preventing this nasality restriction from applying to geminate consonants: i.e. this does not apply to the morpheme-final /k/ in (1) because it has multiple association lines.⁴ This condition along with the structural definition (1) eliminates syllable combinations like * /sek-pa/, * /kap-sek/, or * /te-gak/ from the Japanese syllable structure while allowing combinations like /gan-ko/, /kam-pa/ and /gak-koo/.

Observe the surface forms of the following Sino-Japanese compounds which involve alternation of the word *gaku* '(related to) scholarship' (from Itô, p.146). Morpheme boundaries are marked by hyphens:

- (3) a. *gaku-see* `student'
 gaku-batsu `academic clique'
 dai-gaku `university'
 gaku-in `school' or `academy'
- b. *gak-koo* `school' (* *gaku-koo*)
 gak-kai `academic conference' (* *gaku-kai*)

Itô rejects the traditional syncope rule (McCawley (1968) among others) which applies to /kVk/, yielding the geminate /kk/. Instead, she proposes that the underlying form is without a final vowel (i.e. /gak/ rather than /gaku/), and that the forms in (3a) above are the result of epenthesis. In fact, this reflects historical reality in that many Sino-Japanese morphemes had morpheme-final obstruents like /t/, /p/, and /k/ in original Chinese (Okumura (1972)). The derivations of *gak-koo* and *gakusee* are presented in (4) (from Itô, pp.148-149):



In (4a) OCP Fusion via Tier Conflation results in gemination.⁵ However, in (4b), Tier Conflation does not lead to gemination. The morpheme-final /k/ cannot be syllabified because Japanese allows only [+nasal] coda, and

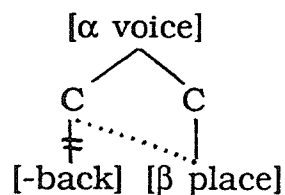
is therefore 'mapped' to a new well-formed syllable (CV) by Stray Epenthesis. The vowel /u/ is later inserted by default insertion.⁶

Itô also suggests that the morpheme-final /t/ in Sino-Japanese vocabulary is 'unspecified' based on the data like (5):

- (5) /bet-to/ → *betto* 'different way'
 /bet-kan/ → *bekkan* 'separate building'
 /bet-puu/ → *beppuu* 'separate cover'
 /bet-si/ → *bessi* 'separate sheet'

Itô argues that the gemination results from a simple feature filling: the following consonant spreads into the unspecified C-slot providing all the feature values (p.153). I cannot, however, agree with this analysis of Sino-Japanese /t/. Instead, I argue that the gemination in (5) is a result of the regressive consonant assimilation, which plays a crucial role in Japanese phonology. (I will use the term consonant assimilation for melody spread & delinking in this study.) Now I propose Regressive Consonant Assimilation (RCA) in Japanese of the form (6):

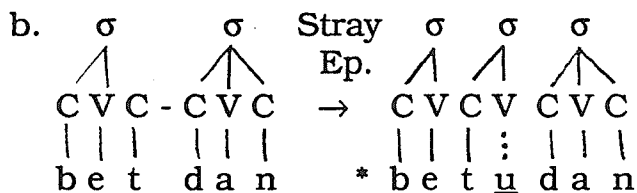
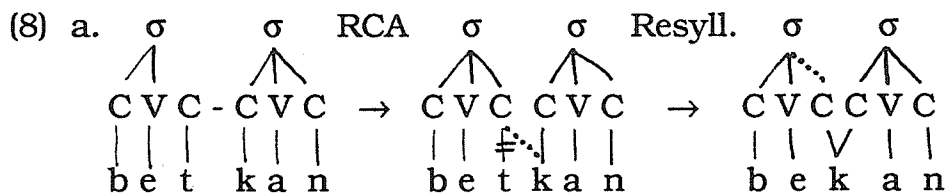
- (6) Regressive Consonant Assimilation (RCA):



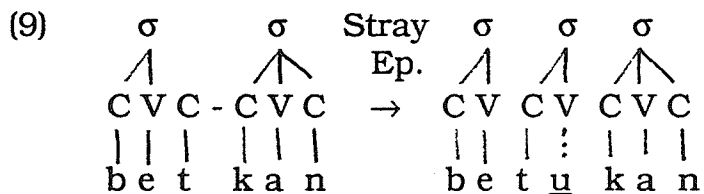
Note that RCA requires the voicing feature of the two adjacent consonants to be matched (the voice-matching constraint).⁷ RCA explains why the gemination is prevented when the consonant following /t/ is [+voice], a phenomenon which Itô (1986) did not deal with. The data in (7) shows that /u/-epenthesis instead occurs between morpheme-final /t/ and a [+voice] consonant:

- (7) /bet-bai/ → *betubai* 'separate sale'
 /bet-dan/ → *betudan* 'different level'
 /bet-mei/ → *betumei* 'different name'

I propose the derivation of *bekkan* and *betudan* as shown in (8a) and (8b), respectively:



RCA produces a geminate in (8a) to which any stray operations cannot apply, and resyllabification licenses the coda. On the other hand, in (8b) RCA cannot apply because of its voice-matching constraint, and the syllable-final /k/ remains stray and triggers Stray Epenthesis. Note that RCA has to precede Stray Epenthesis. (9) shows that Stray Epenthesis which has applied before RCA generates ill-formed surface forms **betukan* for (8a). Once Stray Epenthesis has been applied, RCA is blocked by an intermediating V:



3. Verbal Inflection

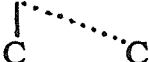
3.1. Past & Gerund Forms

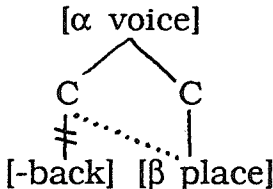
In Japanese, verbs can be classified into two groups depending on whether the stem-final phoneme is a vowel or consonant (I will use the term vowel-stem verbs and consonant-stem verbs for them, respectively). The stem-final vowel is either {/e/ or /i/} (i.e. *tabe-* ('eat'), *kari-* ('borrow')) while the stem-final consonant can be underlyingly {/t/, /r/, /s/, /k/, /g/, /p/, /m/, /n/, or /b/} (McCawley (1968)). /w/ might be expected in the list, but I agree with McCawley's analysis that the surface /w/ in this position is underlyingly /p/ (McCawley (1968, p.94)).⁸ The most notable phonological change in Japanese verbal inflection is the regressive assimilation between consonant-stem verbs and /t/-initial

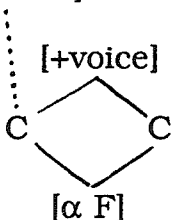
suffixes, such as the past tense morpheme *-ta* and the gerundive morpheme *-te*.⁹ The vowel-stem verbs undergo no phonological change (i.e. /tabe-ta/ → /tabeta/). The surface forms of the past tense (Past) and the gerund forms (Ger) of consonant-stem verbs are shown in (10):

- (10) `win' `kick' `lend' `write' `smell' `buy' `read' `die' `call'
 kat- ker- kas- kak- kag- kap- yom- sin- yob-
- Past *katta ketta kasita kaita kaida katta yonda sinda yonda*
- Ger *katte kette kasite kaite kaide katte yonde sinde yonde*

The stem-final /t/, /r/ and /p/ form a geminate string /tt/; /k/ and /g/ are replaced by /i/; /s/ undergoes /i/-insertion; /m/, /n/, and /b/ become /n/. In addition, /ta/ becomes /da/ after /g/, /n/, /m/ and /b/. I propose the following phonological rules at work in the derivation. Besides RCA, hereby restated in rule (12), (11) and (13) have been proposed in various forms (Kuroda (1965), McCawley (1968), Itô and Mester (1986b) among others):

- (11) Voice Spreading: [+voice]
- 

- (12) RCA (= (6)):
- 

- (13) Nasalization: [+nasal]
- 

Voice Spreading is a left-ward spread rule that spreads the [+voice] feature. Nasalization in (13) nasalizes the initial consonant of a voiced geminate. This rule is responsible for the surface absence of voiced geminates in the native vocabulary. Furthermore, this rule explains the

surface forms of 'emphatic infixation' before voiced consonants (a phenomenon previously studied by Martin (1952), Kuroda (1965), McCawley (1968)) For example, a verb *togaru* ('is sharpened') yields the emphatic form *tongaru*. This process can be explained as the combining effect of feature filling and Nasalization. The derivation of *tongaru* is, therefore, /to \mathbb{X} garu/ → /toggaru/ → /tongaru/ (\mathbb{X} is the phonetically unspecified emphatic infix: I will later use this notation of \mathbb{X} for the unspecified melody in the linear representation of underlying forms). As expected, Nasalization is not triggered after the feature filling when the infix occurs before a voiceless consonant, as in the case of *totemo* ('very'), which yields the infixed *tottemo*.

The application of rules (11) - (13) in deriving the past forms is shown below. The forms which become identical to their surface forms in the derivation are italicized. (Obvious cases of vowel-final, /t/-final, and /n/-final verbs are excluded):

(14)	/kerta/	/kasta/	/kakta/	/kagta/	/kapta/	/yomta/	/yobta/
Voice.Spr.	-	-	-	kagda	-	yomda	yobda
RCA	<i>ketta</i>	<i>kasta</i>	-	-	<i>katta</i>	<i>yonda</i>	<i>yodda</i>
Nasaliz.	-	-	-	-	-	-	<i>yonda</i>

Voice Spreading precedes and feeds RCA by satisfying its voice-matching constraint (i.e. /yom-ta/ has to become /yomda/ first so that RCA can apply, RCA can then feed Nasalization).¹⁰ Nasalization applies to /yodda/, but not to /kagda/. Most importantly, note that /r/ apparently does not trigger Voice Spreading. Stipulating that [+son] consonants like /r/ is unspecified with respect to the voicing feature (Itô and Mester (1986)) devastates the present generalization of Voice Spreading because it evidently applies to nasals. Instead, I suggest that the morpheme-final /r/ in the native Japanese vocabulary is a default consonant which only fills 'unspecified' C-slots later in the derivation. The idea that the C-slot of /r/ in the inflectional derivation is 'unspecified' explains why Voice Spreading does not apply there, and why total assimilation rather than just place assimilation (which is what RCA basically is) occurs in /r/-ending verbs. This is a crucial assumption in this study, to which I will come back later. The morpheme-final /r/ sometimes will be left as it is for simplicity in the representation of the underlying forms.

After applying rules (11) - (13), /kasta/, /kakta/, and /kagda/ still require additional phonological operations to derive their surface *kasita*, *kaita*, and *kaida*, respectively. McCawley (1968) handles this problem assuming the following rules: the spirantization rule which spirantizes [+back] consonants followed by an obstruent, the epenthesis rule which inserts /i/ between a spirant and an obstruent, and finally, a spirant deletion rule which involves the process, /h/ → /w/ → ∅

(15)		/kasta/	/kakta/	/kagda/
	Spirantization	kasta	kahta	kahda
	/i/-Epenthesis	<i>kasita</i>	kahita	kahida
	/h/→/w/	-	kawita	kawida
	/w/→∅	-	<i>kaita</i>	<i>kaida</i>

The change /h/→/w/→∅ is subsumed in the rules associated with the phonological change of /p/, a process I do not question here (see footnote 8). The /i/-epenthesis seems to have the effect of braking up consonant clusters. However, I oppose McCawley's spirantization rule because there is no reasonable motivation. It seems to have been invented just to fulfill the condition of his /i/-epenthesis rule which requires [+cont] for the initial consonant. Itô and Mester (1986) assume Velar Vocalization (p.58) which directly makes /k/ and /g/ into /i/, a process in which I see no plausibility. The existence of such a rule seems out of the question.

I will take the vowel epenthesis approach, but deny the involvement of initial spirantization rule or feature-specific epenthesis rule. Instead, I propose that /i/-insertion is a result of Stray Epenthesis. Take the past tense form of *kas-* ('to lend'), *kasita*, with the underlying form /kas-ta/ for example. The syllable-based analysis can easily explain its derivation as seen in (16):

(16)	σ	σ		σ	σ	σ
	∧	∧	→	∧	∧	∧
	CVC	-CV		CVCV	CV	
	k a s	t a		k a s i	t a	

In (16), most importantly, stray consonant /s/ is rescued by a newly created syllable which arises out of the mechanism of Stray Epenthesis. The default vowel in Japanese verbal inflection is invariably /i/. To be complete, but less importantly here, the /s/ above further undergoes postlexical palatalization in front of /i/. Note that Stray Epenthesis cannot apply to geminate consonants and nasals because they already constitute well-formed codas in Japanese, which explains why forms like **ketita* ('kick') and **yonida* ('call') cannot be generated. Since nasalization in the present context is always the result of gemination, it has to be assumed that the processes which make geminates, feature filling and RCA, have to precede Stray Epenthesis. This ordering prevents Stray Epenthesis from applying to /ker-ta/, /kap-ta/, and /yob-da/ in (14). Voice Spreading precedes RCA, thus Stray Epenthesis cannot apply to /kag-ta/ either.

As for the consonant deletion in /kakita/→*kaita* and /kagida/→*kaida*, I propose Back Consonant Deletion of the form (17):

- (17) Back Consonant C V
 Deletion: [+back] → ∅ / _ + $\left[\begin{array}{l} \text{-back} \\ \text{+high} \end{array} \right]$

Note this rule also erases the C-slot occupied by [+back] consonant. The main characteristics of this rule is that it states that the vowel /i/ 'causes' the deletion. Historically, this deletion has intermediating spirantization which is evidenced by orthographic data. Forms such as *kakita* ('wrote') exist as classical forms, and diachronic change in orthography is かきた (ka ki ta) → かひた (ka hi ta), into the modern かいだ (ka i ta). This is also true in the nonpast form of the adjective as I will discuss later: i.e. さむき (sa mu ki) → さむひ (sa mu hi) → さむい (sa mu i) ('is cold'). Other vowels do not trigger this spirantization. Note that the lexical rule (17) does not apply inside monomorphemic string like *aki* ('autum', * ai). Interestingly, it does not apply in derivational morphology, for example, *kaki-tai* ('wants to write', * kai-tai), indicating the rule's restrictive domain of application. In this study, I will simply include the + notation in rule (17) to indicate the morpheme boundary in inflectional morphology.

The complete derivation of the past forms is now shown below (Obvious cases of vowel-final, /t/-final, and /n/-final verbs are excluded):

(18)	'kicked'	'lent'	'wrote'	'smelled'	'bought'	'read'	'called'
	/keXta/	/kasta/	/kakta/	/kagta/	/kapta/	/yomta/	/yobta/
Voice.Spr.	-	-	-	kagda	-	yomda	yobda
RCA	<i>ketta</i>	<i>kasta</i>	-	-	<i>katta</i>	<i>yonda</i>	<i>yodda</i>
Nasaliz.	-	-	-	-	-	-	<i>yonda</i>
Stray Ep.	-	<i>kasita</i>	<i>kakita</i>	<i>kagida</i>	-	-	-
Bk Cons.Del.	-	-	<i>kaita</i>	<i>kaida</i>	-	-	-

3.2. Nonpast & Provisional Forms

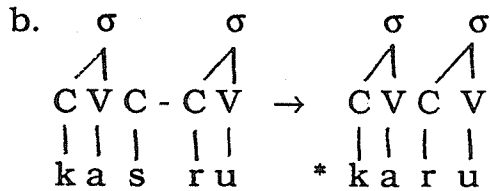
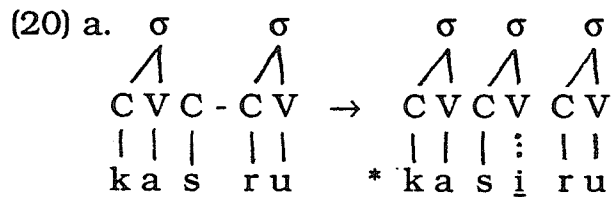
The other inflectional forms should be also analyzable by the syllable-based argument, otherwise the previous argument becomes vacuous. In this section, I will examine the nonpast (Np) and provisional forms (Pro), whose surface forms are shown in (19):

(19)	'eat'	'borrow'	'kick'	'lend'	'write'	'smell'	'die'	'read'	'call'
	tabe-	kari-	ker-	kas-	kak-	kag-	sin-	yom-	yob-

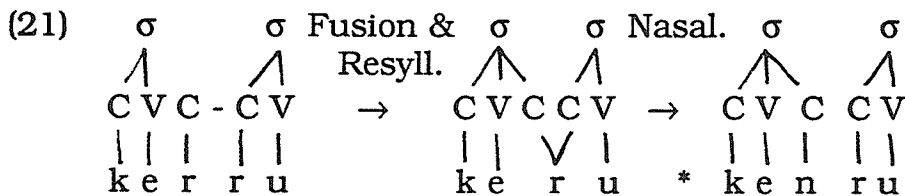
Np *taberu kariu keru kasu kaku kagu sinu yomu yobu*

Pro *tabereba kakereba kereba kaseba kakeba kageba sineba yomeba yobeba*

McCawley (1968) among others identifies *-ru* to be the nonpast tense morpheme and *-reba* to be the provisional morpheme, and assumes that the /r/ is deleted by the continuant deletion rule which deletes [+cont] consonant before a consonant. However, I will reject this analysis by the following argument. Suppose /r/ is in the underlying form (as is invariably assumed in the previous analyses), RCA does not take place between, for example, /s/ and /r/ in the underlying /kas-ru/ ('lend', in (19)) due to the violation of RCA's voice-matching constraint). Then, Stray Epenthesis has to apply, and this will generate ill-formed *kasiru as seen in (20a). Stray Erasure, supposing that something forbids Stray Epenthesis in this particular case, also generates ill-formed *karu (20b):



Note that there is no motivation for maintaining the stray /s/ in the underlying /kas-ru/ and dropping /r/ which is already 'in' a well-formed syllable structure. In addition, *-ru/-reba* suffixation should produce gemination with stem-final /r/, and presumably triggers Nasalization as shown in (21), only to create ill-formed strings like *kaenru:¹¹



Even when the morpheme-final /r/ is underlyingly unspecified, /kaX-reba/ results in gemination via feature filling, and follows the same steps as described in (21).

I therefore reject the previous analysis of the nonpast and provisional morphemes, and propose that their underlying forms are *-u* and *-eba*, respectively. These underlying forms necessitate that /r/ be inserted at

the onset of the syllable to derive the allomorphic *-ru* (Np) and *-reba* (Pro). To account for this phenomenon within the framework of the template approach, I propose that the onset consonant is lexically required in Japanese. Itô's language-particular syllable well-formedness condition of Japanese (2) is thus revised as (22):

(22) Japanese Syllable Well-formedness Condition

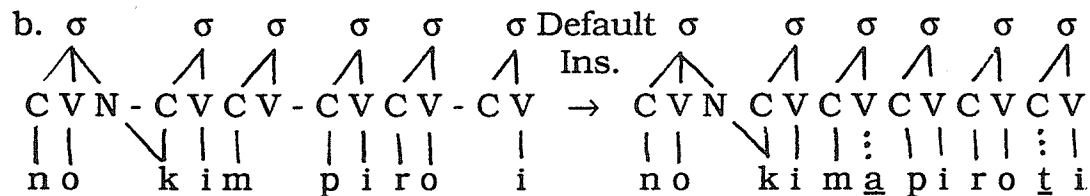
Syllable Template: [C V V C]

Coda Condition: * C] σ
 |
 [-nasal]

Onset Condition: obligatory

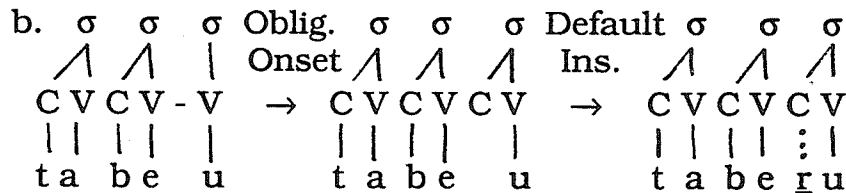
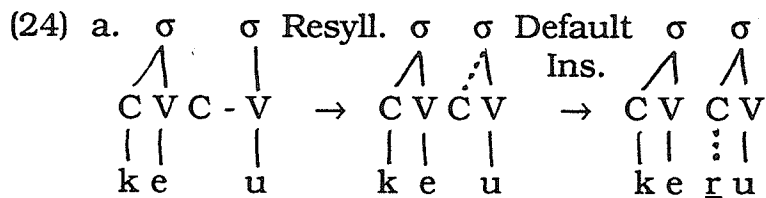
Itô (1986, pp.156-162) also discusses a case of onset obligatory language. In Axinica Compa (an Arawakan language spoken in the Amazon jungle), /a/ is inserted to break up consonant clusters (CC - CaC) and /t/ is inserted between two vowels (VV - VtV). The Ns in the underlying forms below are the nasal archisegments which always assimilate to the following consonants:

- (23) a. /noN-kim-piro-i/ → nonkimapiroti 'I will really hear'
 /noN-pok-piro-i/ → nompokapiroti 'I will really come'
 /noN-pisi-piro-i/ → nompisipiapiroti 'I will really sweep'
 /noN-pok-i/ → nompoki 'I will come'
 /noN-pisi-i/ → nompisiti 'I will sweep'



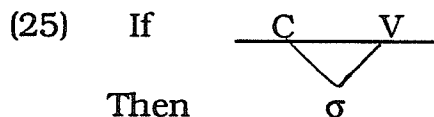
In (23b) the obligatory onset condition ensures the syllables to have onset, and the default segments are filled later by default insertion.

Given that the onset is obligatory in Japanese lexical derivation, I propose the derivation of *keru* ('kick') and *taberu* ('eat') as shown in (24a) and (24b):



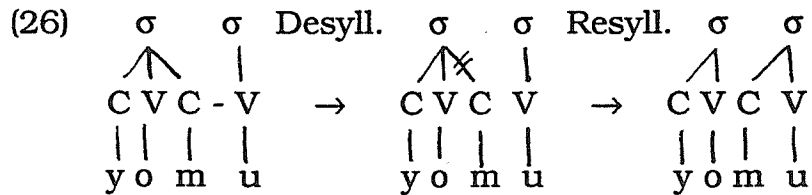
However, the obligatory onset condition, as it is easily pointed out, does not apply to the word-initial syllable in Japanese. Japanese has many vowel-initial words such as *aku* ('open'), *ikiru* ('live'), etc.. Interestingly, however, Axininca Compa also permits onsetless syllables in the word-initial position (Payne (1981)). This coincidence strongly suggests that there is a generalizable constraint on the onset obligatory condition shared with these languages. It is possible, as Itô (1986) suggests, that the domain in which all the syllable-wellformedness conditions have to be satisfied starts from the head (i.e. the nucleus of the initial syllable). This will allow onsetless syllables only word-initially. My intuition is, however, that a glottal stop is functioning as the onset of word-initial vowel. This will also account for the distinction of certain compoundings such as *sato-oya* ('foster parent') and *satooya* ('sugar store') by the existence of a glottal stop in the former (/sato?oya/). It is possible to derive some kind of extraprosodicity with this respect, applicable throughout the lexical derivation. I will not, however, pursue this matter in this study.

Finally, I also have to discuss the case where Universal Core Syllable Condition (UCSC) plays an important role. In the template approach of the syllable theory, UCSC is described as in (25) (Itô (1986, p.7)):



UCSC ensures that CV-sequences are always tautosyllabic. This condition continuously applies during the derivation, and the (re)syllabification by UCSC prevails over the effect of language-specific syllable-wellformedness conditions like Coda Condition. Itô (1986) suggests that when the violation of UCSC arises as the result of Coda Condition, it leads to the desyllabification of the coda consonant and subsequent resyllabification satisfies UCSC. This process seems evident in the Japanese verbal inflection when the morpheme-final phoneme of verbal stem is nasal. For

example, the verb, *yomu* ('read') has the syllable structure [yo]σ [mu]σ, in which the underlying form is presumably /yom-u/. The derivation of the surface syllable structure of *yomu* is presented in (26):



UCSC violation

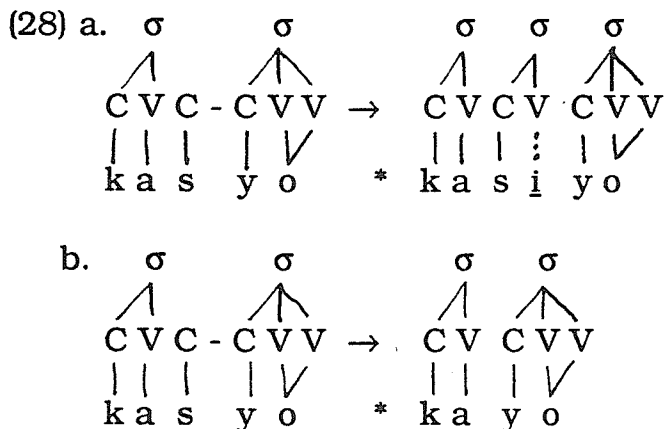
3.3. Presumptive Form

I now turn to the the presumptive forms (Pve), whose surface forms of vowel-stem verbs and consonant-stem verbs are compared in (27):

- (27) `eat' `borrow' `kick' `lend' `write' `smell' `die' `read' `call'
 tabe- kari- ker- kas- kak- kag- sin- yom- yob-

Pve *tabeyoo kariyoo keroo kasoo kakoo kagoo sinoo yomoo yoboo*

McCawley (1968) assumes the presumptive morpheme to be *-yoo* and accounts for the allomorphic *-ro* by the continuant deletion rule. However, this analysis is again implausible under the present framework because neither Stray Epenthesis (28a) nor Stray Erasure (28b) will generate the well-formed surface form, for example, *kasoo* ('probably lend'), from the underlying /kas-yoo/. Note that RCA does not take place between /s/ and /y/ (violation of the voice-matching constraint):



Neither * *kasiyoo* nor * *kayoo* is well-formed. Therefore, I propose that the underlying form of the presumptive morpheme is *-oo* rather than *-yoo*; and that /y/ is inserted rather than deleted. I will argue for the default consonant status of /y/ and /r/ in the next subsection.

There are other cases which can be analyzed along the lines of this argument. The passive and the potential morpheme manifest as *-rare-* and *-re-* after vowel-stem verbs and *-are-* and *-e-* after consonant-stem verbs, respectively. Following the previous argument, their underlying forms should now be identified as *-are-* and *-e-*. The causative morpheme is underlyingly *-ase-* rather than *-sase-* by the same argument. The default consonant is /s/ rather than /r/ in this case. Its manifestation as *-sase-* may be showing the duplication of the following consonant (i.e. /*tabe-ase-* → /*tabesase-*/).¹² I have, however, little to say at this moment on this aspect of Japanese phonology. In any event, the present analysis indicates that the /r/, /y/, and /s/ in the previous examples are more likely to be inserted rather than deleted.

3.4. Default Consonant in Japanese

I will now argue specifically for the default consonant status of /r/ and /y/ because it seems to be the most objectionable proposal to the native speakers of Japanese. Recall that /r/ and /y/ could occur in inflection where directly preceded by verbal stem-final vowels (as seen in /*kariru*/, /*kariyoo*/, and /*taberu*/, /*tabeyoo*/); and that the vowel-final vowels of Japanese verbs can only be /e/ or /i/. Both /y/ and /r/ can be originated in this postvocalic position as a result of feature filling. The unspecified C-slot created by the obligatory onset condition can be filled by the feature of the preceding vowel, [+son, +cont, -back]. Only /y/ and /r/, in Japanese, constitute a natural class with these features, and presumably, can be selectively inserted in this consonant position. Tsukishima (1987, p.496) indicates the insertion of /y/ (but not /r/) in this position in the historical derivation of the presumptive form /*yoo*/.

Alternation of /y/ and /r/ is also claimed to be allowed in some cases in classical Japanese: i.e. alternation of the prenominal verbal suffixes ('rentaikee') *-ru-* / *-yu-* in old Japanese (Mabuchi (1968)): interchangeability of the passive morphemes *-(r)ayu* / *-(r)aru* (Tsukishima (1987)). Interestingly, /y/ and /r/ are still interchangeable in one case in modern Japanese inflection. The surface imperative form of vowel-stem verbs can be either *-yo* or *-ro* (i.e. the imperative form of *tabe-* ('eat') can be either *tabeyo* or *tabero*).

This type of plasticity in /y/ and /r/, seems to indicate that they share a special amicability to the adjacent vowels probably because of their [+son, +cont] nature which they share with any vowels. This amicability of /y/ and /r/ is indicative as to my characterization of them as the default consonants. It seems, however, that /r/ is predominant as a Japanese default consonant at least in modern Japanese, and appears in more general contexts. The more particular default consonant /y/ appears only

in the presumptive form in modern Japanese. The surface absence of word-initial /r/ in native vocabulary also supports the primary default status of /r/ because onset is not lexically obligatory at word-initial position in Japanese. Thus the onset of the word-initial syllable can not be a default position to take /r/.

Note also that /r/ does not undertake Voicing Spread as we saw in (14) while nasals and other voiced obstruents do. The present analysis can avoid the dilemma that the analysis by the underspecification faces here, since nasals are apparently capable of providing the [+voice] feature. In the present framework, the inapplicability of Voice Spread can be easily explained by the absence of feature at the C-slot. The total assimilation in CC sequence can also be easily explained by feature filling if the initial C is 'unspecified'. These observations seem to provide a strong support for the existence of the default consonants, primarily /r/, in Japanese.

4. Adjectival Inflection

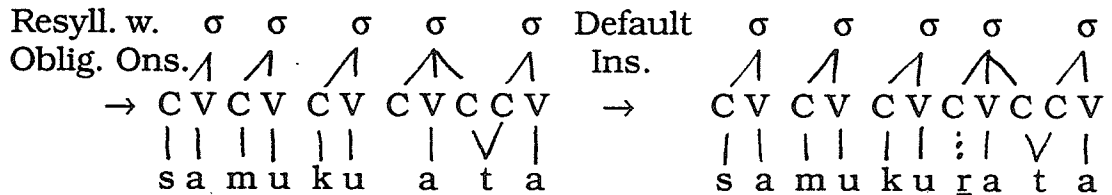
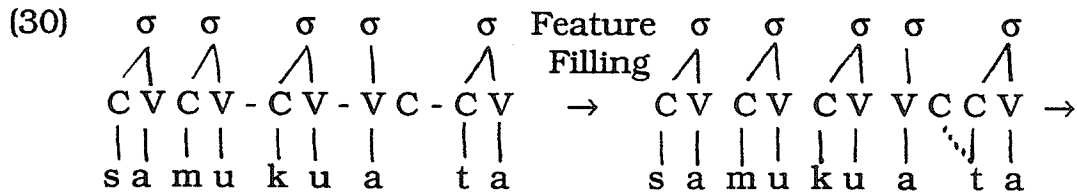
4.1. Adjectival Morphology in Japanese

There has been no argument, as far as I know, that explicitly refutes the analysis that the Japanese adjectival stems, unlike verb stems, all end with vowels (mostly back vowels: i.e. *aka-* ('red'), *too-* ('far'), and *samu-* ('cold')). What have been considered as the inflectional endings of adjectives (Bloch (1946), McCawley (1968), among others) are contrasted to those of verbs in (29). Their similarities are highlighted by separating the overlapping parts with hyphens:

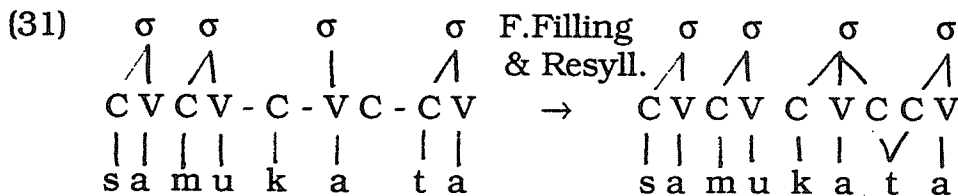
(29)	Adjectives	Verbs
a. Nonpast	-i	-u
b. Past	-kat-ta	-ta
c. Presumptive	-kar-oo	-oo
d. Provisional	-ker-eba	-eba
e. Gerundive	-ku-te	-te

McCawley (1968) makes the rather unmotivated assumption that /k/-initial morphemes seen in adjectival inflections like *-kar-*, *-ker-*, *-ku-* are infixes, whose function he did not specify. These infixes are obligatorily inserted before the inflectional suffixes like *-ta*. As McCawley was aware, *-kar-* surfaces as *-kat-* before /t/ by RCA. I will assume that *-ker-* is also an allomorph of *-kar-*. (I ignore the context which triggers the vowel alternation.) Chew (1973) recognizes the involvement of the auxiliary verb *-ar-* ('be'), and further decomposes these inserts into a connective morpheme *-ku-* and the auxiliary *-ar-*. Chew's analysis matches the traditional Japanese analysis in which the *ku*-form of adjective is called

renyooke ('continuative form'), the form whose primary function is to serve as a base for suffixation. However, the vowel deletion implicit in Chew's analysis (/ -ku-ar- / → -kar-) is implausible since the underlying /ku/ will inevitably constitute a well-formed syllable by continuous syllabification. The underlying /samu-ku-ar-ta/ in the present framework would yield the ill-formed * *samukuratta* ('was cold'):



Note that * *samukuatta* which might result without the obligatory onset condition in (30) is also ill-formed. If the well-formed surface *samukatta* ('was cold') were to derive from the underlying form /samu-ku-ar-ta/, the necessary process seems very hard to motivate since that requires the decomposition of a well formed syllable by /u/-deletion that produces the stray /k/, which later syllabified again into the following syllable. Rather than postulating this unmotivated process inevitably arises with the underlying /samu-ku-ar-ta/, I propose the different underlying form /samu-k-ar-ta/, which will yield the surface form more naturally:



Two crucial conclusions that I derived in Uchida (1991) are relevant here. First, the adjectival stem includes -k-, which I proposed to be the independent adjective-formative morpheme, rather than assuming -k- to be a part of the inflectional endings.¹³ Secondly, the adjectival inflection in Japanese basically requires -ar- ('be') -support, which is quite analogous to the English *be*-support. Morphologically, this will result in a simpler underlying configuration: /adjective stem + auxiliary verb +

inflectional suffix/ as exemplified in (32) (I call the adjectives without *-k-* like *samu* in (32) 'adjectival root'). The auxiliary verb *-ar-* is underlyingly /aX/ from the previous argument:

(32) / samu - k - aX - ta /
 cold -adj -be -PAST

The inflectional paradigm of auxiliary *-ar-* is virtually identical to that of the verb *ar-* ('be' or 'exist') as shown below (33). The overlaps are again highlighted with hyphens:

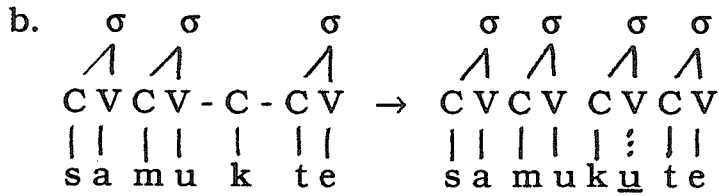
(33)		-ar-	ar
	Past	<i>samuk-atta</i>	<i>atta</i>
	Presumptive	<i>samuk-aroo</i>	<i>aroo</i>
	Provisional	<i>samuk-ereba</i>	<i>ereba</i>

This suggests that the *-ar-* is derived from the the verb *ar-*. In English, *be* can function as a verb or function as an auxiliary verb to support inflection. These observation seems to justify my assumption that adjective inflection involves the auxiliary verb *-ar-*.

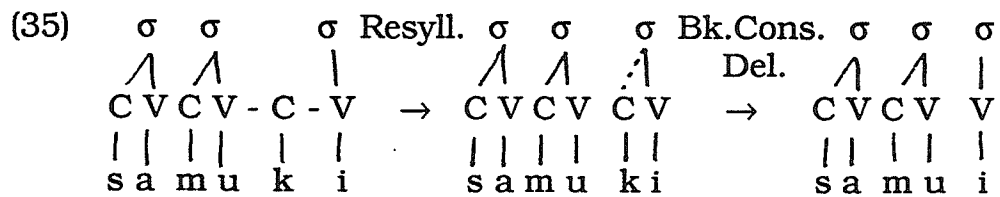
4.2. Adjectival *-ku* Form & Nonpast Form

Adjectives manifest the *-ku* ending when they are used as adverbs or occur as complements of certain verbs: i.e. *hayaku hasiru* ('run quickly'), *hayaku naru* ('become quick'). As argued in Uchida (1991), these *ku*-final forms are morphologically no more than the bare adjective stems. In the present framework, this ending as well as the gerundive ending *-kute* (29e) are naturally derivable via Stray Epenthesis from the underlying /samu-k/ and /samu-k-te/, respectively. The segment /k/ in both forms fails to be syllabified because of the Japanese coda condition, and the fact that [+back] consonants are not subject to RCA (see (6)). (34a) and (34b) below show that Stray Epenthesis maps the stray /k/ into a newly created well-formed syllable, and that the default vowel /u/ fills its nucleus:¹⁴

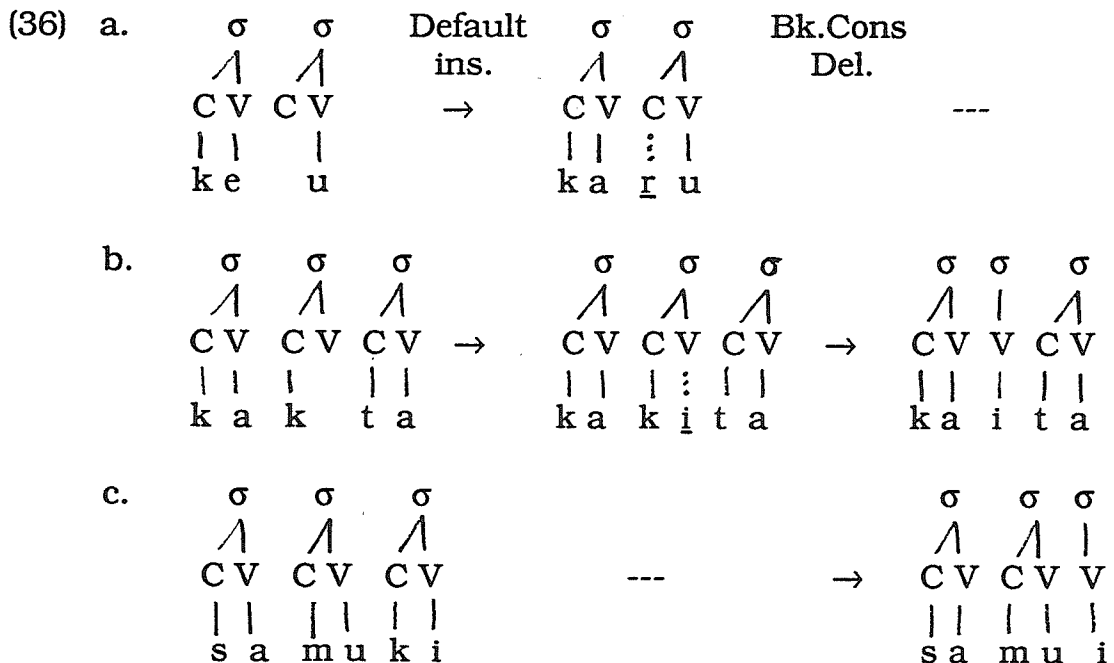
(34) a. σ σ σ σ σ
 \wedge \wedge \wedge \wedge \wedge
 C V C V - C \rightarrow C V C V C V
 || | | | | || | | | | ;
 s a m u k s a m u k u



As for the nonpast forms (e.g. *samui* ('is cold')), I have to assume no involvement of *-ar-*: thus *-i* is the special tense morpheme which does not require *-ar-* support (Uchida (1991)). Thus, *samui* is underlyingly /samu-k-i/, and the /k/ is eventually deleted by Back Consonant Deletion:



Note, Back Consonant Deletion applies after the cycle of continuous application of the language-specific template matching. The obligatory onset condition presumably does not have to be met after the cycle is completed. This late application of Back Consonant Deletion seems to be obvious because the rule is crucially ordered to apply after the default insertion. (36) shows the relevant final-stage derivations of *keru* ('kick')(36a), *kaita* ('wrote')(36b) and *samui* ('is cold') (36c):



5. Summary

Itô (1986) demonstrated that the syllable-based analysis provides a plausible and systematic account of the phonology of Sino-Japanese compounds. Unlike the rules of previous analyses which are often not associated with any obvious motivations, all the phonological changes are motivated by the general mechanism of Prosodic Licensing and Stray operations. In this paper, I analyzed the morphology of Japanese inflection by utilizing the dynamics of her syllable theory. The underlying inflectional components proposed in this study reveals how adjectival inflection and verbal inflection are related in Japanese:

(37)	Adjectives	Verbs
a. Nonpast	-i	-u
b. Past	-aX-ta	-ta
c. Presumptive	-aX-oo	-oo
d. Provisional	-aX-eba	-eba
e. Gerundive	-te	-te

It now becomes clear how the Japanese adjectival and verbal inflections are related. In identifying these underlying forms, the present study depended on some crucial assumptions: 1) sonorants and other obstruents are specified as to [±voice] throughout the lexical derivation, 2) the regressive consonant assimilation, a prominent phonological rule in Japanese, has the voice-matching constraint, 3) Japanese has the obligatory onset condition, 4) /r/ (and /y/ in limited context) is the default consonant in Japanese.

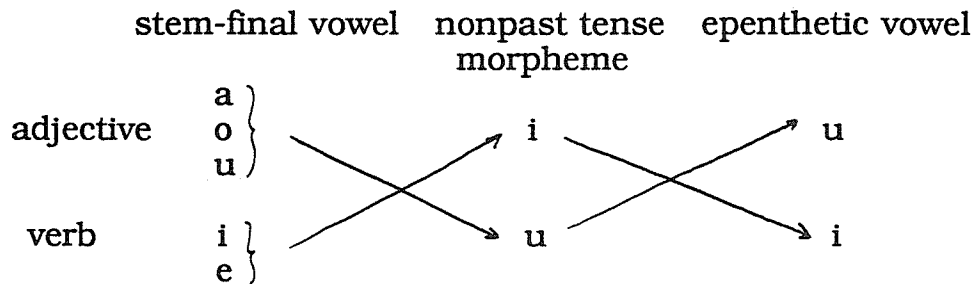
The remaining problem is how to reconcile the present analysis with the theory of underspecification. Itô and Mester (1986) provide a strong argument for the applicability of the underspecification framework in Japanese by their analysis of the Japanese sequential voicing phenomenon, or *rendaku*. The entire argument of the present study, however, hinges crucially on the assumption that sonorants, nasals and other voiced obstruents in Japanese have the distinct [+voice] feature in the lexical derivation. This contradiction in Japanese phonology definitely requires further study.

Footnotes

1. The Sino-Japanese morphemes are typically the modern descendants of 'imported' Chinese morphemes which consist of a major part of modern Japanese vocabulary.
2. Activation of Stray Epenthesis is parameterized while Stray Erasure is universally 'on' (Itô (1986)). Since Stray Epenthesis applies before Stray Erasure at the end of phonological cycle, Stray Erasure will have no visible effects if Stray Epenthesis applies all stray segments (p.116). This seems to be the case in Japanese.
3. Yasushi Sato (personal communication) pointed out the inadequacy of this coda condition: Itô's coda condition in (2) can not prevent word-final /m/, which is ill-formed in Japanese. On the other hand, Japanese words can supposedly end with /n/, and the condition in (2) simply cannot capture this discrepancy. This problem seems to require mora-based analysis rather than syllable, since the coda /n/ is moraic and only /n/ (but not /m/) can be moraic word-finally in Japanese. I will not, however, pursue this issue in the present study.
4. Itô maintains that a syllable external information like additional linking to the adjacent syllable as in the case of gemination 'need only be available to the Universal Linking Constraint, and not to the language-particular syllable condition' like (2); therefore, the coda condition in (2) is compatible with the Locality Principle which specifies that well-formedness of syllable is determined strictly 'inside' the syllable (1986, p.28).
5. Fusion is a mechanism which fuses two identical consonants into a single melodic unit. Tier Conflation is to 'line up' tiers, presumably causing the effect of Bracket Erasure, where concatenating morphemes are lexically represented on separate tiers in the previous stage (a convention proposed by McCarthy (1981, 1986).
6. Itô (1986) assumes the epenthetic vowels to be /u/ after non-palatalized consonants and /i/ after palatalized consonants in the Sino-Japanese compoundings. For example, while *gaku* has the underlying form /gak/, *seki* ('stone') has the underlying form /sek^y/).
7. To explain the gemination in (5) by RCA, however, has a peculiar problem: the morpheme-final /t/ seems to undergo, not only place, but a total assimilation. Note that RCA is basically a place assimilation rule; and in the derivation of /bet-si/→*bessi*, the manner [+cont] also spreaded. Considering the discrepancy indicated by the derivation like /kas-ta/→*kasita* (*kas-*, 'lend'; *-ta*, the tense suffix), I have to assume that [+cont] can spread leftward, but [-cont] cannot.

13. One important distinction was made in Uchida (1991) in this respect that the adjectives without *-k-*, for example, *samu-* ('cold') as in *samu-sa* ('coldness') are just the meaning-bearing part of the adjective or 'adjectival root' while adjectives with *-k-* or 'adjective stem' like *samu-k-* ('be cold') are predicates (i.e. they project their argument structures), holding the same status as the verbal stems like *kak-* ('write'). This is based on the observation that *-k-* is never involved in any derivational morphology (lexical compounding and suffixation) of adjectives while the *-k-* morpheme is necessary in the inflectional morphology of adjectives. See Uchida (1991) for detailed discussion.

14. What determines the quality of the epenthetic vowel in Japanese inflectional morphology is by no means clear. However, the epenthetic vowel seems to be consistently /i/ in verbal morphology and /u/ in adjectival morphology. This, by the way, shows a curious vowel alternation paradigm between verbs and adjectives:



I owe this analysis to Chris Brockett (personal communication), whose discerning eye pointed out this peculiar phenomenon.

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On Japanese Verbal Morphology: A Templatic Approach*

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0. Introduction

Traditional accounts of Japanese verbal paradigms (as per Bloch (1946)) call for classifying regular verbal stems as ending in /e/ or /i/, and classifying irregular verbal stems as consonant-final, as in the following:

(1) Traditional classification of Japanese verbals

a. regular verbal	<i>taberu</i>	stem	<i>tabe-</i>
b. irregular verbal	<i>nomu</i>	stem	<i>nom-</i>

This initial classification of irregular stems as being consonant-final has resulted in numerous generative proposals positing a wide variety of processes to handle the surface forms of the verbal conjugations, among those Kuroda (1965), McCawley (1968), Chew (1973), de Chene (1985), and Fukui (1986); for notable improvements due to advancement in the field in general, see Kajihara (1992) and Uchida (1992) in this volume.

In this paper I will abandon the basic assumption that irregular verbals are consonant-final, leaving behind the baggage that assumption entails (and, of course, picking up a different matched set). I will first posit that irregular verbal stems are also vowel-final, unfailing ending in the vowel /i/; this is in contrast with the traditional rule of vowel epenthesis which inserts /i/ between the stem and certain suffixes. To support this I will present as evidence the formal forms of irregular verbals and various compounds formed from irregular verbal stems. Taken together with the irregular verbal paradigm, I will maintain that these warrant not only positing irregular verbals as having a stem-final /i/, but also positing a templatic irregular verb-final syllable of the form CV, where the consonant remains for the most part unvariable, and the vowel alternations observed are due to the shift of this templatic syllable's vowel; after this shift has occurred, the appropriate suffix (in some cases, a \emptyset form) is then added to the altered verbal stem.

This basic premise of this paper is that a synchronic generative process continues to produce the irregular verbal morphology in Japanese that is observed in surface forms, and that this process was also responsible for the formation of several forms surviving in the regular verbal and adjectival paradigms.

§1 will contain a brief overview of the Japanese verbal system. In §2, justifications for stem-final /i/ in irregular verbals will be presented. §3 will contain an overview of the verbal conjugational paradigms; §4 will contain a traditional analysis of irregular conjugations, with §5 presenting an alternative account using the templatic verb-final syllable and a process I will call Syllable Shift. §6 will compare the two analyses, and §7 will conclude with a brief summation of the arguments presented in this paper.

* This templatic approach first occurred to me while the teaching associate of my first-year Japanese class, a Japanese linguist named Keiko Inoue, was explaining a verbal alternation that will be discussed in §5.6. As far as I am aware, this is the first time this analysis has been applied to the Japanese verbal system. If I am mistaken, please inform me of the published work a similar analysis has appeared in so that I may properly cite it in future versions of this paper. All comments will be appreciated, and can be sent to varden@u.washington.edu.

1. The Japanese verbal system

This section contains a brief overview of the classes observable within the Japanese verbal system.

While Japanese verbals are not inflected for number or gender, the verbal system overall is quite complex. On a pragmatic level, most verbals possess an informal form (also known as the citation form), a neutral formal form, four humble formal forms, as well as two honorific formal forms (terms are from Jordan (1963, 1988)). In addition, each verbal has gerund, informal past, desirative, conditional, representative, provisional, tentative, imperative, potential, causitive, and passive forms; the majority of these are formed by suffixation, and many of these suffixes can be compounded in a cyclic manner.

There are two principle classes of verbals in Japanese, regular (*itidan*) verbals and irregular (*godan*) verbals, so named for the number of vowels found at the end of the stem in the verbal's conjugation (from *iti* '1', *go* '5' and *dan* 'step', 'level', 'grade'). For example, *taberu* 'to eat' is a regular verbal; its stem is *tabe-*, and the vowel *-e-* is found stem-finally before all suffixes (see Example (8)). Irregular verbals, then, have all five vowels occurring stem-finally in their conjugations, as in the verbal *hanasu* 'to talk' (throughout this paper 'np' will stand for 'non-past'):

(2) *Hanasu* 'to talk'

a. plain formal np	<i>hanasimasu</i>	'to talk'
b. informal np	<i>hanasu</i>	'to talk'
c. informal neg. np	<i>hanasanai</i>	'to not talk'
d. provisional	<i>hanaseba</i>	'provided (one) talks'
e. tentative	<i>hanasoo</i>	'let's talk'

There are two other classes of verbals in Japanese, but they consist of only seven other verbals - five honorific forms that basically behave as irregular verbals, and the two regular verbals *kuru* 'to come' and *suru* 'to do' that display the remnants of the vowel harmony processes that were present in Old Japanese.

2. Irregular (*godan*) verbal stems

In this section I will argue against the traditional analysis that posits irregular Japanese verbals as having consonant-final stems; I will instead propose that all irregular Japanese verbals are underlyingly /i/-final, presenting as evidence the variety of surface forms of verbal stems that can be observed in the language.

As noted above, traditional analyses (as in Kuroda (1965), McCawley (1968)) posit consonant-final irregular stems, and a rule of vowel epenthesis to explain the /i/ found in conjugations involving certain suffixes. This rule of epenthesis must then be extended to the stems that are found in the formal forms of irregular verbals, to a wide variety of compound words formed by combining verbal stems with nominals, adjectivals and other verbals, and to the nominalized stems of certain verbals.

2.1. Formal forms of verbals

Japanese utilizes a complex system of verbal forms to establish relative status of the speakers involved; the tone of the conversation can be informal or formal, and the speaker can either maintain the same level as the addressee, utilize a very abrupt style with those lower or equal in status, or either exalt the addressee or humble themselves with those of higher status. These varying degrees can be seen in the various forms of the regular verbal *taberu* 'to eat':

- (3) Formal forms of the verbal *taberu*
- | | |
|--------------|--|
| a. plain | <i>tabemasu</i> |
| b. humble | <i>otabe-suru/otabe-simasu</i>
<i>otabe-itasu/otabe-itasimasu</i> |
| c. honorific | <i>otabe ni naru/otabe ni narimasu</i>
<i>otabe da/otabe desu</i> |

The *o-* prefix is an honorific prefix also used with nominals (and in certain cases, adjectivals); note the various shading possible by using either the informal form of *suru* 'to do', its plain formal form *simasu*, the humble informal equivalent *itasu* 'to make, to do' or its plain formal form *itasimasu*. The same holds for the forms containing the informal and formal forms of *naru* 'to become' and the copula *da* used in the honorific forms.

This same paradigm is seen with irregular verbals as well, as can be seen with the verbal *nomu* 'to drink':

- (4) Formal forms of the verbal *nomu*
- | | |
|--------------|--|
| a. plain | <i>nomimasu</i> |
| b. humble | <i>onomi-suru/onomi-simasu</i>
<i>onomi-itasu/onomi-itasimasu</i> |
| c. honorific | <i>onomi ni naru/onomi ni narimasu</i>
<i>onomi da/onomi desu</i> |

Note here that the stem exhibits a final /i/ - this is true of all formal forms of all irregular verbals.

2.2. Compounds involving verbal stems

Verbal stems can combine with nominals, adjectivals and verbals to form compounds; the class of the compound is determined by the final member. The range of these constructions can be seen in the following:

- (5) Compounds formed with irregular verbal stems
- kaimono* 'shopping' ← *kau* 'to buy' + *mono* 'thing'
 - iriguti* 'entrance' ← *iru* 'to enter' + *kuti*¹ 'mouth'
 - kakiyasui* 'easy to write' ← *kaku* 'to write' + *-yasui* 'marked by ease'
 - hanasinikui* 'hard to say' ← *hanasu* 'to talk, say' + *-nikui* 'marked by difficulty'
 - nomisugiru* 'to drink to excess' ← *nomu* 'to drink' + *sugiru* 'to go past'
 - norikaeru* 'to transfer vehicles' ← *noru* 'to board' + *kaeru* 'to (ex)change'

Examples a. and b. are nominals, c. and d. are adjectivals, and e. and f. are verbals. Note that all verbal stems are again /i/-final; again, all irregular verbals that are the initial members of a compound word display this stem-final /i/.

2.3. Nominalized forms of irregular verbal stems

Of special note are the nominalized forms of some verbal stems, such as *hiki* 'influence' (← *hiku* 'to pull'), and the bare-stem surfacing of two verbs of motion *iku* 'to go' and *kaeru* 'to return home' in gerundive formations. The first class has the same distribution as any other nominal, while the latter two occur in conjunction with the locative/directional particle *ni* in a

¹ The voicing of the second member of a compound, as in this example, is known as *rendaku*. See Itô and Mester (1986, 1989) for discussions.

specialized construction (here TOP, SUB and LOC/DIR are the particles of topicalization, subject marking and location/directional, respectively):

(6) Use of nominalized verbal stems in Japanese

- a. *Kachoo wa, hiki ga arimasu.*
section head TOP influence SUB exists
'The section head has influence.'
- b. *Kaeri ni yotte kudasai.*
return LOC/DIR stop in to receive
'Please stop in on your way home.'
(lit. 'Please give me stopping in within your return')
- c. *Iki ni katte yotta.*
go LOC/DIR buy stopped in
'I bought it and then stopped in.'

Syntactic distribution aside, what is pertinent here is that all three stems - indeed, any of the limited number of stems that can be nominalized - surface as /i/-final², just as they do when formally contained within a compound word.

2.4. Comparison of analyses of stems

As stated above, the traditional analysis posits a consonant-final stem for all irregular verbals; for example, the verbal *kaburu* 'to wear upon the head' is said to have a stem *kabur-*. Instead of calling upon a rule of vowel epenthesis, the /i/ observed in the surface forms can be explained by positing (*i*)*masu* as the plain formal suffix, the optional /i/ being used with irregular conjugations to yield the plain formal form *kaburimasu*. As far as surface forms go, both of these analyses are equivalent.

Positing two plain formal stems, *-masu* for use with regular verbals and *-imasu* for use with irregular verbals, is not unreasonable; as we shall see in §3, it is necessary to posit two alternate suffix forms with several other conjugations. It is not feasible to extend this to the compound forms in (5), however, because these are formed by the addition of independent nominals, adjectivals and verbals; it is not reasonable to posit two forms for these when they are observed nowhere else in the language. Likewise, the stems seen in the humble and honorific formal forms are followed by independent verbals and particles that surely do not have two forms, and the bare verbal stems in (6) occur as distinct words before a particle. This necessitates the use of vowel epenthesis to derive the surface forms.

The use of vowel epenthesis is also not unprecedented - the use of this process to conform loan-word syllables to Japanese templates is well documented (see Ohso (1973), Lovins (1975)). I have an objection with this epenthetic analysis, however; the consistency observed in the stem-final /i/ is not observed in the epenthetic vowels found in loan-words. In those environments, either /u/, /o/ or /i/ can be epenthetic. This can be seen in the following (epenthetic vowels are in bold - *j* is a voiced coronal affricate):

(7) Epenthetic vowels in loan words

- | | |
|------------------------|----------------------|
| a. <i>Sobieto</i> | 'Soviet' |
| b. <i>Makudonaludo</i> | MacDonald's |
| c. <i>Noosuesuto</i> | 'Northwest Airlines' |
| d. <i>nootobukku</i> | 'notebook' |
| e. <i>Shiatoru</i> | 'Seattle' |

²This also provides what I consider fairly persuasive evidence that Japanese is a stem-based language.

f. <i>sandoitchi</i>	'sandwich'
g. <i>faaji</i>	'fudge'
h. <i>messeiji</i>	'message'
i. <i>suponji</i>	'sponge'
j. <i>eggu</i>	'egg'
k. <i>gorufu</i>	'golf'
l. <i>furansu</i>	'France'
m. <i>pikunikku</i>	'picnic'
n. <i>puroguramu</i>	'program'

These examples show the distribution of truly epenthetic vowels³. Interestingly, the only common examples I know of that do not adhere to this paradigm all end in a /k/ in the target language; i.e. *kekki* 'cake', *suteeki* 'stick', 'steak' and *sutoraiki* 'a labor strike' (cf. *sutoraiku* 'a baseball strike').

As can be seen in (7), /o/ occurs after coronal stops (examples a-f), /i/ occurs after coronal affricates (f-i), and /u/ occurs after every other consonant (b-e, i-n). If this epenthetic rule utilized in conforming loan-words to the Japanese syllable template were the same as that responsible for the irregular verbal stem-final vowel, /i/ would not occur except in those cases where the stem ended in a coronal affricate - these are only a minority of the verbals, and none of those shown in (5). It therefore becomes necessary to posit a separate vowel epenthesis rule that occurs only with irregular verbal stems; an additional stipulation that is not necessary if stem-final /i/ is accepted.

Due to the unfailing surfacing of irregular verbal stems with a final /i/ in formal forms, within compound words, and when they occur as nominals, as well as making it unnecessary to posit a separate vowel epenthesis rule for irregular verbals, I maintain that all irregular verbal stems in Japanese are underlyingly /i/-final. The stem of any verbal, regular or irregular, can then be found by deleting the suffix of the plain formal form *-masu*.

3. Verbal conjugations

In this section I will present a brief overview of the verbal conjugations of both regular and irregular verbals in Japanese.

3.1. Regular (*itidan*) verbals.

The full conjugation of a regular verbal shows the basic inflectional suffix paradigm for each form (suffixes are in bold):

(8) <i>Osiemasu</i> 'to teach'		
a. informal np	<i>osieru</i>	'to teach'
b. gerund	<i>osiete</i>	'teach and...' ⁴
c. informal past	<i>osieta</i>	'taught'
d. conditional	<i>osietara</i>	'if (one) teaches'
e. representative	<i>osietari</i>	'teaching'
f. provisional	<i>osiereba</i>	'provided one teaches'
g. tentative	<i>osieyoo</i>	'let's teach'
h. imperative	<i>osiero</i>	'teach!'
i. negative np ⁵	<i>osienai</i>	'(one) doesn't teach'
j. desirative np	<i>osietai</i>	'want to teach'

³ These are in contrast with vowels that inserted to create a diphthong or consonant-vowel combination that is not present in Japanese (as in *uesuto* 'west', where [ue] is used to produce the target [we]), and with the /a/ used to replace a syllable-final /r/, as in *doa* 'door'.

⁴ This is one use of the gerund form, to combine clauses. Other uses include the progressive and perfective.

⁵ The negative non-past and desirative forms are adjectivals.

k. potential np	<i>osierareru</i>	'be able to teach'
l. causitive np	<i>osiesaseru</i>	'make (one) teach'
m. passive np	<i>osierareru</i>	'to be taught'

These forms show the unmarked suffixes used with regular verbals, and the unvarying verbal stem. This same paradigm is seen for all regular Japanese verbals.

3.2. Irregular (*godan*) verbals.

Somewhat the same suffixal pattern is used to conjugate irregular verbals, with some notable differences. Consider the following conjugation:

(9) *kakimasu* 'to write, to draw'

a. informal np	<i>kaku</i>
b. gerund	<i>kaite</i>
c. informal past	<i>kaita</i>
d. conditional	<i>kaitara</i>
e. representative	<i>kaitari</i>
f. provisional	<i>akeba</i>
g. tentative	<i>kakoo</i>
h. imperative	<i>kake</i>
i. negative np	<i>kakanai</i>
j. desirative	<i>kakitai</i>
k. potential	<i>kakeru</i>
l. causitive	<i>kakaseru</i>
m. passive	<i>kakareru</i>

This is basically the same paradigm seen with other irregular verbals, with the exception of the forms in b-e⁶ - those suffixes are the same in both the regular and irregular verbal paradigms; it is the stem that undergoes a change. While a thorough discussion of these conjugations is outside the focus of this paper, in the interest of completeness I will present a brief overview.

The following example shows the range of variation occurring in these four conjugations of irregular verbals, here grouped by the change occurring in the stem:

(10) Selected conjugations of irregular verbals

<u>verb</u>	<u>gerund</u>	<u>inf. past</u>	<u>conditional</u>	<u>representative</u>	<u>gloss</u>
<i>hikimasu</i>	<i>hiite</i>	<i>hiita</i>	<i>hiitara</i>	<i>hiitari</i>	'to pull'
<i>oyogimasu</i>	<i>oyoide</i>	<i>oyoida</i>	<i>oyoidara</i>	<i>oyoidari</i>	'to swim'
<i>araimasu</i>	<i>aratte</i>	<i>aratta</i>	<i>arattara</i>	<i>arattari</i>	'to wash'
<i>koorimasu</i>	<i>kootte</i>	<i>kootta</i>	<i>koottara</i>	<i>koottari</i>	'to freeze'
<i>matimasu</i>	<i>matte</i>	<i>matta</i>	<i>mattara</i>	<i>mattari</i>	'to wait'
<i>komimasu</i>	<i>konde</i>	<i>konda</i>	<i>kondara</i>	<i>kondari</i>	'to become crowded'
<i>yobimasu</i>	<i>yonde</i>	<i>yonda</i>	<i>yondara</i>	<i>yondari</i>	'to call'
<i>sinimasu</i>	<i>sinde</i>	<i>sinda</i>	<i>sindara</i>	<i>sindari</i>	'to die'

All irregular verbals that share the last syllable of the plain formal form with one of the verbals in (10) display the same alternations; these can be summarized as follows (where [r] represents a flap as in American English 'butter'):

⁶ There is one additional alternation, present in /wV/-final verbals, which was alluded to in the opening note and will be discussed in §5.6.

(11) Stem alternations as phonological rules

- a. [ki], [gi] → [i]
- b. [i], [ri], [tʃi] → [t] - geminate with following [t]
- c. [mi], [bi], [ni] → [n]

Rules a. and c. are the remnants of historical changes in the language that were not limited to verbal conjugations (see Miller (1967), Martin (1987) for discussions). Briefly, those in a. are the deletion of velar consonants before the high front vowel, and those in c. are the collapsing of moras with initial nasals (the /b/ thought to be derived from a prenasalized stop) to form the moraic nasal. For b., I have only the tentative suggestion that all of these moras have initial consonants that are somehow 'weak' - either deleted ([i]) (see §5.6), or underspecified coronal consonants ([tʃi], [ri]). These syllables, therefore, may be easily detached from their timing slot, which then forms a geminate consonant through re-association to the following timing slot.

Understanding the origin of the coronal deletion in the verbal paradigms in a., however, does not add any explanatory power to the analysis in this paper, since this deletion could occur after /i/-epenthesis in a traditional analysis.

4. A traditional approach

In this section I will present a traditional analysis of Japanese verbal morphology, of the type used in Kuroda (1965) and McCawley (1968).

Notice that arranging the verbal paradigms in the fashion of (8) and (9) certainly leads one to posit consonant-final stems, together with a rule of consonant deletion. Comparing these two paradigms within a consonant-final stem framework shows the similarities and the differences:

(12) Comparison of regular and irregular verbal paradigms

<u>Conjugation</u>	<u>Regular suffixes</u>	<u>Irregular suffixes</u>
a. gerund	-te	-te
b. informal past	-ta	-ta
c. conditional	-tara	-tara
d. representative	-tari	-tari
e. desirative np	-tai	-tai
f. informal np	-ru	-u
g. provisional	-reba	-eba
h. potential np	-rareru	-eru
i. passive np	-rareru	-areru
j. causitive np	-saseru	-aseru
k. tentative	-yoo	-oo
l. imperative	-ro	-e
m. negative np	-nai	-anai

The /t/-initial suffixes previously discussed are the same for both classes of verbals; the same goes for the desirative suffix /-tai/, although the stems do not undergo a change with this suffix. Notice also that the forms in (12) f-k are basically the same, with the irregular suffixes missing the initial consonant.

For (12)f-k, traditional analyses posit one set of suffixes, with suffix-initial consonants being deleted after the irregular stem's final consonant. A sample derivation of (9g) would then be as follows:

- (13) derivation of *kakoo* - traditional analysis
- | | |
|---------------------|----------------|
| underlying | <i>kak-yoo</i> |
| continuant deletion | <i>kak-oo</i> |
| surface form | <i>kakoo</i> |

However, Uchida (1992) makes a valid objection to this analysis; either the epenthetic vowel rule should apply, yielding **kakiyoo*, or Stray Erasure (as per Steriade (1982)) should apply to /k/, yielding **kayoo*, since it is the stem-final /k/ that is not licensed in the coda position; the /y/ in the onset of the suffix is perfectly acceptable. He therefore posits an underlying irregular suffix -oo, and extends this to the other conjugations as well, relying on /r/- and /y/-epenthesis to derive the regular verbal forms.

This certainly improves the previous analyses, but it still calls for an epenthetic rule I believe is not necessary.

5. A Syllable Shift analysis

In this section I will present an alternative to the traditional analysis, one I will call Syllable Shift. In order to formulate this analysis, it is necessary to introduce the main Japanese syllabary, called the *gojuuon* (lit., five-ten-sound, 'fifty sounds'⁷).

5.1. The *gojuuon* syllabary

The basic syllabary is arranged much like a multiplication table, producing the following cross-reference of syllable onsets and vowel nuclei (allophonic variants are in bold, using IPA symbols):

(14) The 50 basic syllables

	a	i	u	e	o
-	a	i	u	e	o
k	ka	ki	ku	ke	ko
s	sa	ʃi	su	se	so
t	ta	tʃi	tsu	tɛ	to
n	na	ni	nu	ne	no
h	ha	çi	fu	he	ho
m	ma	mi	mu	me	mo
y	ya	i	yu	e	yo
r	ra	ri	ru	re	ro
w	wa	i	u	e	o/wo

The glide deletions are well-attested historical changes (again, see Miller (1967), Martin (1987)); for a good discussion of the other allophones, see Vance (1987). I will call particular note to the rounded glide deletion before all non-low vowels observable in the last row (the particle *wo* is only used to mark the objective case in careful speech; this syllable is never found word-internally). These deletions will come to bear in the present analysis.

⁷ There are not and likely have never been fifty syllables in the Japanese syllabary; however, the 5 by 10 arrangement from which the name derives contains all of the syllables that are found stem-finally in the verbal morphology.

5.2. Syllable Shift

Again re-arranging the conjugations in (9), this time with a different emphasis, a different pattern for most of the forms comes to light (regular verbal suffixes are in parentheses for comparison):

(15) *kakimasu* 'to write, to draw'

a. informal np	<i>kaku</i>	(-ru)
b. negative np	<i>kakanai</i>	(-nai)
c. passive	<i>kakareru</i>	(-rareru)
d. causitive	<i>kakaseru</i>	(-saseru)
e. provisional	<i>akeba</i>	(-reba)
f. potential	<i>kakeru</i>	(-rareru)
g. imperative	<i>kake</i>	(-ro)
h. tentative	<i>kakoo</i>	(-yoo)
i. gerund	<i>kaite</i>	(-te)
j. informal past	<i>kaita</i>	(-ta)
k. conditional	<i>kaitara</i>	(-tara)
l. representative	<i>kaitari</i>	(-tari)
m. desirative	<i>kakitai</i>	(-tai)

Again, I posit that the basis of Japanese irregular verbal morphology is a stem-final templatic syllable of the form CV, where the consonant is invariant for a given verbal (with the exception of those forms discussed in §3.2 and §5.6), and that the base stem is the *Ci*-final form found in the plain formal form of verbals - above, *kakimasu*. Further, I posit that there are several classes of inflected stems formed from this base stem by shifting the final syllable of the base to a different column of the 50-syllable Chart (why I am positing a shift of syllable rather than a shift of vowel will be apparent in §5.6). The suffix (when there is one) is then adjoined to this transformed stem.

I will refer to this shift by the ordinal number of the column ordered as in the 50-syllable Chart; for example, a shift from the 2nd column (*Ci*) to the 1st column (*Ca*) will be referred to as 1st Column Syllable Shift.

5.3. Syllable Shift in irregular verbals

If we apply this analysis to the irregular verbal *kakimasu* in (15) above, the derivation of a-h⁸ would be:

(16) Derivation of selected conjugations of *kakimasu*

a. informal non-past		
underlying		<i>kaki + Ø</i>
3rd Column Syllable Shift		<i>kaku</i>
surface form		<i>kaku</i>
b. negative non-past		
underlying		<i>kaki + nai</i>
1st Column Syllable Shift		<i>kaka + nai</i>
surface form		<i>kakanai</i>
c. passive		
underlying		<i>kaki + re + ru</i>
1st Column Syllable Shift		<i>kaka + re + ru</i>
surface form		<i>kakareru</i>

⁸ The forms in (15) i-m do not show an alternation of the vowel of the last syllable, and therefore would not participate in this process.

d. causitive		
	underlying	<i>kaki + se + ru</i>
	1st Column Syllable Shift	<i>kaka + se + ru</i>
	surface form	<i>kakaseru</i>
e. provisional		
	underlying	<i>kaki + ba</i>
	4th Column Syllable Shift	<i>kake + ba</i>
	surface form	<i>akeba</i>
f. potential		
	underlying	<i>kaki + ru</i>
	4th Column Syllable Shift	<i>kake + ru</i>
	surface form	<i>kakeru</i>
g. imperative		
	underlying	<i>kaki + Ø</i>
	4th Column Syllable Shift	<i>kake + Ø</i>
	surface form	<i>kake</i>
h. tentative		
	underlying	<i>kaki + o</i>
	5th Column Syllable Shift	<i>kako + o</i>
	surface form	<i>kakoo</i>

The passive and causitive stems are listed as simply *-se* and *-re* because of the way they combine cyclically with suffixes used to derive adjectivals; this will be discussed further in §5.7. The additional suffix *-ru* in those derivations is the informal present tense marker, as in (8)a.

There are four reasons why I find this analysis preferable to a traditional approach - 1) the objection based on the particular epenthetic vowel called for in earlier analyses discussed in §2.3; 2) the extension of Syllable Shift to the historical origin of some of the conjugations of regular verbals and adjectivals; 3) the ease of accounting for the informal non-past forms of verbals that show a seemingly epenthetic *-w-*; and 4) the application of this analysis to the cyclicity of compound verbal and adjectival inflections.

5.4. Syllable Shift in regular verbals

This analysis can be extended to the historical derivation of several of the regular verbal conjugations, with the added stipulations that the base form that Syllable Shift applied to was the informal non-past suffix *-ru*, and that some remnant of a consonantal harmony process is observable in the causitive form. A possible derivation of the conjugations (again, except those with the /t/-initial suffixes) is shown below with *tabemasu*, 'to eat':

(17) Selected derivations of the regular verbal *tabemasu*

a. informal non-past		
	underlying	<i>tabe + ru</i>
	surface form	<i>taberu</i>
b. negative non-past		
	underlying	<i>tabe + nai</i>
	surface form	<i>tabenai</i>
c. passive		
	underlying	<i>tabe + ru + re + ru</i>
	1st Column Syllable Shift	<i>tabe + ra + re + ru</i>
	surface form	<i>taberareru</i>
d. causitive		
	underlying	<i>tabe + ru + se + ru</i>
	1st Column Syllable Shift	<i>tabe + ra + se + ru</i>
	Suffix Consonantal Harmony	<i>tabe + sa + se + ru</i>
	surface form	<i>tabesaseru</i>

e. provisional		
underlying		<i>tabe + ru + ba</i>
4th Column Syllable Shift		<i>tabe + re + ba</i>
surface form		<i>tabereba</i>
f. potential		
underlying		<i>tabe + ru + re</i>
1st Column Syllable Shift		<i>tabe + ra + re + ru</i>
surface form		<i>taberareru</i>
g. imperative		
underlying		<i>tabe + ru</i>
5th Column Syllable Shift		<i>tabe + ro</i>
surface form		<i>tabero</i>
h. tentative		
underlying		<i>tabe + oo</i>
Glide Insertion		<i>tabe + y + oo</i>
surface form		<i>tabeyoo</i>

It is interesting to me to note that these possible derivations, with the exception of the potential and imperative forms, utilize the same Syllable Shift with regular verbals as they do with irregular verbals. Additionally, I was informed in lecture that the irregular potential suffix has replaced the historical potential suffix of *-rare(ru)*; that is, the forms for the potential and passive were the same for irregular verbals but have now diverged. I have no comparative explanation for the imperative form.

Also seen here, the negative non-past suffix is the same, but the preceding regular verbal stem's syllable does not participate in Syllable Shift.

To make clear my position, all forms in (17) have been provided to attempt to justify the process of Syllable Shift in the historical history of Japanese, as well as in the synchronic derivation of the irregular verbals.

5.5. Syllable Shift in adjectivals

Adjectivals share some of the conjugations that are seen in the verbal paradigms; although, again, I do not proposit this to be a synchronic process, with adjustment Syllable Shift can be extended to the historical derivation of several of the adjectival forms as well. Take as an example the conjugation of the adjectival *hayai* 'fast', 'early':

(18) Inflectional paradigm for *hayai*

a. non-past adjectival	<i>hayai</i>
b. adverbial	<i>hayaku</i>
c. polite adverbial	<i>hayoo</i> ^{8a}
d. gerund	<i>hayakute</i>
e. past	<i>hayakatta</i>
f. conditional	<i>hayakattara</i>
g. representative	<i>hayakattari</i>
h. provisional	<i>hayakereba</i>
i. tentative	<i>hayakaroo</i>

Adjectival stems are found by deleting the *-i* of the non-past form; for this adjectival, *haya-*. Using this standard, a comparison of the adjectival suffixes with the regular and irregular verbal suffixes I have posited in (15) and (16) (minus the corresponding Syllable Shift) yields the following:

^{8a}The polite form of this adjectival now exists only in the idiomatic *Ohayoo gozaimasu* 'Good Morning! (lit. earliness is)'

(19) Comparison of inflectional suffixes

	<u>adj.</u>	<u>reg. verb.</u>	<u>irreg. verb.</u>
a. non-past	-i	-ru	-u
b. adverbial	-ku	-	-
c. gerund	-kute	-te	-te
d. past	-katta	-ta	-ta
e. conditional	-kattara	-tara	-tara
f. representative	-kattari	-tari	-tari
g. provisional	-kereba	-reba	-ba
h. tentative	-karoo	-yoo	-o

Miller (1967:331) notes that the historical evolution of adjectivals from Middle Japanese onward included the deletion of inflectional /k/ intervocally, yielding, for example, *shiroi* 'white' from *shiroki*. This is evidently the same velar deletion that occurs in the verbal paradigms in Figure (10); I expect this, since both verbal and adjectival derivations are cyclic and hence should occur at the same level of phonology with the same rules applying to both.

If this deletion is incorporated into the derivation of the adjectival forms, along with a condition that Syllable Shift applies to the adjectival suffix *ki*, the following derivations can be posited:

(20) Derivations of the adjectival *haya-*

a. non-past	underlying	<i>haya + ki</i>	
	velar deletion	<i>haya + i</i>	
	surface form	<i>hayai</i>	
b. adverbial	underlying	<i>haya + ki</i>	
	3rd Column Syllable Shift		<i>haya + ku</i>
	surface form	<i>astsuku</i>	
d. gerund	underlying	<i>haya + ki + te</i>	
	3rd Column Syllable Shift		<i>haya + ku + te</i>
	surface form	<i>hayakute</i>	
h. provisional	underlying	<i>haya + ki + reba</i>	
	4th Column Syllable Shift		<i>haya + ke + reba</i>
	surface form	<i>hayakereba</i>	
i. tentative	underlying	<i>haya + ki + roo</i>	
	1st Column Syllable Shift		<i>haya + ka + roo</i>
	surface form	<i>hayakaroo</i>	

The derivation of h. allows an explanation for the previously unaccountable vowel /e/ present in the provisional adjectival form; similarly, i. accounts for the /a/ in the tentative form, although it does posit a third tentative suffix separate from the regular and irregular verbal tentative suffixes (cf. (16)g. and (17)g.).

Forms d-f. cannot be derived cleanly through Syllable Shift, nor would I expect all of the adjectival paradigm to be since it has changed drastically since throughout the history of Japanese (see Miller (1967: 328) for discussion of earlier forms).

5.6. *wV*-final irregular verbals

As I mentioned in the introductory note, this analysis first occurred to me as an explanation for seemingly epenthetic /w/ in several conjugations of certain irregular verbals. While the process of Syllable Shift does not provide any explanatory power over other analyses with regard to this

glide deletion, utilizing Syllable Shift makes it unnecessary to posit a second consonantal deletion rule to delete the suffix's initial consonant before the glide is deleted.

This class of verbals have stem-final long vowels or diphthongs in most of the surface forms, as in *iimasu* 'to say', *aimasu* 'to meet', and *kaimasu* 'to buy'. In all such verbals, there is an additional alternation not seen in the verbals discussed so far, the seemingly epenthetical /w/ present in the informal non-past, causitive and passive forms:

(21) Selected conjugations of <i>arau</i> 'to wash'	
a. plain formal	<i>araimasu</i>
b. gerund	<i>aratte</i>
c. informal non-past	<i>arawanai</i>
d. causitive	<i>arawaseru</i>
e. passive	<i>arawareru</i>

The derivation of these verbals can be seen to be straightforward, when one posits an underlying /w/ in the stem⁹ and takes into account the deletion of the rounded glide before all vowels except /a/:

(22) Selected derivations of <i>aimasu</i> 'to meet'	
a. plain formal non-past ¹⁰	
underlying	<i>awi + masu</i>
Rounded Glide Deletion	<i>ai + masu</i>
surface form	<i>aimasu</i>
b. informal non-past	
underlying	<i>awi + Ø</i>
3rd Column Syllable Shift	<i>awu + Ø</i>
Rounded Glide Deletion	<i>au + Ø</i>
surface form	<i>au</i>
c. causitive	
underlying	<i>awi + se + ru</i>
1st Column Syllable Shift	<i>awa + se + ru</i>
Rounded Glide Deletion	-
surface form	<i>awaseru</i>
d. passive	
underlying	<i>awi + re + ru</i>
1st Column Syllable Shift	<i>awa + re + ru</i>
Rounded Glide Deletion	-
surface form	<i>awareru</i>

All other forms of this class of verbal would undergo Rounded Glide Deletion, and the /w/ would not surface.

Again, utilizing Syllable Shift allows these conjugations to grouped together with the other irregular verbals without the necessity of explaining why the informal non-past suffix surfaces as *-u* rather than *-ru*.

5.7. Cyclical application of Syllable Shift

Perhaps the strongest evidence for this analysis come from its application in the cyclical derivation of complex verbals. For instance, the passive causitive form is often listed in conjugational paradigms of verbals, along with the separate passive and the causitive forms. This

⁹ Kuroda (1965) posits the underlying /w/; however McCawley (1968) posits an underlying /p/ which changes to /w/ through /h/.

¹⁰ The steps in a. would hold for all other formal form derivations.

is because of the distinct vowel situated in the middle of what is purported to be the passive causitive suffix:

- (23) Passive and causitive conjugations of *nomimasu* 'to drink'
- | | | |
|----------------------|---------------------|------------------------|
| a. passive | <i>nomaseru</i> | 'to be drunk' |
| b. causitive | <i>nomareru</i> | 'to cause to drink' |
| c. passive causitive | <i>nomaserareru</i> | 'to cause to be drunk' |

However, Syllable Shift provides an explanation for this alternation, since the process of forming a causitive form involves exactly this same vowel shift as the simple passive form:

- (24) Derivation of the passive causitive form of *nomimasu*
- | | | |
|---------------------------|--|---------------------------|
| a. passive conjugation | | |
| underlying | | <i>nomi + se</i> |
| 1st Column Syllable Shift | | <i>noma + se</i> |
| informal present | | <i>noma + se + ru</i> |
| b. causitive conjugation | | |
| input from a. + suffix | | <i>nomaseru + re</i> |
| 1st Column Syllable Shift | | <i>nomasera + re</i> |
| informal present | | <i>nomasera + re + ru</i> |
| surface form | | <i>nomaserareru</i> |

Note, however, that this does require the application of Syllable Shift to the informal present marker in the middle of the cycle; making a strong case for this to indeed be a compound suffix. Since the purpose of this paper is to illustrate the process of Syllable Shift I will continue to treat this case as a compound suffix for now.

This type of cyclic application can be applied many times in the Japanese derivational system. For instance, Itô and Mester (1991) list the following as a possible conjugation of the verbal *hatarakimasu* 'to work'. This form is considered grammatical but marked by the native speakers I have consulted, most likely due to the difficulty in imagining the circumstances which would spur its utterance - parsing is from Itô and Mester (1991):

- (25) Possible conjugation of *hatarakimasu* 'to work'
- hatarakaseraretagarisugiru*
 'to act excessively like (someone) wants to be caused to work'
- | | | | | | | |
|----------------|-------------|--------------|------------|--------------|--------------|------------|
| <i>hatarak</i> | <i>-ase</i> | <i>-rare</i> | <i>-ta</i> | <i>-gari</i> | <i>-sugi</i> | <i>-ru</i> |
| to work | caus | pass | desir | to act | excess | present |

This form can be derived straight-forwardly via Syllable Shift, once one takes into account the restrictions on each class of suffix. Different conjugations of the verbal *arau* 'to wash' can be used to elicit the suffixation restrictions on the suffixes involved:

- (26) Selected conjugations of the verbal *arau* 'to wash'
- | | |
|------------------------------------|--------------------------|
| a. <i>araimasu</i> | 'to wash (plain formal)' |
| b. <i>arawaseru</i> | 'to cause to wash' |
| c. <i>arawareru</i> | 'to be washed' |
| d. <i>araitai</i> | 'to want to wash' |
| e. <i>araisugiru</i> | 'to wash too much' |
| f. <i>araitagaru</i> ¹¹ | 'to try to wash' |

¹¹Itô and Mester (1991) translate *-garu* as 'to act like...'. This does not agree, however, with the dictionaries I have checked, nor the native informants I have consulted. According to them, both *araitai* and *araitagaru* refer to the desire

g. <i>arawasetai</i>	'to want to be caused to wash
h. <i>arawaretai</i>	'to want to be washed'
i. <i>arawasesugiru</i>	'to cause to wash too much'
j. <i>arawaresugiru</i>	'to be washed too much'
k. <i>araitagarisugiru</i>	'to try to wash too much'

Forms (26)a-f show that each of these suffixes attaches to a stem. The forms in g-j show that the underlying forms of the passive and causitive suffixes are indeed *-se* and *-re*, as alluded to before. (26)f shows where *-gari* attaches to the stem of the form derived from the adjectival-deriving desirative suffix *-tai* (stem *-ta*), and (26)k shows where *sugiru* attaches to the stem of the regular verbal-deriving suffix *-garu* (stem *-gari*) (*-gari* is selectionally restricted to combining with the desirative suffix).

(25) can then be derived in the following manner:

(27) Cyclical derivation of (25) via Syllable Shift

a. verbal stem	<i>hataraki</i>
b. causitive	
1st Column SS	<i>hataraka</i>
causitive suffix	<i>hataraka + se</i>
present suffix	<i>hataraka + se + ru</i>
c. passive	
1st Column SS	<i>hatarakasera</i>
passive suffix	<i>hatarakasera + re</i>
d. desirative	
desirative suffix	<i>hatarakaserare + ta</i>
e. attemptive	
attemptive suffix	<i>hatarakaserareta + gari</i>
f. excessive	
excessive suffix	<i>hatarakaseraretagari + sugi</i>
present suffix	<i>hatarakaseraretagari + sugi + ru</i>
g. surface form	<i>hatarakaseraretagarisugiru</i>

This surface form is a regular verbal form, and can be inflected for the past tense or the gerund form like other regular forms, *hatarakaseraretagarisugita* and *hatarakaseraretagarisugite*.

5.8. Same-column shifts - semantic classes?

The question arises as to whether the vowel involved in each of the conjugations does indeed carry any semantic weight, or whether the conjugations of a certain column's vowel are grouped together coincidentally. If we group the irregular verbal suffixes discussed so far together by the vowel to which they attach, we see the following:

(28) Suffixes grouped by vowel to which they attach to

bare stem	<i>-ta-</i>	desirative	<i>hatarakita(i)</i>	'to want to work'
(2nd Column)	<i>-garu</i>	attemptive	<i>hatarakitagaru</i>	'to try to work'
	<i>-sugi</i>	excessive	<i>hatarakisugi(ru)</i>	'to work too much'
stem +	<i>-te</i>	gerund	<i>hataraitaite</i>	'to work and...'
internal change	<i>-ta</i>	inf. past	<i>hataraita</i>	'worked (informal)'
	<i>-tara</i>	conditional	<i>hataraitara</i>	'if X works'
	<i>-tari</i>	representative	<i>hataraitari</i>	'working and...'

to wash something, the difference being is that the former can be a completely mental state, while the latter entails a physical attempt at washing. Hence the translation given for the latter.

1st Column SS	-nai	negative np	<i>hatarakanai</i>	'to not work'
	-se-	causitive	<i>hatarakase(ru)</i>	'to make work'
	-re-	passive	<i>hatarakare(ru)</i>	'to be worked'
3rd Column SS	Ø	infor. present	<i>hataraku</i>	'to work'
4th Column SS	Ø	imperative	<i>hatarake</i>	'Work!'
	Ø-	potential	<i>hatarake(ru)</i>	'able to work'
	-ba	provisional	<i>hatarakeba</i>	'provided X works'
5th Column SS	-o	tentative	<i>hatarakoo</i>	'let's work!'

Looking over the phonological environments of the above forms, as well as the glosses for the same, I see no way to classify each group of suffixes on either a phonological or semantic basis. In light of a lack of evidence for any concrete semantic grouping, I will assume that these groupings are merely coincidental, and that any possible underlying cause would have been obscured by changes in the verbal paradigm.

6. A comparison of approaches

In this section I will provide a comparison of traditional approaches and the Syllable Shift analysis set forth in this paper.

To achieve this end, I will lay out what I believe are the pertinent considerations in determining the worth of various analyses¹²:

(29) Comparison of Syllable Shift and traditional analyses

<u>consideration</u>	<u>traditional analysis</u>	<u>Syllable Shift</u>
regular verbal stems	vowel-final	vowel-final
irregular verbal stems	consonant-final	vowel-final
desirative suffix, honorific forms, nominalized stems, compounds formed from stems	vowel-epenthesis required	bare stem
gerund, informal past, conditional, representative forms	vowel-epenthesis + stem-internal change required	stem-internal change required
informal np, imperative forms	separate suffix for regular + irregular	suffix for regular; vowel shift for irregular
provisional*, potential*, passive*, negative np forms	separate suffixes	Syllable Shift + same suffixes
causitive suffix	glide deletion/insertion for irregular	separate suffixes
tentative suffix	separate suffixes	separate suffixes

Obviously there is no singular overwhelming reason to favor one analysis over the other; however, I believe that allowing us to abandon the vowel-epenthesis rule called for in a traditional analysis,

¹² * marks those conjugations where Syllable Shift is required to apply to the informal np suffix of the regular verbal rather than to the verbal stem.

as well as the collapsing of the regular and irregular provisional, potential, passive and negative *np* suffixes, and the ease of explaining the discrepant vowels present in the cyclical application of poly-inflected conjugations, certain regular verbal and certain adjectival forms, warrant the positing of Syllable Shift as a historically and synchronically active process.

7. Conclusion

In this paper I have presented evidence in support of the argument that all Japanese verbal stems are vowel-final, specifically /i/-final, in contrast to traditional analyses that posit consonant-final stems. In addition to this I have posited an irregular verbal stem-final syllable of the form *Ci*, and a process I called Syllable Shift whereby this stem-final syllable shifts from one column of the basic syllabary to another during the conjugation of the verbal. Further, I applied this process to the historical development of certain regular verbal and adjectival conjugations.

In closing, I will state that I am certain that the generative rules I have posited herein exist, for they are the rules that I use to generate the verbals that I am responsible for as a student of Japanese - given the plain formal *-masu* form of any verbal, along with the knowledge of whether it is regular or irregular, the generalizations stated in this paper allow for unerring conjugational derivations. Whether or not they are also utilized by the native speaker of Japanese is a matter for further investigation.

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On the so-called 'light' verb *suru* in Japanese

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1. Introduction

The verb *suru*¹ in Japanese appears in several different contexts. It can attach to a noun (often Sino-Japanese nouns) and derive a verb of the form N-*suru*. Miyagawa (1987) argues that N-*suru* constructions are formed in the lexicon, and that *suru* can attach to any noun there. This is such a strong claim that it predicts even nonexisting forms. He claims that among all these N-*suru* constructions, the ill-formed ones are filtered out in the syntax by the Theta Criterion.

Suru can also appear after an accusative Case-marked nominal in the form, -o *suru*. Grimshaw and Mester (1988) note that *suru* of this type can be further divided into two kinds.² One is just like a regular verb capable of assigning specific theta-roles to its arguments and associated with a specific meaning.³ The other is often considered as a kind of a 'light' verb, in terminology due to Jespersen (1954). The latter kind of *suru* is thematically incomplete having no theta-role to assign, but it appears to be able to assign accusative Case to the nominal preceding it. What makes a study of this *suru* interesting is that although *suru* is devoid of theta-roles, in terms of the Case-marking, some NPs and clauses, which are obviously theta-related to the head noun of the sister NP of *suru*, appear to behave as if they were the arguments of *suru*. Grimshaw and Mester argue that this is made possible by argument transfer from the noun to *suru*.

So far three types of *suru* have been recognized. The following examples illustrate each of these types.

(1) a. N-*suru*

John-ga Mary-to aiseki-*suru*
John-nom Mary-with table-sharing-*suru*
'John shares a table with Mary'

b. 'heavy' *suru*

John-ga seki-o *suru*
John-nom cough-acc *suru*
'John coughs'

c. 'light' *suru*

Aribai-ga keisatsu-ni [CP John-ga muzitsu-da to] syoomei-o shita
alibi-nom police-to John-nom innocent-cop comp proof-acc *suru* -past
'The alibi proved to the police that John is innocent'

¹ I assume that *suru* actually consists of the verb root /s/, an inflectional ending /u/ and the present tense suffix /-ru/. The inflectional ending can be /i/ depending on the context. Thus, it may be more precise to refer to /s/ as the verbal morpheme. But since in the literature on 'light' verb constructions, *suru* is frequently used as the canonical representation of this verb, in the following discussion *suru* will not be segmented further unless otherwise noted. The past tense form of *suru* is /sita/ [šita], which is spelled *shita* in the text.

² Terada (1990) argues that all instances of *suru* in -o *suru* constructions are just like regular transitive verbs with an agentive subject and optional internal arguments.

³ In contrast to the other type of *suru*, the former *suru* is often referred to as 'heavy' *suru*.

(cf. [NP aribai-no keisatsu-e-no [CP John-ga muzitsu-da to]-no syoomei]
 alibi-gen police-to-gen John-nom innocent-cop comp-gen proof
 'The proof to the police that John is innocent')

The contrasted NP in (1.c) above shows that *aribai*, *keisatsu-ni* and the clause *John-ga muzitsu-da to* are not the arguments of *suru*, but the arguments of the noun, *syoomei*. Since the postposition *ni* can never precede the genitive case marker *no*, following Grimshaw and Mester, I assume that *ni* is replaced by another postposition *e* inside a noun phrase.⁴

In this paper, I will investigate the possibility of reducing these three types of *suru* to two, namely, 'light' and 'heavy', by unifying the light verb *suru* in the N-*suru* and the -o *suru* constructions. I will argue that all 'light' verb *suru* constructions are formed in syntax, assuming the late insertion of *suru* and the notion of 'functional head' following Emonds (1990). This assumption will predict that as the functional head, the noun to which *suru* attaches is not theta-marked. I will also attempt to account for the case marking of 'seeming' arguments of *suru* as a consequence of reanalysis of the D-structure, not as a consequence of the argument transfer proposed by Grimshaw and Mester.

2. N-*suru* constructions

Many nouns in Japanese, both native and Sino-Japanese, can be transformed into verbal forms by affixation of the morpheme *suru*. As Miyagawa (1987) notes, this verbalizing suffix -*suru* does not seem to have an intrinsic argument structure or theta-roles to assign. Rather, in many cases, an N-*suru* construction inherits the argument structure of the noun to which it is suffixed. Thus, the number and types of arguments in N-*suru* constructions can vary according to the argument structure of the noun.

- (2) a. Taro-ga yamanobori-*suru*
 Taro-nom mountain climbing *suru*
 agent
 'Taro climbs a mountain'
- b. Ronbun-ga kansei-*shita*
 thesis-nom completion *suru*-past
 theme
 'The thesis was completed'
- c. Antena-ga denpa-o hassin-*suru*
 antennana-nom radio wave-acc transmission *suru*
 source theme
 'The antenna transmits radio wave'

⁴ J. Emonds pointed out (personal communication) the possibility of late insertion of the postposition *ni*. If this is possible, the phonetic realization of the feature of the postposition, presumably [+direction], can be assumed to be dependent on the context in which it is realized; while it is realized as *e* in a noun phrase, elsewhere it can be *ni*.

- d. Sam-ga Academy-shoo-o zyushoo-*shita*
 Sam-nom Academy Award-acc reception *suru*-past
 goal theme
 'Sam received the Academy Award'
- e. Mary-no te-ga John-no unten-o boogai-*shita*
 [Mary-gen hand]-nom [John-gen drive]-acc disturbance *suru*-past
 instrument theme
 'Mary's hand disturbed John's driving'
- f. Diane-ga musuko-no seiseki-ni gekido-*sita*
 Diane-nom [son-gen grades]-dat rage *suru*-past
 experiencer theme
 'Diane got furious at her son's grades'

Thus, *suru* in N-*suru* constructions does not have an intrinsic argument structure. What appears to be the arguments of *suru* are in fact the arguments of the noun to which *suru* is suffixed. In other words, an N-*suru* construction inherits the argument structure from the noun it contains. It follows, then, that only nouns which have argument structures, i.e., thematic nouns⁵, form N-*suru* constructions. I assume Grimshaw's (1990) distinction among nouns with respect to argument structure; process nominals (naming a process or event itself) and result nominals (naming the output of a process or event). Grimshaw argues that concrete nouns are all result nominals while abstract nouns can be ambiguous between process and result interpretations. Following Grimshaw, I also assume that only process nominals have argument structure. Thus, what is meant by 'thematic nouns' here coincides with Grimshaw's 'process nominals'. In fact, non-thematic nouns, i.e., result nominals, do not form N-*suru* constructions as productively as thematic nouns.

(3) **enpitsu-suru*
 pencil *suru*

**eigo-suru*
 English *suru*

Miyagawa argues that all N-*suru* forms are formed in the lexicon, as mentioned earlier. He proposes the following feature and subcategorization frame for *suru*.

(4) *suru*: [+V, -N] [N__]

He claims that by the feature percolation convention, the feature of the head of the word, *suru*, percolates up to the top node forming a new lexical verb, N-*suru*.

Despite the generalization we just observed, i.e., only thematic nouns can productively attach to *suru*, Miyagawa argues that no additional statement is necessary in the subcategorization frame of *suru*, hence it can freely attach to any noun, whether thematic or not. He claims that unacceptable cases such as the ones in (3) can be ruled out by an independent principle of syntax, the Theta Criterion. Since *suru* does not have a theta-role assigning capability, if a noun does not have argument structure, the resulting N-*suru*

⁵ The nouns referred to as thematic nouns here are sometimes called Verb Nouns (VN) by other authors.

cannot assign any theta-roles. Thus, according to Miyagawa, any 'argument' that such N-*suru* would take fails to have a theta role and violates the Theta Criterion.

However, the following facts about the verbs in Japanese seem to be overlooked in Miyagawa's analysis. First, although Miyagawa claims that there is no syntactic structure in which the ungrammatical N-*suru* constructions such as 'enpitsu('pencil')-*suru*' can fulfill the requirement imposed by the Theta Criterion, his observation does not seem to be quite right. In Japanese, there exist a few verbs which do not take any argument or assign any theta role: for example, '*shigure-ru*' ('to drizzle') and '*fubuk-u*' ('to storm'). The property of these verbs is just like that of the English verbs such as 'rain' and 'snow' except that they do not take a pleonastic subject. As long as there already exist well-formed verbs which take no argument or assign no theta-role, nothing prevents us from allowing other non-thematic verbs such as the ones with *suru* (e.g. *enpitsu-suru*). If these verbs do not have to take arguments, the Theta Criterion cannot exclude the ill-formed N-*suru* constructions on the basis of theta-role assignment.

Further, Miyagawa's argument is not quite adequate with respect to the following observation: not all non-thematic N-*suru* constructions are ill-formed. There are well-formed N-*suru* constructions with non-thematic nouns. Several examples are provided below.⁶

(5) *roonin -suru*
 lordless *samurai suru*
 'to have failed in a college entrance exam and wait for another chance to be admitted'

tenisu-suru
 tennis *suru* 'to play tennis'

gakusei-suru
 student *suru* 'to be a student'

yakyuu-suru
 baseball *suru* 'to play baseball'

taikutsu-suru
 boredom *suru* 'to be bored'

binboo-suru
 poverty *suru* 'to be poor'

otya-suru
 tea *suru* 'to chat over tea'

denwa-suru
 telephone *suru* 'to telephone'

Since Miyagawa admits only one type of *suru* morpheme and claims that all N-*suru* constructions are formed uniformly in the lexicon, the well-formed non-thematic N-*suru*

⁶ In addition to the examples given in (5), *suru* can also attach to reduplicative elements, as in '*pikapika-suru*' ('to glitter'), '*betobeto-suru*' ('to be sticky').

examples in (5) cannot be distinguished from the ill-formed ones such as the ones in (3). In sum, according to Miyagawa, all non-thematic N-*suru* constructions are excluded by the Theta Criterion, even though some of them should not be.

The two problems that I have noted in Miyagawa's analysis are due to the across-the-board formation of N-*suru* constructions in the lexicon. I propose that among the N-*suru* constructions, only those formed with a non-thematic noun are formed in the lexicon, while those formed with a thematic noun are formed in syntax.

Let us first consider N-*suru* constructions with a non-thematic noun such as the ones in (5). Those forms are highly lexicalized; not all non-thematic nouns can participate in this type of construction, which is not unusual as a morphological process. For example, although the complex verb '*binboo-suru*' ('to be poor') is well-formed with a non-thematic noun and *suru*, so far there has been no such complex verb as '*yuuhuku-suru*' formed with '*yuuhuku*' ('wealth'), the antonym of '*binboo*'. While the nouns in these forms are all non-thematic, the resulting complex verbs are all intransitive and require an animate subject often with an agentive or volitional thematic role. However, in cases such as '*taikutsu-suru*' ('to be bored') or '*kandoo-suru*' ('to be moved'), for example, the subject should be interpreted as an experiencer. On the other hand, the subject of '*binboo-suru*' is neither an agent nor an experiencer, but a theme. In these cases too, *suru* does not seem to have intrinsic requirement on a subject theta role. In other words, it does not have an intrinsic theta-role to assign. But, obviously, it cannot inherit an argument structure from the attaching noun either, since it is non-thematic. Thus, it seems that as a lexicalized complex verb, a non-thematic N-*suru* construction has an idiosyncratic argument structure not attributable to its components.

In contrast, I argue that N-*suru* constructions with a thematic noun are formed in syntax. As we have already seen, if there is only one lexical entry for *suru*, and all N-*suru* constructions are uniformly formed in the lexicon with the argument structure inherited from the containing noun, then some of the non-thematic N-*suru* constructions are wrongly ruled out by the Theta Criterion. But if we assume that the latter type of N-*suru* constructions are formed in the lexicon while thematic N-*suru* constructions are formed in syntax, we will not have the same problem as Miyagawa's analysis does.

3. The 'Light' verb *suru* in -o *suru* constructions

As we have noted earlier, there are two kinds of *suru* in -o *suru* constructions, 'heavy' *suru* and 'light' *suru*. This distinction is similar to the one between the main verb 'do' and the auxiliary verb 'do' in English. The 'heavy' verb *suru* requires an agentive subject and a theme object as shown in the examples in (6).

(6) Sam-ga tomodachi-to yakyuu-o *suru*
 Sam-nom friend-with baseball-acc *suru*
 'Sam plays baseball with his friends'

Jyuuyaku-ga hoteru-de kaigi-o *shita*
 executive-nom hotel-loc meeting-acc *suru*-past
 'The executives held a meeting in a hotel'

Ken-ga Jim-to shiai-o *suru*
 Ken-nom Jim-with game *suru*
 'Ken played a game against Jim'

Diane-ga yubiwa-o *suru*
 Diane-nom ring-acc *suru*
 'Diane wears a ring'

The 'light' verb *suru*, on the other hand, does not have any restriction on the number or type of the theta-roles of its 'seeming' arguments, as the following examples show.

(7) a. Mako-ga John-to aiseki-o *suru*
 Mako-nom John-with table-sharing-acc *suru*
 agent

a'. Mako-ga [John-to-no aiseki]-o *suru*
 Mako-nom [John-with-gen table-sharing]-acc *suru*
 'Mako shared a table with John'

b. Aribai-ga keisatsu-ni [CP Sam-ga muzitsu-da to] syoomei-o *shita*
 alibi-nom police-to [Sam-nom innocent-cop comp] proof-acc *suru*-past
 instrument goal theme

b'. Aribai-ga keisatsu-ni [NP[CP Sam-ga muzitsu-da to]-no syoomei]-o *shita*
 alibi-nom police-to [[Sam-nom innocent-cop comp]-gen proof]-acc *suru*-past
 'The alibi proved to the police that Sam is innocent'

c. Sentooki-ga [NP misairu-no hassya]-o *shita*
 fighter plane-nom [missile-gen launch]-acc *suru*-past
 'The fighter plane launched a missile'
 Source

Thus, it seems that the 'light' verb *suru* does not have any intrinsic theta-roles to assign, as claimed in Grimshaw and Mester (1988). What appears to be the arguments of *suru* in the above sentences are most plausibly the ones of the nouns heading the accusative Case marked NPs. Where *suru* is not present, the same set of arguments can occur internal to the NPs headed by these nouns:

(8) a. [NP Mako-no John-to-no aiseki] ga daimondai-ni nat-ta
 [Mako-gen John-with-gen table-sharing]-nom big problem-to become-past
 'Mako's table-sharing with John became a big problem'

b. [NP aribai-no keisatsu-e-no [CP Sam-ga muzitsu-da to]-no syoomei]-ga
 alibi-gen police-to-gen [Sam-nom innocent-cop comp]-gen proof-nom

ketteiteki dat-ta
 decisive cop-past

'The proof to the police by the alibi that Sam is innocent was decisive'

c. [NP sentooki-no misairu-no hassya]-ga sensoo-no hikigame dat-ta
 fighter plane-gen missile-gen launch-nom war-gen trigger cop-past
 'fighter plane's launch of a missile triggered the war'

These data suggest that although *suru* does not have an intrinsic argument structure, when it is present, all or some arguments of the noun heading an NP behave as if they were the arguments of *suru*, as far as Case marking is concerned. The contrast between (7.a'-b') and (7.a-b) shows that not all arguments of the noun have to be Case marked like arguments of the verb. The alternative structure of (7.c) in which [NP *misairu*] moves out of the NP headed by [N *hassya*] is not obtained because of the 'double -o constraint' discussed in Harada (1973) and others.

- (9) **Sentooki-ga misairu-o hassya-o shita*
fighter plane-nom missile-acc launch-acc *suru*-past

Even if the sentence (9) is generated in syntax, it is eventually ruled out by the above surface constraint.

By now it should be rather clear that the 'light' verb *suru* in -o *suru* forms has exactly the same property as that of *suru* in thematic N-*suru* constructions except that the former is preceded by an accusative Case marker, and one of the internal arguments of the noun can remain in the NP having a genitive Case marker -*no*. Also, in section 2, I argued that N-*suru* constructions with a thematic noun are formed in syntax, not in the lexicon. Based on the common properties of these two kinds of *suru*, I claim that they are actually the same: there is only one lexical entry for the 'light' verb *suru*. As already discussed, *suru* does not have an intrinsic argument structure and it inherits the argument structure from the noun to which it is attached. I will argue that different realizations of the arguments in terms of Case markers are due to a reanalysis of the D-structure preceding case marking. Before going into the details of my analysis, I will briefly discuss an alternative analysis of the 'light' verb construction by Grimshaw and Mester.

Grimshaw and Mester (1988) exclusively discuss the 'light' verb *suru* in -o *suru* constructions, but N-*suru* constructions are not discussed. They argue that the 'light' verb *suru* acquires arguments through argument transfer from the head of the NP to which it assigns accusative Case. By argument transfer, they claim that when an NP precedes *suru*, at least one argument of the head noun has to be transferred to become an argument of *suru*. Since they assume that the external argument of a noun is suppressed and not visible for the argument transfer, only the internal arguments count for the transfer. But to preserve the hierarchy of the argument structure, when one of the internal arguments is transferred, the external argument is also moved. They claim that argument transfer is motivated to circumvent the Theta Criterion. An NP cannot be theta-marked by *suru* because it is devoid of theta-roles. But if the head of the NP participates in theta-marking as a part of the predicate through argument transfer, it is no longer subject to the Theta Criterion.

However, their analysis of argument transfer seems to allow unwanted ambiguity between the 'light' and 'heavy' verb *suru*, which could contradict their distinction between the two.

When *suru* follows an NP whose head has a theme argument as its only internal argument, it is not clear whether argument transfer takes place or not because of the double -o constraint. Hence, the status of *suru* in this case could be ambiguous between 'heavy' and 'light' verbs.

- (10) a. **Terebikyoku-ga sono bangumi-o hoosoo-o suru*
TV station-nom that program-acc broadcast *suru*
source theme
"The TV station broadcasts that program"

- b. *[Okujyoo-no antena]-ga eiseihoosoo-o zyushin-o *shita*
 rooftop-gen antenna-nom satellite broadcasting-acc reception *suru*-past
 goal theme
 "The antenna on the rooftop received the satellite broadcasting"

If the theme arguments in these sentences are inside the NPs, the corresponding sentences are grammatical.

- (11) a. Terebikyoku-ga [NP sono bangumi-no hoosoo]-o *suru*
 source
 b. Okujyoo-no antena-ga [NP eiseihoosoo-no zyushin]-o *shita*
 goal

According to Grimshaw and Mester, *suru* in (11.a-b) cannot be 'light' because the argument transfer does not take place in these sentences. But they cannot be 'heavy' either because the subjects are not agentive as required.

Terada (1990) and Ahn (1990) argue that *suru* in *o-suru* is always unambiguously 'heavy', intrinsically having an agentive theta role. According to their analyses, (11.a-b) would be claimed ungrammatical since the subjects in these sentences are not agentive, a judgement which I do not share. Although it would be farfetched to interpret *okujyoo-no antena* as in (11.b) an agent, one might argue that the subject in (11.a) could be interpreted as an agent pointing out that the sentence is compatible with phrases such as *wazato-ni*, *itoteki-ni* ('intentionally'), which imply volition of the subject:

- (12) Terebikyoku-ga itoteki-ni sono bangumi-no hoosoo-o *suru*
 TV station-nom intentionally that program-gen broadcast-acc *suru*
 "The TV station intentionally broadcasts that program"

However, even if the subject in (12) can be interpreted as an agent, it still seems to be thematically a source as well. This compositional nature of the subject thematic role can be contrasted with the purely agentive subject in (13):

- (13) Terebikyoku-ga bangumi-no kaihen-o *suru*
 TV station-nom program-gen rescheduling-acc *suru*
 "The TV station reschedules the programs"

In both Terada's and Ahn's analyses, acceptable sentences such as (11.b) would have to be ruled out, and the compositional subject theta-role in (11.a) remains unexplained.

In my analysis, the verb *suru* in (10.a-b) and (11.a-b) are all 'light', taking thematic nouns. Since I do not assume the argument transfer discussed in Grimshaw and Mester, the above examples will not pose any problem for my analysis.

4. A Unified approach to N-*suru* and -o *suru* constructions

Thus far I have discussed that there is only one type of 'light' verb *suru*, which is found in both N-*suru* and -o *suru* constructions. I have also discussed that these constructions are both formed in syntax. I propose that the lexical representation of the 'light' *suru* is as follows:

(14) *suru*: V, +[N__]; N; [+process]

In the lexical entry above, *suru* is specified to adjoin to N⁰ which is a process nominal. The resulting complex verb follows the right-hand head rule of Selkirk (1982) and others; [V⁰*suru*] adjoined to N⁰ projects to another zero level category V⁰.⁷

I assume, following Emonds (1985), that the lexical insertion of the 'light' verb *suru* takes place after D-structure. The 'light' verb *suru* does not have any intrinsic semantic feature, and it only has the grammatical function of deriving a verb from a thematic noun. Thus, it can be classified as a closed class item in the sense of Emonds(1985: ch.4). Also there seems to be no D-structure property to which *suru* has to be sensitive. Hence, the assumption of late insertion of *suru* follows from these observations.

Arguments for the late insertion of *suru* are by no means novel. Miyara (1991) independently argues that '/s/-form', which is the same as *suru* in the present discussion, is inserted at the last cycle of syntactic rules. He discusses '/s/-form' in contrastive verb forms such as [...-wa-s]_V, [...-wa-s]_{VN}, [...-s(i)-wa-s]_{VN},⁸ and compound verbs of the form [...-s]_{VN}. The latter is equivalent to N-*suru* and -o *suru* constructions in the present discussion. Miyara argues that (15.a) below is derived from the underlying structure (15.b) by forward application of Conjunction Reduction:

(15)

Miyara's (24)

- a. Taroo-wa suugaku-o yo-ku [benkyoo-*su*]-ru ga, Ziroo-wa Ø amari [Ø-si]-na-i
Taroo-top math-acc hard study *suru* but Ziroo-top much not
"Taro studies math hard, but Jiro doesn't study much"

Miyara's (27)

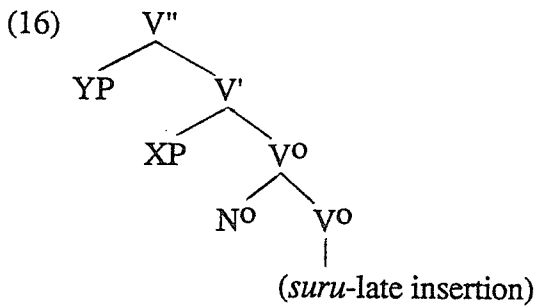
- b. Taroo-wa suugaku-o yoku [bennsyoo-*su*]-ru ga, Ziroo-wa suugaku-o amari
[benkyoo]-na-i

However, the derivation violates a general principle: Conjunction Reduction does not apply to any part of a complex verb. Miyara argues that the derivation is still possible since /s/ (+/i/) is inserted after the application of Conjunction Reduction.

Following the right-hand head rule, X-bar theory, and lexical representation (14), we now have the following structure:

⁷Ahn (1990) independently assumes syntactic incorporation of VN to V⁰ for N-*suru* construction. However, Ahn does not elaborate on this analysis, and N-*suru* construction is treated as completely different from o-*suru* construction.

⁸Miyara argues against the analysis where [yomi-wa-si](ta) is analyzed as a sequence of a noun phrase consisting of a nominalized verb with a contrast marker -*wa* and a main verb *suru*, since [yomi-wa] lacks the common properties of noun phrases such as scramblability and passivizability. He argues that contrastive forms such as [yomi-wa-si](ta) is a verb with semantically empty /s/ (*suru*) inserted at the V-final position.



If the head is empty at D-structure, as we are assuming for *suru*, N^0 can be considered as a "functional head", following Lieber's (1980) definition of head modified in Emonds (1990):

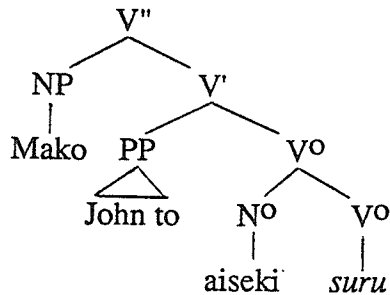
(17)=Emonds (35)

The "functional head" of W^2 is the rightmost *lexically filled* Z^0 dominated by W^2 (and by no other maximal projection under W^2)

As a "functional head" N^0 can select the internal argument XP and the external argument YP, and it can assign theta-roles to them.

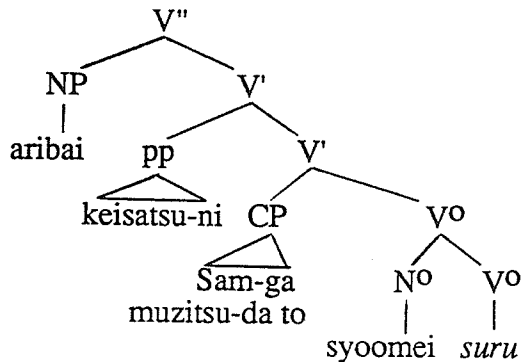
The higher V^0 is assumed to have a Case feature and can assign accusative Case to XP if XP is compatible with Case, i.e., $XP=NP$, and if no contradictory feature is percolated from the "functional head". The following are the examples of the structure with *N-suru*:

(18) a.



Mako-ga John-to aiseki *suru*
 Mako-nom John-with table-sharing *suru*
 "Mako shares a table with John"

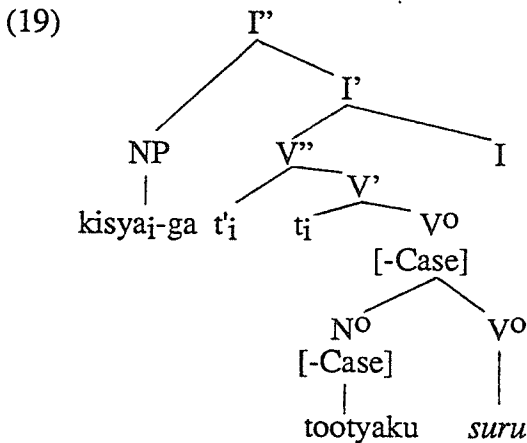
b.



Aribai-ga keisatsu-ni [Sam-ga muzitsu-da to] syoomei *suru*
 alibi-nom police-to [Sam-nom innocent-cop comp] proof *suru*
 "Alibi proves to the police that Sam is innocent"

The external argument eventually moves to the Spec(I) to receive nominative Case.

I assume that ergative nominals have a feature which makes the derived ergative verb incapable of assigning accusative Case. Miyagawa (1989) and Tsujimura (1990a,b) demonstrate that some Sino-Japanese compound nouns should be analyzed as ergative and their Case and thematic properties follow from Burzio's generalization. I will not reproduce but will assume their analyses of ergative nominals based on numeral quantifier float and resultative constructions. Since ergative nominals do not have an external argument, the derived complex verbs do not assign an external theta-role. Burzio's generalization predicts that such verbs will not assign Case to their objects. Thus, when an ergative nominal is the "functional head", the feature [-Case] is percolated up to the first branching node, the higher V⁰. Due to this feature, the internal argument does not receive Case, so it moves up to V". But since the argument still does not get Case at Spec(V), it eventually moves up as far as Spec(I) and gets nominative Case. The derivation is illustrated in (19) below:



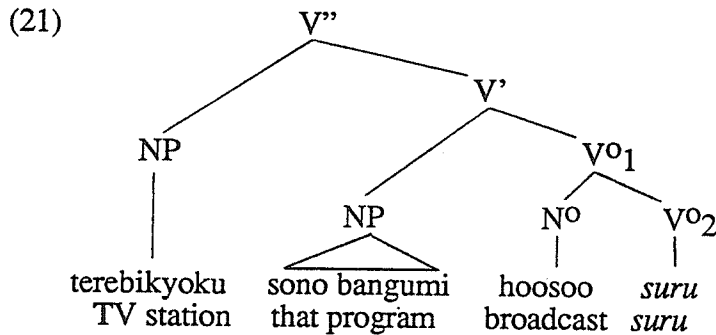
Since I assume that there is only one lexical entry for the 'light' verb *suru*, -o *suru* constructions should also be derived from the D-structure (16). This can be done by assuming a reanalysis of the D-structure.⁸ First, let us consider sentences such as (7a-b), repeated here as (20a-b):

(20) a. Mako-ga John-to aiseki-o *suru*
 Mako-nom John-with table-sharing-acc *suru*

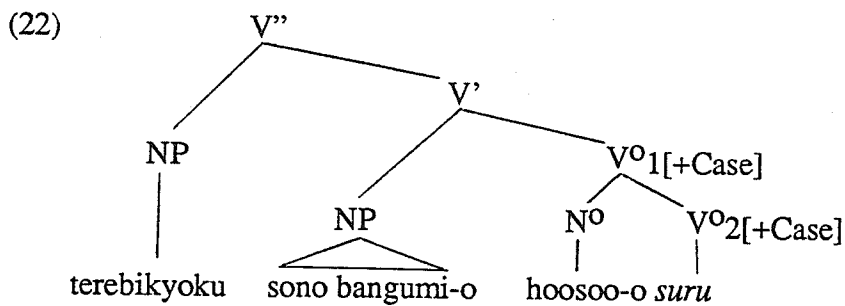
b. Aribai-ga keisatsu-ni [Sam-ga muzitsu-da to] syoomei-o *shita*
 alibi-nom police-to [Sam-nom innocent-cop comp] proof-acc *suru*-past

⁸ Reanalysis of D-structure such as the one proposed here seems to be a necessary procedure to account for cases like the following pseudopassive sentence: This bed was slept in by Marilyn Monroe. Under the assumption that Case absorption by passive morphology is obligatory in English passive, we are forced to assume that Case has been absorbed in the above sentence. However, since intransitive verbs such as *sleep* are generally assumed to have no Case, the absorbed Case above cannot be attributed to the verb. Then, it would not be unreasonable to claim that [VP sleep [PP in NP]] is reanalyzed as [VP [V sleep in] NP], and the verb resulted from the reanalysis inherits Case from the incorporated preposition

In these examples, the lower V^0 appears to assign accusative Case to N^0 . There seem to be two possible analyses concerning the way for the lower V^0 to acquire the Case assigning capability: (i) Case feature copying from the higher V^0 ; (ii) Case feature inheritance from the higher V^0 . These two possibilities make different predictions about the nature of unacceptability of the sentences like (10.a-b), where the internal argument of N^0 is a theme NP. The underlying structure of (10.a), for example, is shown below:

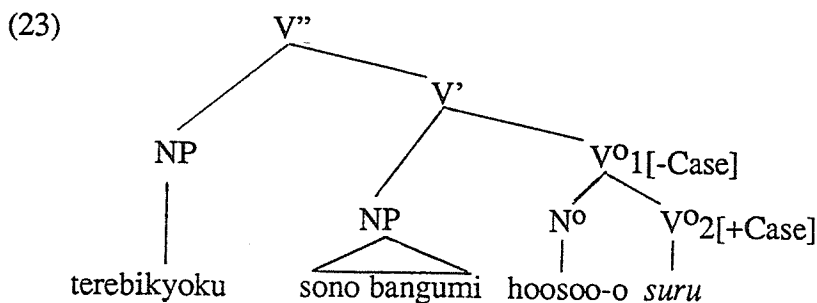


If Case feature copying takes place from V^0_1 to V^0_2 , both V^0_1 and V^0_2 will have Case assigning capability. Consequently, accusative Case is assigned to both N^0 and NP, as shown below:

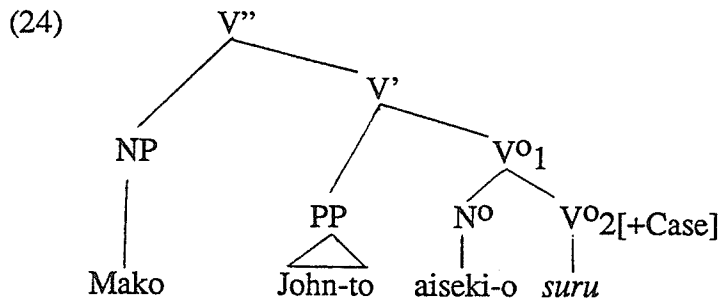


The resulting sentence is eventually ruled out by the double -o constraint as discussed earlier.

If V^0_2 acquires Case assigning capability through Case feature inheritance from V^0_1 , V^0_1 no longer retains Case feature and the sister NP of V^0_1 will not be Case marked, and thus the resulting sentence is ruled out by Case Filter:



When the internal argument of N^0 is a postpositional phrase or a clause, since neither of them is compatible with Case to begin with, whether V^0_1 retains Case feature or not does not make a difference. (20.a) has the structures as follows:



When N^0 is an ergative nominal, as discussed above, the feature [-Case] is percolated up to V^0_1 . Thus, V^0_1 will not have Case assigning capability to be copied or inherited to V^0_2 . Hence, ergative nominals never receive accusative Case as in the case below:

- (25) *Kisya-ga tootyaku-o *suru*
 train-nom arrival-acc *suru*

So far either of the two options for V^0_2 to acquire Case assigning capability has not induced any unwanted consequences, and both can explain the reanalysis equally well. Thus, I will not argue against either one of them in favor of the other here. Rather, I will leave both possibilities open for future investigation.

Although N^0 can be Case marked by V^0_2 , it is neither the argument of V^0_2 , nor a maximal projection, NP. This analysis correctly predicts that N^0 cannot be scrambled or topicalized even if it is Case marked. Observe, for example:

(26) Scrambling

- a. *Mako-ga aiseki-o John-to *suru*
 Mako-nom table-sharing-acc John-with *suru*
- b. *Aribai-ga keisatsu-ni shoomei-o [Sam-ga muzitsu-da to] *shita*
 Alibi-nom police-to proof-acc [Sam-nom innocent-cop comp] *suru* -past
- c. *Aribai-ga syoomei-o keisatsu-ni [Sam-ga muzitsu-da to] *shita*
 Alibi-nom proof-acc police-to [Sam-nom innocent-cop comp] *suru*-past

(27) Topicalization⁹

- a. *Aiseki-wa Mako-ga John-to *suru*
 Table-sharing-top Mako-nom John-with *suru*

⁹Since the topic marker *-wa* cannot follow the accusative Case marker *-o*, in (27.a-b) it is not clear whether the topicalized nouns should be interpreted as an N in *N-suru* or as an N preceding *-o suru* construction. In any case, if an NP is the argument of *suru* and Case marked by it, it should be possible to topicalize this NP.

- b. *Syoomai-wa keisatsu-ni [Sam-ga muzitsu-da to] *shita*
 proof-top police-to [Sam-nom innocent-cop comp] *suru*-past

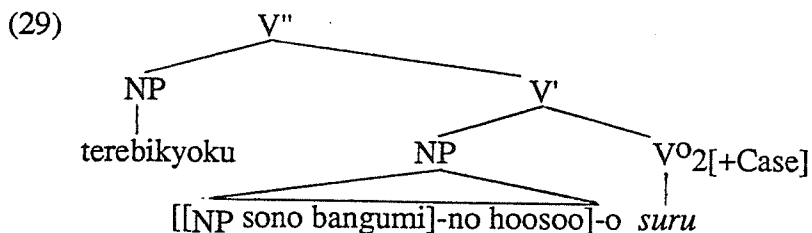
If N^0 is not the argument of *suru*, it does not have to be theta-marked by *suru*. Then, the Theta Criterion is not relevant here. Thus, without argument transfer, this alternative analysis can avoid violation of the Theta Criterion in -o *suru* constructions. Furthermore, in the present analysis, -o *suru* constructions can be clearly distinguished from the cases of 'heavy' *suru*., where *suru* theta-marks its internal argument NP.

Sentences like (11.a-b) repeated here as (28.a-b) are problematic in Grimshaw and Mester's analysis of argument transfer, since they are unable to be classified either as the 'light' verb or 'heavy' verb type construction. However, in the present analysis, these can be accounted for as a consequence of the reanalysis of D-structure.

- (28) a. Terebikyoku-ga [NP sono bangumi-no hoosoo]-o *suru*
 TV station-nom [that program-gen broadcast]-acc *suru*
 "The TV station broadcasts that program"

- b. Okujyoo-no antena-ga [eiseihoosoo-no zyushin]-o *shita*
 rooftop-gen antenna-nom [satellite broadcasting-gen reception]-acc *suru*-past
 "The antenna on the rooftop received the satellite broadcasting"

As discussed above, the lower V^0 , i.e., V^0_2 , can acquire Case assigning capability through reanalysis of D-structure. Once V^0_2 becomes capable of assigning Case, it can behave as if were the head of the V'' , obscuring its nature as a part of a complex verb. In (28.a-b), V^0_1 appears to be merged into the next higher V' leaving V^0_2 as the head of the V'' . The structure of (28.a) is illustrated below as an example:



N^0 becomes the head of the NP resulting from the merger of the lowest V' and V^0_1 . The arguments of the head nouns are assigned the genitive case marking according to the case marking convention in Japanese.

Since only the lowest V' is relevant to this process, (30.b), where the higher V' as well as the lowest V' is involved in the merger, is not possible:¹⁰

¹⁰ In Grimshaw and Mester's analysis, at least one internal argument of the N preceding *suru* must be transferred to the argument of *suru*. Thus, their analysis predicts the following sentence to be ungrammatical with no argument of the noun being transferred:

Mako-ga John-to-no aiseki-o *suru*
 Mako-nom John-with-gen table-sharing-acc *suru*

In contrast, my analysis predicts that this sentence is grammatical with the higher V^0 merged into V' , which coincides with my judgement of acceptability.

(30) a. Aribai-ga keisatsu-ni [NP[Sam-ga muzitsu-da to]-no syoomei]-o *shita*
Alibi-nom police-to Sam-nom innocent-cop comp-gen proof-acc *suru*-past
"The alibi proved that Sam is innocent"

b. *Aribai-ga [NP keisatsu-e-no [Sam-ga muzitsu-da to]-no syoomei]-o *shita*
Alibai-nom police-to-gen Sam-nom innocent-cop comp proof-acc *suru*-past

When N⁰ is an ergative nominal, V⁰₂ will not acquire Case assigning capability, as discussed above. Hence, this reanalysis is not available in this case.

The alternative analysis of the 'light' verb *suru* constructions that I advocate here correctly predicts that the following three sentences are all synonymous:¹¹

(31) a. Aribai-ga keisatsu-ni Sam-ga muzitsu-da to syoomei-*shita*
Alibi-nom police-to Sam-nom innocent-cop comp proof-*suru*-past

b. Aribai-ga keisatsu-ni Sam-ga muzitsu-da to syoomei-o *shita*
Alibi-nom police-to Sam-nom innocent-cop comp proof-acc *suru*-past

c. Aribai-ga keisatsu-ni [NP Sam-ga muzitsu-da to-no syoomei]-o *shita*
Alibi-nom police-to [Sam-nom innocent-cop comp gen proof]-acc *suru*-past
'Alibi proved to the police that Sam is innocent'

In Grimshaw and Mester's analysis, only the alternation of (31.b) and (31.c) is accounted for. Whether the N-*suru* forms like (31.a) are formed in the lexicon or in syntax, they would need at least two different lexical entries for the 'light' verb *suru*. If the N-*suru* forms like (31.a) are formed in the lexicon, they should be distinguished from the N-*suru* forms with 'result' nominals, which are highly lexicalized and have argument structure not attributable to their components. If they are formed in syntax, there should be another kind of *suru*, the one which cannot assign accusative Case. In terms of economy in lexical entries too, the alternative analysis adopted in this paper seems to have advantage over the analysis of Grimshaw and Mester.

5. Conclusion

In this paper, I have argued that there is only one lexical entry for the 'light' verb *suru*, which is subcategorized for a thematic noun. I have also shown how both N-*suru* and -o *suru* constructions can be formed in syntax from the same D-structure, assuming the notions of late insertion of grammatical formatives and functional head, which are elaborated by Emonds (1985: ch.4) and (1990), and reanalysis of D-structure. Further, I have pointed out problems in Grimshaw and Mester's analysis of -o *suru* constructions, and argued against it in favor of the alternative analysis which unifies N-*suru* and -o *suru* constructions.

¹¹(31.b-c) appear to be stylistic variants of (31.a) since there is no significant difference in meaning. It seems to me (31.a) is the most frequently used form among these three. (31.c) sounds more literary than (31.b) and is usually used in writing or formal speech only.

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