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Internal Reduplication and Salish Prosodic Morphology

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I have been interested in Salish language phonology and morphology for a number of years, collaborating with Thomas Hess (University of Victoria) and Violet Hilbert (Lushootseed Research) on several projects on Lushootseed, a Coast Salish language spoken by a reduced number of people around Seattle, Washington, and also with Barry Carlson (University of Victoria) on Spokane, a related Interior Salish language of eastern Washington. The present paper grows out of work with Carlson.

Salish languages are notorious for their large consonant inventories and long surface strings of consonants, and have posed interesting problems for syllable theories over the years. Proposals range from claims that the language has no syllables at all to models in which any segment in the language can constitute a syllable (cf. Greenberg (1962), Hoard (1978); Bagemihl (1989) provides a useful review of such proposals). Patricia Shaw, Bruce Bagemihl and the other researchers with the University of British Columbia's Project on Syllabification in Northwest Coast languages take a different approach. They take seriously the proposals of McCarthy and Prince (1986, and related work) that reduplication makes reference to phonological constituents like the syllable, and are looking closely at the reduplication patterns in Northwest languages as a clue to their syllable structure. What is emerging is a model with very simple syllable structure in the phonology: CVC syllables. The unusual (and universally marked) property of these languages is that they allow unsyllabified segments to persist through phonological derivations and be realized on the surface, while other languages delete unsyllabified material or epenthesize vowels in order to repair syllable structure. This model not only provides a coherent account of syllable structure but it has engendered insightful analyses of the complex reduplication patterns in these languages. So it is with Spokane; in this paper, I investigate a very productive reduplication process and argue that it makes reference to CVC syllable structure in two ways. The process is an internal reduplication, a type of reduplication which has traditionally been a problem for theories of reduplication (cf. Clements (1987), etc.): this Spokane process will turn out like so many of the infixing reduplications in Broselow and McCarthy (1983): copied material from the periphery of a phonological constituent is inserted inside it.

Spokane internal reduplication is traditionally called Out-of-Control (henceforth OC). The name indicates its semantic function, designating the lack of an agent in an action; an animate argument lacks control in a situation (Carlson and Thompson (1982)). This morpheme appears to copy the vowel and the second consonant of typical Spokane CVC roots, attaching the copy directly after C_2. Stress and vowel deletion rules create surface variants as illustrated in the following pair of forms. The form in (1) shows stress on the root and OC as $-C_2$; (2) shows stress on the affix with OC as -VC_2.

(1) hék^{w}k^w 'It came open a crack without my knowing it.'
< √hek^w 'opened a crack', strong root

(2) qc'ic' 'It got tangled up [as a thread might during sewing]
< √qic' 'braided; woven', weak root

Spokane stress is sensitive to an underlying distinction among roots (Carlson (1989)): "strong" roots take stress, "weak" roots lose stress to suffixes. A strong root like *hek^w* in (1) takes initial stress under OC and most other suffixing operations, while words formed from weak roots like *qic'* in (2) display stress toward the end by a process which Bates and Carlson (1989) call Weak Shift. This stress difference creates the different OC forms in (1) versus (2): unstressed vowels are deleted unless adjacent to a laryngeal: hence the vowelless surface root in (2).

I am assuming, along with the works cited previously, a model like that proposed by McCarthy and Prince (1986), in which reduplicative templates make reference to phonological constituents and not the arbitrary strings of consonants and vowels presented in Marantz (1982) and related work. So, the question is: what is the template for OC reduplication, and to what phonological constituent does it affix? It is clear that the process is a suffixing reduplication: since other aspects are less obvious, I will explore this aspect first.

McCarthy and Prince argue that the difference between suffixing and prefixing reduplications can be derived from their positional differences alone. The apparent problem for reduplications like this, where it looks like VC is the copy, is VC patterns are universally absent from prefixal reduplications, while VC suffixation is fairly common. McCarthy and Prince treat the Tzeltal data in (3), where no vowels are deleted, and the facts are clear:

(3) Tzeltal (Berlin (1963), Kaufman (1971), as cited in McCarthy and Prince)

nit	nititan	'push'
net'	net'et'an	'press'
haš	hašašan	'feel with palm'
čol	čololan	'make rows'
p'uy	p'uyuyan	'grind in fingers'

McCarthy and Prince argue that the Tzeltal template is a CVC syllable, and contrast the Tzeltal data with the following data from Kaingang, in which the syllable suffix is copied in its entirety:

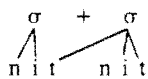
(4) Kaingang (Wiesemann (1972); Poser (1982), cited in McCarthy and Prince)

Root	Plural Stem	
va	vava	'to throw away'
vasan	vasansan	'to exert, fatigue'

McCarthy and Prince argue that the syllable is the suffix in each of these cases, but that Tzeltal differs from Kaingang in that the juncture between the affix and the base is "transparent" to the Onset Rule in the former, but not the latter. The onset for the suffixal syllable may come from the base in Tzeltal, but must come from the copy in Kaingang, in which the boundary is opaque and all the material associating to the template must come from the copy and not the base.

This insightful analysis may be extended to the Spokane data, but I want to suggest that it comes at a higher cost than McCarthy and Prince imply. In particular, simply stating that the boundary is transparent will not force the relevant consonant of the base, say the *t* in *nititan*, to form the onset in the template. In the examples that McCarthy and Prince discuss in detail, the result of not taking the onset from the base violates some independent principle of the phonology in question. McCarthy and Prince do not provide a full derivation of the Tzeltal forms, but state that this reduplication works like the prefixal reduplications for which they provide ample discussion. Here is an informal derivation, with the base on the left and the copy on the right:

(5)



Crucially, however, McCarthy and Prince do not state that the result of filling the template entirely from the copy, which would produce *nitnitan*, is independently illformed in Tzeltal. And whatever the Tzeltal facts, the analogous structure in Spokane is perfectly well-formed; the surface form *hek*^{w}*hek*^{w} is the result of a different reduplication. So, even though I think McCarthy and Prince are correct, and in fact Spokane is going to provide striking confirmation that OC is a syllable template, I'd like to explore an alternative analysis which does not rely on the transparent boundary distinction. This is one proposed by Sloan (1989) for the cognate reduplication in Lushootseed, and was proposed for Spokane as recently August (1990) by Carlson and Bates. This analysis states that the vowel and the final consonant of the root form a phonological constituent, a mora. It is this mora which is the base for affixation, and the affix is a mora template:

(6) root: h e k^w OC affix: μ

μ

σ

Following Broselow and McCarthy (1983), the reduplication copies only the melody of the constituent which is the base for the affixation, here the VC mora:

(7) h e k^w e k^w

μ + μ

This analysis derives the strong root data in (1) and also the OC patterns for strong roots of the shape CVCC, in which only the second consonant surfaces copied:

(8) ʔac'x̣^{w} 'watch, look at' ʔac'c'x̣^{w} 'observe'

In the derivation below, the copy is shown on a different tier from the base, again following Broselow and McCarthy:

(9) ac'

CVC-VC-C -> stress and Unstressed Vowel Deletion -> ʔác'c'x̣

ʔac' x̣

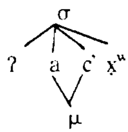
If the base is taken to be anything larger than the mora, for example, the root, the root-final fricative will be copied, and will incorrectly surface as part of the right-edge-in association typical of suffixal reduplication, resulting in the illformed **ʔac'x̣x̣*.

The data below show some weak roots with the same shape and the same pattern under OC; if only the VC copies, the correct derivation will obtain under the mora-copying analysis, because the root-final consonant will not interfere.

(10)	milq^w	'round'	millq^w	'accidently made itself round'
	pitk^w	'pierced'	pittk^w	'pierced by accident'
	weyt	'sick'	weyyt	'sick by accident'

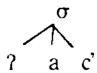
What this straw-man analysis assumes, and what I assumed until recently, is that the last consonant in a CVCC forms part of the root syllable:

(11)



This is what motivated Carlson and Bates, and Sloan, to posit a subsyllabic constituent, the mora. But the work of Bagemihl (1989) points out that the root-final C might not be part of the SYLLABIC structure of the root at all:

(12)



So, a prosodic rule would see this root as a CVC root. And it does seem reasonable that the ROOT is the base for affixation, since this is the base to which other reduplications in Spokane refer (cf. Bates and Carlson (1989)). Thus the data in (8)-(10) cannot be taken as evidence against the hypothesis that I started with, that OC reduplication is a syllable template. So we have two competing hypotheses, that the template is a CVC syllable, and that the template is a VC mora. I will now present some OC data which rather dramatically support the syllable as the proper template.

Recall the data in (10), which show weak CVCC roots taking the strong pattern under OC reduplication; for these three roots, this is the only way in which they behave like strong roots. For example, we know that *milq'*^{w} in (10) is a weak root since it shows effects of Weak Shift under regular derivation:

(13) mlq'^{w}-nt-én 'I made it into a ball (solid).'

There is, however, a more common OC pattern for surface CVCC weak roots than the pattern illustrated in (10), and this more common pattern supports the syllable template analysis over the analysis which makes reference to a mora template. Surface weak CVCC roots commonly form OC as $C_1C_2C_2VC_3C_3$, in which BOTH post-vocallic consonants are copied:

(14)	calx̣^{w}	'bunched'	clláx̣^{w}x̣^{w}	'It suddenly bunched up.'
	ʔamx̣^{w}	'shave'	ʔammáx̣^{w}x̣^{w}	'It got shaved by mistake.'
	č'in'x^{w}	'crowding; pesty'	č'n'n'úx^{w}x^{w}	'He found himself in a compromising, crowded, boring, embarrassing situation or became these accidentally.'

Further, weak surface CCVC roots have this same pattern under the reduplication: $C_1C_2C_2VC_3C_3$ is the surface pattern under OC for these roots, as exemplified in the data in (15):

(15)	p'raq' 'turned back'	p'rraq'q'	'It got turned back by accident.'
	p't'ič' 'broken open'	p't't'ič'č'	'It got broken open by accident.'
	šlič 'turn'	šllič̌č	'It got turned by accident.'

Now, the difference between the roots in (10) versus those in (15) can be derived if those in (15) result from underlying two-vowelled CVCVC roots, in which the very productive rule of Unstressed Vowel Deletion has applied. The roots in (10) have only a single vowel underlyingly. The data in (16) corroborate this suggestion, because they have two vowels on the surface. Moreover, these weak, final stressed, CVCVC roots, which surface with an unstressed vowel because they contain laryngeal consonants, appear as $C_1C_2C_2VC_3C_3$ under OC reduplication, the same remarkable pattern as obtained for (14) and (15).

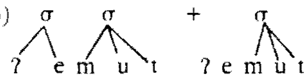
(16)	č'ehék^w 'uncovered'	č'ehhék'^{w}k^w	'It suddenly became uncovered.'
	?emút 'sit singular'	?emmútt	'He sat by accident.'
	?ewét 'sneak up on'	?ewwétt	'He sneaked up on it by accident.'

To summarize thus far, the weak roots in (14-16) have the underlying shape CVCVC.

A possible analysis would be that OC reduplication copies each mora (VC). Before vowel deletion, (16) would show the following copied moras: *?em-em-ut-ut*. But this analysis requires that in the syllabification of *?emut*, the second root consonant syllabify with the preceding vowel, as illustrated below:

(17)
```
       μ      μ
      / \    / \
  ?  e   m  u   t
```

But this putative representation violates the universal generalization that syllable onsets will be preserved at the expense of coda structure; the first nasal in (17) would be expected to syllabify with the vowel which follows it, rather than with the preceding vowel. This dilemma, forced by the mora-copying analysis, can be taken as evidence against it. The preferred analysis, which posits a syllable template, can account for these data with no extra stipulation, as illustrated in the derivation in (18):

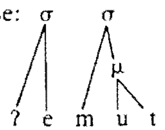
(18) 

-> ʔem+mut+ut ->UVD->ʔemmútt

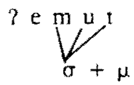
The copy is placed before the final vowel: this is a true infixing reduplication in the sense of Broselow and McCarthy (1983): root-peripheral material is placed inside a root, as shown after the first arrow in the derivation in (18).

It might be possible to analyze the affix as being inserted in its surface position (I build here on a suggestion by D. Archangeli at the presentation of this paper at WECOL.) If the base constituent were the rightmost mora of the root, the correct insertion site would be predicted. If the entire root copied, and the template were a syllable, the correct results would be obtained.

The rule would be: PREFIX an empty syllable template to the FINAL mora of the root; the fact that the final mora of the root is targeted would correctly ensure right-edge-in reprosodization, since the affix is a suffix with respect to the root. The entire root melody would copy, because the root is the base for affixation. The derivation below illustrates this hypothesis.

(19) base: 

-> reduplication: affix σ ->



copied root melody, right-edge-in

-> ʔem+mut+ut

This final suggestion is tentative, but the main points of the analysis are well motivated: Spokane internal reduplication has illustrated clearly the benefits of analyzing Salish phonology as being constrained by simple rules of syllabification.

References

Bagemihl, Bruce. (1989). Syllable structure in Bella Coola. Unpublished manuscript, University of British Columbia.

Bates, Dawn and Barry F. Carlson. (1989). Prosodic structure in Spokane morphology. *Working Papers of the Linguistics Circle of the University of Victoria* 8:1 75-95.

Broselow, Ellen and John McCarthy. (1983). A theory of internal reduplication. *The Linguistic Review* 3:25-88.

Carlson, Barry F. (1980). Spokane -e-. *International Journal of American Linguistics* 46.78-84.

Carlson, Barry F. (1989). Reduplication and stress in Spokane. *International Journal of American Linguistics* 55.

Carlson, Barry F. and Dawn Bates (1990) Modelling out-of-control reduplication in Spokane. *Papers from the International Conference on Salish and Neighboring Languages*. Univerisity of British Columbia.

Carlson, Barry F. and Laurence C. Thompson. (1982). Out-of-control in two (maybe more) Salish languages. *Anthropological Linguistics* 24:51-65.

Carlson, Barry F. and Pauline Flett. (1989). *Spokane Dictionary*. University of Montana Occasional Papers in Linguistics No. 6.

Clements, G.N. (1987) The problem of transfer in nonlinear phonology. *Cornell Working Papers in Linguistics*.

Greenberg, Joseph. (1962). Is the vowel-consonant dichotomy universal? *Word* 18:73-81.

Hoard, James. (1978). Syllabication in Northwest Indian languages, with remarks on the nature of syllabic stops and affricates. In A. Bell and J. B. Hooper, Eds., *Syllables and Segments*, pp. 59-72. Amsterdam: North Holland.

Ito, Junko. (1986). *Syllable Theory in Prosodic Phonology*. Ph.D. Dissertation, University of Massachusetts, Amherst.

Marantz, A. (1982). Re: reduplication. *Linguistic Inquiry* 13:435-482.

McCarthy, John and Alan Prince. (1986). Prosodic morphology. Unpublished manuscript, University of Massachusetts, Amherst and Brandeis.

Sloan, Kelly. (1989). Affixation to the mora. *Proceedings of the West Coast Conference on Formal Linguistics*.

Can Verb Movement Be Substitution For A Maximal Projection?

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0. Introduction

In this paper we analyze Focus-Verb-Movement (or Predicate Clefting) in Tuki, a Bantu language spoken in Central Cameroon (West Africa). It is argued that the behavior of the focused verb in this language can be accounted for by a condition that licenses the substitution of a head for the specifier position of a maximal projection. We have called this condition the Categorial Identity Condition (CIC). The CIC opens the door for the licensing of the movement of a head to a maximal projection. Whether or not the CIC is realized in a given language could be the dividing line between Verb Focussing Languages and Non Verb Focussing Languages. This is expressed as the Verb Focussing Parameter.

1.1. The Tuki Empirical Material

In Tuki Focus-V-Movement a focused verb appears in clause initial position indicating focus or contrastive focus. The verb in clause initial position is the infinitive form of the verb that appears inside the clause.

```
(1)O                  suwa   owu  Puta a   mu  suwa
   infinitive marker  wash   FOC  Puta SM  p1  wash
   tsono raa
   clothes her
   "Puta WASHED her clothes"
```

The focused verb may not carry tense or aspectual morphology. The focused verb can only be in the infinitive form:

```
(2)a.O  noba owu Isomo a  ma noba agee  waa  idzo
     inf. beat FOC Isomo SM p2 beat wife his yest.
     "Isomo BEAT his wife yesterday"
   b.*O  ma noba owu Isomo a ma noba agee waa idzo
      inf p2 beat FOC Isomo SM p2 beat wife his yest
```

1.1.1. Characteristics of the Focused Verb

When a focused verb is moved to clause initial position, its complements cannot follow it.

```
(3)a.O    nya  owu  Mbara  a  nyam  cwi
     inf. eat FOC  Mbara SM  eats  fish
     "Mbara EATS fish"
   b.O    nya   owu (*cwi) Mbara a   nyam  cwi
     inf. eat   FOC   fish Mbara SM  eat   fish
```

Adverbs can, however, follow the focused verb to clause initial position showing that it is indeed the verb that is clefted:

```
(4)O  numa  ifundu  owu   onguna  o  ma  numa  idzo
   inf. shine much  FOC   sun    SM  p2  shine yest.
   "The sun SHINED a lot yesterday"
```

1.1.2.<u>Can any Verb Be Focused?</u>

Every verb with a base form can be focused in this language. Intransitive verbs can be focused:

```
(5)O   bina  owu  Puta a  kutu  bina
   inf.dance FOC  Puta SM progr. dance
   "Puta is DANCING"
```

Ergative verbs can be clefted too:

```
(6)Wara (= O   +  ara)  owu  vadzu     va  m(a)  ara
   come    inf.  come   FOC  children   SM p2  come
   "the children CAME"
```

Transitive verbs can be focused:

```
(7)O     kusa  owu  Isomo a   ma   kusa  tsono
   inf.  buy   FOC  Isomo SM  p2   buy   clothes
   "Isomo BOUGHT clothes"
```

Verbs which take a double object construction can be focused:

```
(8)o fa  owu  Nduma  a   mu  fa   isa    waa   moni
   inf. give FOC Nduma SM p1  give father her money
   "Nduma GAVE her father money"
```

Verbs which are part of an idiomatic expression can be focused:

```
(9)O     suwa  owu nubura nu  ma suwa idzo
   inf.  wash  FOC rain   SM  p2  wash  yesterday
   "it RAINED yesterday"
```

Verbs whose argument structure has been modified by verbal morphology, such as causative verbs (10), reciprocal verbs (11), applied verbs (12) can be focused:

(10)O bang- ey- a owu Puta a ma bang-ey-
inf. cry Appl. FV FOC Puta SM p2 cry Appl
a mwana waa
FV child her
"Puta made her child CRY"

(11)O dinga- na owu Dima na Kunu va- dinga-
inf.love REC FOC Dima and Kunu SM love
na- m
REC Asp
"Dima and Kunu LOVE each other"

(12)O namb- en- a owu Puta a ma namb-
inf. cook Appl. FV FOC Puta SM p2 cook
en- a aneme waa vibufa
APPL.FV husband her vegetables
"Puta COOKED vegetables for her husband"

1.1.3.<u>Characteristics of Focus-V-Movement Constructions</u>

Consider the following constructions:

(13)a.O nya owu Isomo a nyam cwi
inf. eat FOC Isomo SM eat fish
"Isọmo EATS fish"
b.*[O nya owu [ate [Isomo a nyam]]]
inf. eat FOC what Isomo SM eats
c.*[ate [o nya owu [Isomo a nyam]]]
what inf. eat FOC Isomo SM eats

Notice in (13 b-c) the presence of a focused verb and fronted wh-element. The ungrammaticality of both constructions as opposed to the grammaticality of (13a) suggests that the focused verb and the fronted wh-phrase compete for the same structural position. So it has to be the case that the position occupied by the clefted verb is also the position that a wh-item would normally occupy in a construction that exhibits syntactic wh-movement.

We have just considered short distance wh-movement. Now let us turn to long distance wh-movement. Tuki licenses long wh-movement:

(14)a.ate aye o bunganam [ee [Mbara a mu dza
What FOC you think that Mbara SM p1 say
[ee [Puta a ma namba]]]]
that Puta SM p2 cook
"What do you think that Mbara said that Puta cooked?"
b.ane odzu o ma barafya [CP 0 [O beraana]]
who FOC you p2 forget inf. call

"who did you forget to call?"

Focus-V-Movement may also occur long distance. Verbs like obungana "to think" and ob "to say" license long distance predicate clefting:

(15)a.wenda owu Mbara a bunganam [ee [o nu
go FOC Mbara SM thinks that inf. f1
endam na Purasi
go to Paris
"Mbara thinks that you will GO to Paris"
b.o banga owu Mbara a b [ee [nosi waa
inf. cry FOC Mbara SM says that mother his
a nu bangam
SM f1 cry
"Mbara says that his mother will CRY"

Now consider the following constructions:

(16)a.*[na ane odzu]$_i$ Isomo a m(u) udza na
to whom FOC Isomo SM p1 tell to
Puta maru ama ee [visimbi vi m(u) dzara x_i]]
Puta story this that police SM p1 talk
"*to whom Isomo told Puta the story that the police talked?"
b.*wuna owu Isomo a m(u) udza na Puta maru
kill FOC Isomo SM p1 say to Puta story
ama [ee [visimbi vi m(u) una Dima]]
this that police SM p1 kill Dima
"Isomo told Puta the story that the police KILLED Dima"
c.*O fenda owu Isomo a m(u) uba maru ama [
inf. repair FOC Isomo SM p1 hear story this
ee [Dima a ma fenda matuwa waa]]
that Dima SM p2 repair car his
"Isomo heard the story that Dima REPAIRED his car"

(16a) is illicit because the pied piping of the wh-phrase na ane has taken place over an island. Similarly (16 b-c) are both ruled out because a clefted verb is related to an identical verb inside an island (in this case a complex noun phrase). So Focus-V-Movement obeys the Complex Noun Phrase Constraint. Moreover, it also obeys the Wh-Island Constraint. Hence the illicitness of the following constructions:

(17)a.*O kos- en- a tu t idzima [ate [tu
inf. buy appl. FV we neg know what we
fitim o kos- en- a iya itsu
can inf. buy Appl. FV mother our

"we do not know what we can BUY for our mother"

b.*wenda owu tu t idzima [tane [t endam]]
go FOC we Neg know where we go
"we do not know where we are GOING"

Thus it can be safely stated that Focus-V-Movement is subject to the Complex Noun Phrase Constraint and the Wh-Island Constraint.

1.2.Focus-V-Movement

1.2.0.Summary

Up to now, we have established the following facts about Focus-V-Movement in Tuki:

(18)(i) In this language, Focus-V-Movement moves a verb to clause initial position; the verb in clause initial position is the infinitive form of the verb that appears inside a clause.

(ii) A syntactically raised wh-element and a focused verb may not occur in the same clause, suggesting that syntactic Wh-Movement and Focus-V-Movement substitute items to the same position.

(iii) Long distance Focus-V-Movement is licensed when there is a bridge verb.

(iv) The relationship between a focused verb and its copy inside the clause is strictly subject to Bounding Theory as evidenced by the fact that a clefted verb may not be related to its copy inside a complex noun phrase or a wh-island. This amounts to saying that the relationship between a focused verb and its copy is constrained by Subjacency and CP, IP and NP are the Bounding Nodes.

1.2.1.Wh-Movement as Substitution for FP

We have argued extensively elsewhere (see Biloa (in preparation)) that Wh-Movement in Tuki (and Duala) substitutes wh-phrases for the specifier position of a Focus Phrase. Very briefly, we summarize here the arguments that have led to such a conclusion.

1.2.1.1.Structure of Focus Sentences

Focus constructions in Tuki are characterized by the appearance of a focus word after the focused constituent:

(19)a.Puta a nu fam nosi waa moni nambari
Puta SM f1 give mother her money tomorrow
"Puta will give her mother money tomorrow"

b.Puta odzu a nu fam nosi waa nambari
Puta FOC SM f1 give mother her tomorrow
"it is Puta who will give her mother money tomorrow"

c.Moni odzu Puta a nu fam nosi waa
money FOC Puta SM f1 give mother her
"it is money that Puta will give her mother"

Any constituent of the sentence except the verb has been focused and has appeared in pre-FOC position. Thus focus sentences have the following structure:

(20) XP Focus Word IP

1.2.1.2.<u>Matrix Wh-Questions</u>

When Wh-Movement occurs in the Syntax, a focus word accompanies the extracted wh-word:

(21)a.Ane odzu Mbara a benam
who FOC Mbara SM hates
"who does Mbara hate?"
b.Ate aye Mbara a mu kusa
what FOC Mbara SM p1 buy
"what did Mbara buy?"
c.Ni owu Mbara a nu kusam matuwa
when FOC Mbara SM f1 buy car
"when will Mbara buy a car?"

Matrix wh-questions have a structure similar to focus constructions:

(22) Wh-XP Focus Word IP.

1.2.1.3.<u>Embedded Wh-Questions</u>

Now admire the fact that a focus word occurs in Tuki embedded questions:

(23)a.Mbara a sesam [ee [ane [odzu [Puta a
Mbara SM asks that who FOC Puta SM
benam]]]]
hates
"Mbara asks who Puta hates"
b.Mbara a sesam [ee [ate [aye [Puta a mu
Mbara SM asks that what FOC Puta SM p1
kusa
buy
"Mbara asks what Puta bought"
c.Mbara a kambim [ee [ni [owu [Puta a nu kusam
Mbara SM astonish that when FOC Puta SM f1 buy
matuwa
car
"Mbara wonders when Puta will buy a car"

Tuki embedded questions have the following structure:

(24) THAT WH Focus Word IP

1.2.1.4. Wh-Questions and Clause Structure

So far we have argued the following:

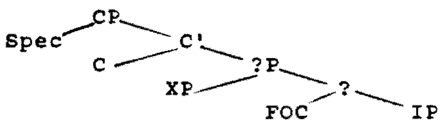
(i) Focus sentences have the structure XP Focus Word IP.

(ii) When movement occurs in the Syntax, wh-questions are formed Wh-XP Focus Word IP.

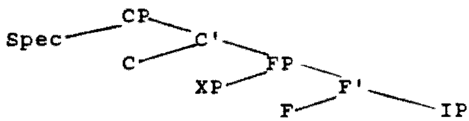
(iii) Embedded questions are formed That WH Focus Word IP.

(iv) The choice of the focus word is dependent upon the choice of moved wh-element, suggesting that an agreement relation obtains between them.

In view of (i-iv), the structure of Tuki questions seems to be:

(25)


Since ?P is the projection of focus word, it can be analyzed as a F(ocus) P(hrase):

(26)


1.2.2. Focus-V-Movement as Substitution for FP

As in Wh-Movement, a focus word appears when a verb is clefted:

(27) wanyo owu Isomo a ma nyo maabo idzo
drink FOC Isomo SM p2 eat wine yesterday
"Isomo DRANK wine yesterday"

Do we want to treat the similarity between Focus-V-Movement and Syntactic Wh-Movement (in terms of the choice of the focus word) as a coincidence or as a logical outcome of the fact that Focus-V-Movement is simply as Koopman puts it the WH-Type of Verb Movement?

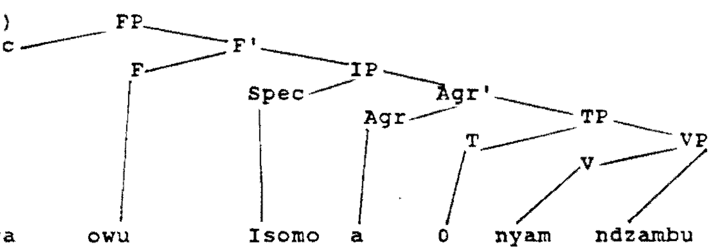
We want to claim that both Focus-V-Movement and Wh-Movement in this language substitute their extracted elements for the same position. If Focus-V-Movement and Wh-Movement were raising to different syntactic positions, we would expect the following (b-c) sentences to be grammatical:

(28)a.[o nya owu [Isomo a nyam ndzambu]]
inf. eat FOC Isomo SM eats meat
"Isomo EATS meat"
b.*[o nya owu [ate aye [Isomo a nyam]]
inf. eat FOC what FOC Isomo SM eats
c.*[ate aye [o nya owu [Isomo a nyam]]]
what FOC inf. eat FOC Isomo SM eats
d.[ate aye [Isomo a nyam]]
what FOC Isomo SM eats
"what does Isomo eat?"
e.*[ane$_i$ odzu$_i$ [ate$_j$ aye$_j$ [Mbara a ma fa x_i x_j]]]
who FOC what FOC Mbara SM p2 give
"who$_i$ what$_j$ Mbara gave x_i x_j"
f.*[ate$_j$ aye$_j$ [ane$_i$ odzu$_i$ [Mbara a ma fa x_i x_j]]]
what FOC who FOC Mbara SM p2 give
"what$_j$ who$_i$ Mbara x_i x_j"

The ungrammaticality of the (b-c) sentences is paralleled by the behavior of the (e-f) constructions: it seems to be the case that double application of (wh-) movement to the same structural position is strictly prohibited.

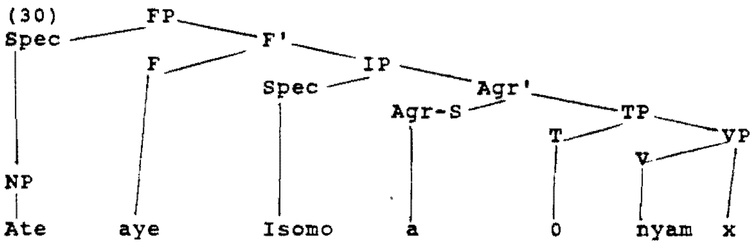
Since we have argued that wh-items substitute for FP, it is appropriate to state that Focus-V-Movement substitutes for the same structural position. Thus (28a) will be assigned the following representation:

(29)



The phrase marker of (28d) is provided below:

(30)



In many respects, (30) and (31) look alike. But it is (30) that we need to motivate further. What happens when (28a) is embedded? We obtain the following structured sentence:

(32) Mbara a b [CP ee [FP [Spec onya [F'[F owu [IP
Mbara SM says that eat FOC
Isomo a nyam cwi]]]]]]
Isomo SM eats fish
"Mbara says that Isomo EATS fish"

The parallelism between Focus-V-Movement and syntactic Wh-Movement carries over embedded contexts since we know by now that constructions such as the following are licensed:

(33) Mbara a sessam [CP ee [FP [Spec ate [F' [F aye
Mbara SM asks that what FOC
[IP Isomo a nyam
Isomo SM eats]]]]]]
"Mbara asks what Isomo eats?"

In view of the parallelism between Focus-V-Movement and Wh-Movement, our claim that the former process is substitution to the specifier position of a headed constituent focus phrase seems to be supported by a strong factual basis. However, the position that a maximal projection can be the landing site of X^o Movement is far from uncontroversial. In fact there are three possible types of Head Movement:

(34) (Chomsky 1986; Baker 1988)
(i) Substitution for a maximal projection (i.e. a specifier)
(ii) Adjunction to a maximal projection
(iii) Substitution for or Adjunction to an X^o category

Chomsky (1986a) indicates that (34i) and (34ii) are ruled out by some version of "structure preservation" which prohibits XP projections from taking the position of X^o projections and vice versa (see also Baker (1988, 59)).

Chomsky and Baker assume that only (34iii) is a viable option for Verb Movement. If indeed (34iii) is the only viable option for Verb Movement, it may not account for the empirical material presented here. Recall that it was clearly shown above that the focused verb competes with the extracted wh-phrase for the same structural position. Crucially, assuming that the Tuki clefted verb substitutes for or adjoins to some head will amount to saying that wh-movement in this language raises wh-items to some X^o category. This, obviously, cannot be maintained. Since a verb and a wh-phrase may not be fronted in the same clause, the only way out for us is to maintain that verb movement in the Tuki case of predicate clefting is substitution for a maximal projection (i.e. a specifier). But there is a question that has so far remained unaddressed: what allows verb movement in Tuki to be substitution to FP? In other words, under what conditions can an X^o category move to an XP?

1.3. <u>The Categorial Identity Condition</u>

If it can be maintained that the clefted element in Tuki Focus-V-Movement constructions is a verb we have to explain how this view fares with regard to the theory of phrase structure. Chomsky (1986b) elaborates on the circumstances under which categories can occur in certain configurations. He mentions that predication and theta-marking are the relationships that license the occurrence of maximal projections in structures. Nonmaximal projections (i.e. X^o), on the other hand, must be licensed relative to the maximal projection in which they appear, by X-bar theory. With the above in mind, let us assume that specifiers of functional maximal projections are neutral with respect to the nature of categories they might host (temporarily or permanently). This would allow lexical categories to substitute for the specifier position of a functional maximal projection, a desired result in view of the Tuki empirical material. If this conclusion proves to hold water, it would force a recasting of X-bar theory and the structure-preserving hypothesis in the following form:

(35) <u>Categorial Identity Condition</u> (CIC)
Specifiers of functional maximal projections are

unspecified with respect to categorial identity.

The Categorial Identity Condition (CIC) extends alittle bit the scope of the standard X-bar Convention and the Structure-Preserving Hypothesis. The latter constraints on configurational schemata require that maximal projections substitute for maximal projections, while the CIC states that the specifiers of maximal projections can host raised items irrespective of their identity. Thus the CIC allows the movement of a head to the specifier position of a maximal projection. Now, it is fairly obvious that the CIC cannot apply to all languages, since French and English among others do not license verb focussing constructions à la Tuki. Thus it is appropriate to suggest that the manifestation of the CIC in a given language could be the dividing line between Verb-Focussing-Languages and Non-Verb-Focussing-Languages. Let us formalize this linguistic dichotomy in the form of a parameter:

(36) <u>Verb Focussing Parameter</u>
Heads [May/May Not] substitute for the specifier position of a functional projection.
MAY: Tuki, Vata (for the latter language see Koopman (1984).
MAY NOT: English, French...

It is possible to argue that the existence of verb focussing constructions in languages like Tuki and their nonexistence in languages like English can be attributed to a difference in the constituent structure of those languages. We leave, however, this issue for future research.

2.<u>Conclusions</u>

In this paper, we have analyzed predicate clefting in Tuki. We have argued that predicate clefting and syntactic Wh-Movement raise elements to the same structural position. It was also shown that the behavior of a head in predicate clefting as well as the behavior of a maximal projection in Wh-Movement are regulated by Subjacency. The claim that a head can substitute for the specifier position of a functional maximal projection was said to follow from a proposed invariant principle (the Categorial Identity Condition) that essentially indicates that specifiers of functional maximal projections are neutral in respect of categorial identity. It was stipulated that the CIC may be the dividing line between languages such as Tuki that syntactically extract a verb and languages such as English that have to resort to other mechanisms to express verb focalization. This was formalized in the form of a parameter.

References
Baker, M. (1988), Incorporation, The University of Chicago Press, Chicago.
Biloa, E. (in preparation). The Syntax of Operator Constructions in Tuki, Ph.D. dissertation, University of Southern California, Los Angeles.
Chomsky, N. (1986a). Barriers, The MIT Press, MA.
Chomsky, N. (1986b). Knowledge of Language, Praeger, New York.
Koopman, H. (1984). The Syntax of Verbs. From Verb Movement Rules in the Kru languages to Universal Grammar, Foris Publications.

Memory Structures Underlying the Meaning of Proper Names

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This paper presents a model of the mental representation which might underlie the referential use of proper names and also accounts for the human ability to extend the use of names to new individuals and to use proper names as common nouns and even verbs. The model attempts to resolve a number of questions about proper names and the meaning of proper names that have arisen throughout the history of philosophy and unifies a number of observations that psychologists have made about names in more recent years. The model relies on specific notions about the information stored in memory (Clark & Marshall, 1981; Miller & Johnson-Laird, 1976): that there are both individual concepts (extensions or tokens) which are stored in memory for particulars, and generic concepts (categories, intensions, or types) that are stored in semantic memory. Lexical items are stored in an area of cognition which is specific to linguistic knowledge, the lexicon, but they find their meanings in associations with the individual and generic concepts stored in memory.

In this model, proper names are associated with a representation of their owners in the form of individual concepts in memory for particulars, but they also evoke a generic concept of NAME stored in semantic memory. It is by means of this three-way relationship which holds between the proper name in the lexicon, the concept of the individual owner of the name, and the generic concept of NAME in semantic memory that the name succeeds in refering to an individual. Furthermore, because of the link which is shared between a proper name and the generic concept of NAME in semantic memory, a proper name can be extended to new individuals who have that name.

When we hear the name of an individual, the phonetic signal is associated with a representation of that phonetic sign stored in the mental lexicon. The phonetic sign that we have perceived and accessed in the lexicon, say Aristotle, is associated with an individual concept in an area of secondary memory which we may call "person memory," following Miller & Johnson-Laird, so perceiving and accessing the name causes the individual concept to become activated. The name Aristotle must also be linked to the generic concept NAME in semantic memory, where information about types or categories is stored, because we know that the concept of name is a superordinate for the name Aristotle.

According to Miller and Johnson-Laird (page 306), each individual concept in person memory consists of a conceptual core of the individual surrounded by the properties associated with the individual. The properties associated with the person are not definitional; we can think of these properties as appositives; just as the non-restrictive relative clauses we use with proper names do not identify, but only inform, so the properties that are associated with the name and the person in person memory do not define or identify.

Another way to imagine the relationship between the individual and the properties associated with the individual is to imagine the central core concept of the individual as embedded in a context composed primarily of associated propositional, visual, and acoustic images or properties of the individual. The context also includes related concepts of other people and places stored in our memory for particulars. Indeed, the properties can be any kind of dynamic information: an acoustic or visual image, a smell, a memory for a place or an episode, a gender association, in short, almost anything.

The results of Durso and O'Sullivan's (1983) priming task suggest that we store some kind of visual image of the individual, provided that we have some idea what the person looked like. In their study, they found that both pictures of individuals and outlines of states primed their names, while pictures of common noun objects did not prime their category terms. Farah Fawcett, it would appear, is more closely linked to a visual image of Farah Fawcett than the word carrot is linked to the visual image of a carrot. We also store acoustic information about people in the individual concepts. We recognize many people on the phone merely by their voices, so it is logical that associated with the conceptual core identity of the person is a representation of that person's voice as well.

Person concepts can be composed of less and less information; we have concepts of people of whom the only information we have is their name or a few contextual properties. Needless to say, our person concepts can be of real people or fictitious people and we may not even know the difference. Real people and fictitious people are both concepts of individuals embedded in a context of associated images, episodes, and places. It is this idea of embedded core concepts that accounts for the Moses illusion as discussed by Erickson and Mattson (1981).

In their paper they asked why subjects would not notice the erroneous name in the following question:

How many animals did Moses take on the Ark?

The fact of the matter is that for most people, the individual concepts of Moses and Noah are embedded in extremely similar contextual properties. An erroneous use of Moses for Noah will not be noticed. An erroneous use of Nixon for Noah will be noticed, however, as their research showed. That is because the contextual information is quite different for each individual concept.

We turn now to an explanation of how names, if they refer to individual concepts in memory, can be extended to other individuals. Macnamara (1984, page 28) provides an example of his son Kieran's acquisition of proper names. When Kieran was 16 months and 14 days old he met a girl named Lisa, but he refused to call her by that name because he already knew another girl by that name. He obviously had a person concept labeled by a name and appeared to think that names corresponded one-to-one with individuals in the world. Children do sometimes undergeneralize the meanings of words. His concept of a proper name was that it was a rigid designator, i.e. a name that refers to the same individual in all possible worlds. A proper name could denote only one person to Kieran.

A little later, Macmamara reports, Kieran met three girls with the same name and had no problem calling them all by the same name. It seems that Kieran at this time has realized that names are not rigid designators; they only refer directly with respect to a particular context or situation. To do this, Kieran must have reorganized his concepts in memory, generalizing the NAME relation. The representation of the name in the mental lexicon is associated with one or more individual concepts in person memory, but it is also related to the generic concept of NAME in semantic memory. Thus, names stored in the lexicon are also associated with the categorial concept of NAME in semantic memory and that allows the name to be extended to another individual concept. Semantic memory is considered to be where generic information is stored about categories and the meaning of categories is encoded through the interrelationships they have with other categories. Categories are not used in a referential or extensional way within semantic memory; rather, they are intensional types.

Some support for the model suggested here comes from a free recall study (Birch, 1989) that I performed in order to observe the amount of clustering of names vs other grammatical categories in subjects' recall protocols. While ample evidence has shown that words are recalled in clusters based on meaning associations or semantic fields, an experiment by Cofer and Bruce (1965) showed that words did not cluster by grammatical category. That indicates that grammatical categories like noun or verb may not be organizational superordinates in semantic memory.

I performed a similar free recall task with count and mass nouns, perfective and imperfective verbs, and proper names, and found that the proper names were remembered better that the other words and they were remembered before the other words, but most importantly, they were recalled in clusters of two, three or four names, while the nouns and verbs did not cluster by grammatical category. The results are shown in Figure 1. A chi-square test on the data (with the categories collapsed to cluster vs non-cluster because of the low expected values for the clusters of three and four) indicated that the results obtained were significant (S= 59.13, p < .01). The significance of the result tells us the clustering effects are non-independent with respect to linguistic category and an examination of the data tells us what aspect leads to non-independence.

Category:	Names	Mass	Count	Perf.	Imperf.
Clusters:					
1 (i.e. no cluster)	31	49	57	52	39
2	23	10	4	5	7
3	11	1	0	0	0
4	4	1	0	0	0

Fig.1 Amount of clustering of different linguistic categories.

The results of this free recall task suggest that NAME is a superordinate category in semantic memory. Following Miller & Johnson-Laird's model of the organization of semantic memory, NAME is a core concept in semantic memory around which a lexical field is organized. Thus, the proper names that are stored in the lexicon are associated with a central concept of NAME in semantic memory. The meaning of proper names, then, could be the generic superordinate category NAME stored in semantic memory.

I have presented a model of proper names which attempts to do justice to the thoughts of philosophers and the research of psychologists. We find that names do have a sense or meaning, but only through their association with the intensional concept of NAME in semantic memory. We also find that they have reference and denotation, through the extensional concepts in memory for particulars which are associated with the name. Barwise and Perry (1983) point out that certain linguistic expressions are more "efficient" than others: while the meaning stays the same, the term can refer to many individuals. By this definition, pronouns are extremely efficient and proper names are extremely inefficient. The meaning stays the same, but each proper name doesn't necessarily refer to a lot of individuals. On the other hand, Hocket points out that it is an absolute universal of language that all languages have proper names, while the presence or absence of other grammatical categories shows more variation in the languages of the world. This supports the argument that naming is a linguistic ability which can be separated from predication, which forms the basis for the use of nouns, verbs, and adjectives.

Though both naming and predication rely on more general cognitive abilities, naming does not involve quantification or categorization like predication does. This is the difference between proper names and other nouns; this is the problem that names have always posed for syntactic and semantic theories. That is, while proper names are nouns or noun phrases, they are syntactically and semantically different from common nouns and noun phrases which rely on categorization and quantification. Yet, paradoxically, proper names can be used as predicates: common nouns and even verbs.

Lakoff and others (1974) have described the disparity between the logical conception of proper names as constants and certain marked syntactic structures involving names in English. He points out a number of ways in which names do not always act like logical constants in everyday language: they can be ambiguous, they occur with definite and indefinite articles and the number 'one,' if they occur with definite or indefinite articles they may occur with adjectives, they can be quantified over, and they are decomposable. Clark & Clark (1979) also give examples where proper names, seemingly the most prototypical of nouns, find uses as verbs. An explanation for these marked syntactic characteristics of names follow from the mental representation given above, with the addition of what have been called <u>semantic operators</u> (see Birch, 1989 and Birch, forth-coming, for a discussion of these semantic operators based on Johnson-Laird (1983: page 413; see also Miller, 1983, page 71).

Lakoff notes a number of anomalous uses of names, but by far the most interesting cases for our purposes involve the use of names as properties. Lakoff begins by noting that the name Henry Kissinger in the following sentence has two readings:

Sam Schwartz told his girlfriend that his name was Henry Kissinger, and so she believes that she has been dating Henry Kissinger.

On one reading (a), she thinks that he is the Henry Kissinger while on the other reading (b), she thinks he is merely a Henry Kissinger. This can be explained if we consider that for reading (a) the girlfriend must have a representation of the name Henry Kissinger in her mental lexicon which is associated with the generic concept NAME in semantic memory and an individual concept in memory for particulars whose conceptual core is surrounded by information such as: secretary of state, ladies' man, diplomatic, etc. Sam Schwartz must be consistent with the conceptual core and associated properties of HENRY KISSINGER, whose name he took over, so that she thinks that her boyfriend is the ex-secretary of state.

In reading (b), the girlfriend has Henry Kissinger in her mental lexicon, a connection with the generic concept of NAME in semantic memory, and one or more individual concepts associated with the name: one belonging to her boyfriend, another belonging to the ex-secretary of state, and so on. Her mental representation of her boyfriend is merely one of those that are associated with the name Henry Kissinger.

The difference between the two readings of the name is often expressed syntactically by means of the definite/indefinite distinction in articles, as it was in the two readings above. Lakoff points out the following sentence:

Sarah is dating _a_ Henry Kissinger, not _the_ Henry Kissinger.

How can the use of articles with names be explained if names are NPs and rigid designators? The use of a proper name with an article is marked and peripheral in English, but it is easy enough to explain. We have noted the difference between names and predicates earlier in this paper; the unmarked case, of course, is that of a name used as part of the naming relation. In the marked case of the proper name with an article, the proper name itself is being used as a predicate associated with the core concept of the individual who has that name or to one or any number of the properties or images that are stored in association with that core concept. In this sentence, the name Henry Kissinger is being used to denote a number of individuals that have only the property of being named Henry Kissinger in common. The indefinite article works as it usually does with predicate terms; it ranges over the group and picks out one individual, but not necessarily any specific one. If the definite article is used, the quantifier picks out one specific member of the group, which in this case is most likely to be the famous Henry Kissinger since that is the one which would be most easily made definite for pragmatic reasons.

One way that we might conceive of how names become predicates is to imagine that the name combines with a nominal operator which converts it to a type of predicate, a common noun, and makes it able to combine with the sorts of things that common nouns (but not proper names in the unmarked case) can combine with: plural morphemes, articles, quantifiers, adjectives, and other modifiers.

If it is true that the name is no longer just a name but also a predicate, we should be able to make a distinction between referential uses and attributive uses of descriptions which use names as predicates. Under normal circumstances, proper names can have only a referential use, but definite descriptions have both referential and attributive uses. For instance, in the following sentence, we can note both uses:

I always invite the coach to my parties.

In the attributive use, "the coach" refers to anyone who happens to be the coach, whatever year, say. In the referential use, "the coach" refers to a specific person who is the coach. In like manner, we can discern both an attributive use and a referential use in the following use of a proper name as a predicate:

I always invite the Albert Einstein of the freshman class.

There seem to be two readings: one where the description selects one specific individual (say, Mary Smith) who is the most scientifically or mathematically gifted in the freshman class, and one where the description selects whoever may be described with that attribute in any given year. This sentence is an example where the name, the generic concept of NAME, the individual core concept ALBERT EINSTEIN, and certain associated properties are activated in conjunction with the nominal operator. It is the associated properties which provide the meaning of the noun phrase the Albert Einstein.

Clark & Clark (1979) give a number of examples of proper names used as verbs; they are a subset of denominal verbs in general, like bottle or paint. They point out some recent innovations derived from proper names and contrast those with denominal verbs that are idioms, where the association with the proper name has been lost, like in the case of lynch or boycott. An example of a recent innovation is the use of Wayned in the sentence:

We all Wayned and Cagneyed--to buy breathing space from the guy who really did like to fight.

Clark & Clark argue that such innovations require the creation of entirely new meanings out of the concepts in memory. In contrast, the meanings of idioms like <u>boycott</u> must be listed in the lexicon, since there is no way to construct a meaning for them. Thus, for Clark & Clark, the listener's mode of inter-preting the innovation Wayned must be quite different from the mode of getting an interpretation for the idiom boycott. However, with the view expressed in this paper, that all meanings of words, including names, are constructed from the concepts stored in semantic memory and memory for particulars, the difference between innovations and idioms can easily be explained.

Names can combine with a nominal operator that allows for predicative uses of names. Likewise, innovative uses of proper names as verbs requires the activation of the name listed in the lexicon, the generic concept of NAME in semantic memory, the individual concept of the person in memory for particulars, and a verbal or relational operator OV. The meaning of the innovative denominal verb relies on the speaker's and listener's knowledge of the properties associated with the central core concept of the individual, but it is not a meaning that is newly created. On the other hand, idiomatic uses of verbs derived from names are cases where the knowledge of the individual has been lost, and the concepts that defined the verb (derived from the properties associated with the individual concept) are generic and stored in semantic memory.

To sum up, in looking at the memory structures underlying the meaning of names we find a way to account for the unmarked referential use of names, the extendibility of names to new individuals, the marked referential or attributive use of proper names as common nouns, and both innovative and idiomatic uses of proper names as verbs.

REFERENCES

Anderson, J.R. (1976) <u>Language, Memory and Thought</u>. Wiley, New York.

Anderson, J.R. and Bower, G.H. (1973) <u>Human Associative Memory</u>, Winston, Washington D.C.

Anderson, J.R. and Hastie, R (1974) Individuation and reference in memory: proper names and definite descrptions. <u>Cognitive Psychology</u> 6, 495-514.

Ashcraft, Mark H. 1989. Human Memory and Cognition. Glenview, IL: Scott, Foresman & Company.

Barsalou, Lawrence & Medin, Douglas. 1986. Concepts: static definitions or context-dependent representations? Cahiers de Psychologie Cognitive 6, 2, 187-202.

Barwise, J & Perry, J, (1983) Situations and Attitudes Cambridge, MA: MIT Press.

Birch, Barbara. 1988. The Psychology of Names, Nouns, and Verbs. Unpublished doctoral dissertation, University of Wisconsin, Madison, WI.

Bousfield, W.A. (1953) The occurence of clustering in the recall of randomly arranged associates. The Journal of General Psychology 49, 229-240.

Clark, H.H. and Clark, E. (1979) When nouns surface as verbs, Language 55, 4, pages 767-811.

Clark, H.H. and Marshall, Catherine (1981) Definite reference and mutual knowledge. Elements of Discourse Understanding, K. Joshi, B. Weber, and I.Sag. Cambridge, Cambridge University Press.

Cofer, Charles (1965) On some factors in the organizational characteristics of free recall. American Psychologist, April 1955. 261-272.

Cofer, C. and Bruce, D. (1965) Form-class as the basis for clustering in the recall of nonassociated words. Journal of Verbal Learning and Verbal Behavior 4, 386-389.

Devitt, Michael and Kim Sterelny, (1987) Language and Reality, MIT Press, Cambridge, MA.

Donnellan, K, (1986) Reference and Kripke's Puzzle about Belief. UW Department of Philosophy Colloquium. Oct. 31, 1986.

Dowty, D., Wall, R., and Peters, S. (1981) Introduction to Montague Semantics, Dordrecht, Holland: D.Reidel Publishing

Durso, F. and O'Sullivan, C. (1983) Naming and remembering proper and common nouns and pictures. Journal of Experimental Psychology: Learning, Memory and Cognition, 9, 497-510.

Erickson, T. and Mattson, M. (1981) From words to meanings: a semantic illusion. Journal of Verbal Learning and Verbal Behavior 20, 540-551.

Fodor, J. A. (1983) The Modularity of the Mind: an Essay on Faculty Psychology, Cambridge, MA: MIT Press.

Fodor, J.D. Fodor, J.A. and Garrett, M.F. (1975) The psychological unreality of semantic representations. Linguistic Inquiry, VI. 4, 515-531.

Frankel, F. and Cole, M. (1971) Measures of category clustering in free recall. Psychological Bulletin, 76, 1, 39-44.

Frege, Gottlob, (1967) On sense and reference, in Contemporary Readings in Logical Theory, ed. by Copi and Gould, New York, New York: Macmillan.

Fromkin, Victoria (1987) The lexicon: evidence from acquired dyslexia. Language 63, 1, 1-22.

Hockett, Charles. 1963. The problem of universals in language. Universals of Language, ed. by J. Greenberg. Cambridge, MA:MIT Press.

Johnson-Laird, Phillip (1983) Mental Models, Harvard University Press, Cambridge MA.

Kripke, S. (1972) Naming and Necessity, in Semantics of Natural Language, pp 253-355. ed. by Davidson, D. and Harman, G. Dordrecht, Holland: D. Reidel Publishing.

Lakoff, George (1974) Humanistic linguistics, in Linguistics: Teaching and Interdisciplinary Approaches, ed by Francis P. Dinneen, S.J. Georgetown Round Table on Languages and Linguistics.

Loftus, Elizabeth (1972) Nouns, adjectives, and semantic memory. Journal of Experimental Psychology, 96, 1, 213-215.

Macnamara, John (1984) Names for Things: A Study of Human Learning. MIT Press, Cambridge, MA.

Miller, G. (1983) Semantic relations among words, in Linguistic Theory and Psychological Reality, ed by Halle, Bresnan, and Miller, MIT Press, Cambridge, MA.

Miller, G. and P. Johnson-Laird (1976) Language and Perception. Harvard University Press, Cambridge, MA.

Partee, B. (1987) Noun phrase interpretation and type-shifting principles, in Studies in Discourse Representation Theory and the Theory of Generalized Quantifiers, ed. by Groenengijk, de Jongh, and Stokhof. GRASS 8, Dordrecht, Holland: Foris.

Partee, B. and Rooth, M. (1983) Generalized conjunction and type ambiguity, in Meaning, Use and Interpretation of Meaning, ed. by Bauerle, Schwarze, and von Stechow. Berlin: Walter de Gruyter, 361-383.

Roenker, D.L., Thompson, C., and Brown, S. (1971) Comparison of measures for the estimation of clustering in free recall. Psychological Bulletin, 76, 1, 45-48.

Rosch, E. (1974) Linguistic relativity, in Human Communication: Theoretical Explorations, Lawrence Erlbaum.

Russell, B. (1967) On Denoting, in Contemporary Readings in Logical Theory, ed. by Copi and Gould. New York, New York: Macmillan.

Tulving, E. (1962) Subjective organization in free recall on unrelated words. Psychological Review (July) 344-354.

Wickens, D.D. (1970) Encoding categories of words; an empirical approach to meaning. Psychological Review, 77, 1, 1-15.

A Logic of Descriptions and the Foundations of Principle-Based Grammars & Parsers

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Designing a parser based on a Government-Binding theoretic grammar is generally recognized to be an extremely hard problem. There are many sources of complexity to deal with, most of which raise issues of parsing efficiency which are of considerable interest to computational linguists, but not so often of much interest to the linguistics community at large. The system I will discuss here derives from questions of parsing efficiency, but I think it leads to some observations of interest to linguists in general. In particular it reveals a curious and unexpected kinship between GB grammars and the rewrite grammars of Formal Language Theory, and in doing so highlights some real differences.

To see why this should be unexpected, suppose we divide the grammar into two phases: structure generation and structure testing (that is, filtering, or licensing). GB Theory proposes a radical separation in principle between these two aspects of computing structural descriptions. Very little attention is paid to the first phase: structures are assumed to be freely generated. The whole content of the grammar lies in the second part, in designing the system of filters or licensing conditions which prune back the excesses of the free generator. Rewrite grammars go just the opposite way. It is in the nature of the 'rewrites-as' or 'derives' relation that every step of the derivation both generates new structure and tests it, just by virtue of having generated it.

The separation of the generate and test steps in GB Theory is one source of complexity in parsers which seek to implement the theory faithfully, since the time spent proposing and rejecting candidate structures can be immense. Various approaches have attempted to improve performance by interleaving the generate and test steps more closely, without materially altering the representation of the grammar. My own approach derives from this line of attack, and extends it, to the point where generate steps and test steps are fused, as in a rewrite grammar. In what follows I will describe a simple grammar formalism within which much if not all of standardly assumed GB principles can almost certainly be cast. Using this formalism I will be able to show a very close formal similarity between the 'licenses' relation of GB licensing conditions and the 'rewrites' or 'derives' relation of rewrite grammars. To the extent that this is possible, it minimizes the significance of the radical separation of generation from testing, and indeed suggests that GB grammars are objects much less unfamiliar to students of Formal Language Theory than they have long appeared.

I will call this formalism "Licensing Grammar". As the name suggests, I will make the assumption that the principles of GB are all in one way or another licensing conditions. The goal of the formalism is to give some rigor to the 'licenses' relation, and to see what can be made to follow from such a formulation.

Let us begin by defining a Licensing Grammar as a list of pairs (φ,ψ), as in (1), taking φ (the 'licensee') to be a logical expression describing a configuration to be licensed and ψ (the 'licensor') to be a logical expression describing the configuration in which it would be licensed.

(1) **Def'n**: a *Licensing Grammar* is a set of pairs (φ,ψ),
where φ describes the element to be licensed
(the *licensee*),
and ψ (the *licensor*) describes the configuration
within which φ is licensed.

For the time being I will not restrict what sort of objects φ and ψ can be, as long as they can be interpreted as descriptions of structural configurations written in some formal, logical language, and they can be taken to denote one or more (usually more) constituent structures. But keep in mind that the claim that GB can be represented in this way is stronger or weaker depending on the expressive power we allow to descriptions, and computational efficiency will vary inversely with that expressive power and directly with the strength of the claim.

Within this formalism we can define well-formedness as in (2).

(2) **Def'n**: $\mathrm{wf}(\Delta)$ iff $\forall(\varphi,\psi)\in G.\ ((\varphi\subseteq\Delta)\rightarrow(\psi\subseteq\Delta))$.

This formula is one way of expressing what we mean when we say "in order to be fully well-formed, a structural description must be fully licensed." The definition in (2) states that, given some structural description Δ, for all licensing conditions (φ,ψ) in a grammar G, if a licensee is found somewhere in the structure, then its licensor must be there as well.[1]

We can now define the naive parsing problem for Licensing Grammars as in (3). Given some predicate sd( ) which holds of all objects just in case they are syntactic structural descriptions, the problem is to find some object Δ which makes (3) true.[2]

(3) *The Naive Parsing Problem for Licensing Grammars*

$$\exists\Delta,\ sd(\Delta) \wedge wf(\Delta).$$

This shows clearly the radical separation of structure generation (the sd( ) predicate) from structure testing (the wf( ) predicate), and the relevant efficiency problems should be clear immediately: structures appear to be selected by sd( ) without any help from the grammar, which is all contained in the wf( ) predicate.

The formulation in (3) is of course far too simple-minded, and a fair number of much more sophisticated proposals are already in the literature (see in particular Stabler(1990), Fong (1989), and Johnson(1989)). The following approach is in many ways a descendant of these approaches, though the point of view may at first seem unfamiliar. The conception of licensing conditions in (1) leads immediately to the definition of a relation between descriptions, which I will write "$\Rightarrow$", defined as in (4).

(4) **Def'n**: Given descriptions Δ, Γ,[3] and a Licensing Grammar G,
$$\Delta \Rightarrow \Gamma \text{ iff } \exists(\varphi,\psi)\in G.\ (\varphi \subseteq \Delta) \wedge (\Gamma = (\Delta \cup \psi)).$$

That is, if we have a description Δ in which we find some configuration φ which needs to be licensed, then we can relate Δ to a new description Γ which contains everything in Δ and also the configuration in which φ is licensed. We can think of '$\Rightarrow$' as another way of expressing the licensing relation, or as a sort of ordering on structural descriptions, according to which Γ is 'more grammatical' than Δ.

The '$\Rightarrow$'-relation has obvious formal similarities to the 'rewrites' relation of Phrase Structure Grammars, if we consider that we can take an initial description Δ and rewrite it as Γ, approaching full well-formedness as we do so. Note that this definition allows for vacuous derivation when ψ is already in Δ; this will become relevant below.

We can now relate the notion of 'rewrites' in (4) to the notion of 'well-formedness' in (2), as in (5)

(5) **Claim**: $\mathbf{wf}(\Delta)$ iff $\forall\Gamma.(\Delta \Rightarrow \Gamma) \rightarrow (\Delta = \Gamma)$.

The claim is that a well-formed, that is, fully licensed description is one in which any more licensing which might apply would apply vacuously. The proof requires no more than to consider the two definitions, (4) and (2).

Using the derives relation we can now define another, related notion of well-formedness, namely 'derivable from the grammar'. I will use the symbol Σ to denote the start symbol of the grammar, that is, the description which describes all well-formed trees (a bare S node in the case of standard Context-Free Grammars). The symbol $\Rightarrow^*$ denotes the rewrites relation applied as many times as you like, that is, the reflexive transitive closure of the rewrites relation. $\mathcal{L}(G)$ is the tree-language generated by the grammar, that is, in a sense, the language which it strongly generates.

(6) **Def'n**: Given Δ, Σ, descriptions, and G, a Licensing Grammar
$\Delta \in \mathcal{L}(G)$ iff $\mathbf{wf}(\Delta) \wedge (\Sigma \Rightarrow^* \Delta)$.

The definition in (6) states that we consider Δ to be in the tree-language of the grammar just in case it is both well-formed and derivable from the initial state of the grammar. This is potentially stronger than the definition of $\mathbf{wf}()$ in (2), since it is in principle possible for a description to contain things which are never related to the grammar, and hence never need to be licensed. However, for grammars like GB which are concerned to rule out such extra-grammatical, unlicensed elements in the statement of the grammar itself, these two definitions, of $\mathbf{wf}()$ and of $\mathcal{L}(G)$, should be equivalent.

We can now apply (5), and say as in (7) that Δ is in $\mathcal{L}(G)$ if it is as far away from Σ as we can get by means of the 'derives' relation.

(7) $\Delta \in \mathcal{L}(G) \text{ iff } (\Sigma \Rightarrow^* \Delta) \wedge \forall\Gamma\, (\Delta \Rightarrow \Gamma) \rightarrow (\Delta = \Gamma)$.

So now we have a characterization of well-formedness solely in terms of derivations from a licensing grammar. As with more familiar rewrite systems, every step of the derivation uses knowledge in the grammar to guide structure generation, even though the statement of the grammar remains a purely declarative system of licensing conditions.

Now, in the remainder of this paper, I would like to look at licensees and licensors, and introduce one detailed formalism for expressing them. Note that it will not be possible in the scope of this paper to introduce a system adequate to serious grammatical work. However, the intuitions behind this simpler system carry over into the more powerful system, so that the flavor of this research should come through. The particular description system I have in mind is a logical language whose predicates express aspects of syntactic structures. The description language combines some ideas from Marcus' D-Theory (Marcus, Hindle & Fleck 1983) with some elements of the Kasper-Rounds Logic for feature structure representations (Kasper 1987; Kasper & Rounds 1986; Moshier & Rounds 1987).

Descriptions, according to my loose definition of the previous section, are expressions which we can think of as denoting sets of our more familiar constituent structures. Not that we normally only thing of constituent structures as well- or ill-formed in any linguistically relevant sense. Therefore, in order to say what might be meant by 'grammaticality' as it applies to descriptions, it is necessary to offer some sort of logical semantics for descriptions in terms of constituent structures, so that we can see what descriptions 'mean', and hence what a 'grammatical' description might be. Therefore we take completed constituent structures as the individuals in a domain of reference, and the descriptions which are derived from the grammar as logical formulae, which individuals may or may not satisfy. This is roughly the approach which Kasper & Rounds use in constructing a logic for feature structure representations.

The formalization of the 'syntactic individuals' which I use is based on the axiomatization of constituent structure trees in Rodman (1977), itself based on McCawley (1968), and the axioms which I adopt are also very close to those presented by Lasnik &

Kupin (1977). The treatment of features in constituent structures follows Kasper-Rounds Logic pretty closely. Kasper-Rounds Logic has been by now fairly well studied, and is completely formalized, so I will talk less about issues concerning the features of nodes. Marcus et al.'s D-Theory has never been formalized, to the best of my knowledge, so my effort will be concentrated there.

Consider the general class of structures, called Labeled Cross-Ordered Structures, defined as in (8). We will take as members of our domain of reference, that is as 'syntactic individuals,' only those Labeled Cross-Ordered Structures which meet the axioms which follow in (9-12)

(8) **Def'n**: *Labeled Cross-Ordered Structures*

A *labeled cross-ordered structure* is a tuple $\langle N, \mathbf{D}, \mathbf{P}, \mathcal{I}, f \rangle$ such that:

- N is a finite set of objects (interpreted as "nodes"),
- **D** is a strict partial ordering of N (interpreted as "dominates"),
- **P** is a strict partial ordering of N (interpreted as "precedes");
- $\mathcal{I}$ is a Feature Structure Interpretation, i.e. a triple $\langle I, S, A \rangle$, where
  - I is a finite set of nodes, and $I \cap N = \emptyset$,
  - $S{:}I \rightarrow$ Values (interpreted as the value of a feature),
  - $A{:}(I \times \text{Attributes}) \rightarrow I$ (interpreted as attribution of a feature to a node in I);
- $f{:}N \rightarrow I$ (the labeling function).

The two orderings of N must meet the standard conditions on strict partial orders, that is, they are irreflexive, asymmetric and transitive. Furthermore the orderings' interaction is regulated in a specific way, namely that for any pair of nodes, they must be ordered with respect to each other somehow (the "Exhaustive Cross-Ordering Condition"), and they must not be ordered with respect to each other in more than one way (the "Exclusive Cross-Ordering Condition"). That is, every node is related to every other node in exactly one way. Also, the representation must be <u>rooted</u>. That is, there must be a unique greatest element in the dominance order. Finally, within the dominance order, immediate dominators must be unique, that is, a node cannot have more than one mother. This does not hold of the precedence order.

(9) The **D** (dominates) and **P** (precedes) relations are *irreflexive*, *asymmetric*, and *transitive*.

For ρ equals either **D** or **P**,
(i) Irreflexivity: $(\alpha,\alpha) \notin \rho$.
(ii) Asymmetry: $(\alpha,\beta) \in \rho \rightarrow (\beta,\alpha) \notin \rho$.
(iii) Transitivity: $\{(\alpha,\beta),(\beta,\gamma)\} \subseteq \rho \rightarrow (\alpha,\gamma) \in \rho$.

(10)(a) *Exhaustive Cross-Ordering*

For every pair of nodes α & β *at least one* of the following holds:

$(\alpha,\beta) \in \mathbf{D}, (\beta,\alpha) \in \mathbf{D}, (\alpha,\beta) \in \mathbf{P}, (\beta,\alpha) \in \mathbf{P}$.

(b) *Exclusive Cross-Ordering*

For every pair of nodes α & β *at most one* of the following holds:

$(\alpha,\beta) \in \mathbf{D}, (\beta,\alpha) \in \mathbf{D}, (\alpha,\beta) \in \mathbf{P}, (\beta,\alpha) \in \mathbf{P}$.

(cf. McCawley's Axiom 5; Rodman's C3; Lasnik & Kupin's ex. (9))

(11) *Rootedness*

There is a node $\top \in \mathrm{N}$ such that for all $\mathrm{x} \in \mathrm{N}$, distinct from $\top$, $\top$ dominates **x**:

$\exists \top \in \mathrm{N}.(\forall \mathrm{x} \in \mathrm{N}.(\top,\mathrm{x}) \in \mathbf{D})$

(cf. McCawley's Axiom 1; Rodman's C1; cf. also Lasnik & Kupin ex. (9))

(12) *Tree Condition*

Least ancestors are unique in **D**. That is, α immediately dominates β iff

$(\alpha,\beta) \in \mathbf{D}\ \&\ \forall \mathrm{x} \neq \alpha.(\,(\mathrm{x},\beta) \in \mathbf{D} \leftrightarrow (\mathrm{x},\alpha) \in \mathbf{D}\,)$.

(cf. Rodman's C2, McCawley's Axiom (3). This also follows roughly from Lasnik & Kupin's definition of *dominates* (p.176), and their axioms (ex.9, p.177).)

From these axioms the essential properties which we think of as defining constituent structure trees can be proven. Thus we can see that these structures have the generally convergent, 'triangular' shape we want trees to have. No branches may cross and each node dominates a continuous substring of the terminal elements, so the nodes of the tree do indeed define objects we might want to think of as grammatical constituents. Also it can be shown that a node's descendants will inherit that node's precedence properties. This is another aspect of what we might think of as the integrity or discreetness of constituents, which underlies our ability to treat them as well-defined objects of inquiry.

Turning to the description language, we have four basic predicates, which hold, or fail to hold, of trees. The first (14a: $\alpha \sqsupset \beta$) expresses the dominance relation between nodes. The second (14a: $\alpha < \beta$) analogously expresses their precedence relations. The third (14b: $\mathbf{v}$:a) associates a feature with a value. The fourth (14c: $\mathbf{v} \doteq$ v) expresses feature equality between two nodes, as perhaps in agreement relations, or in co-indexing. For the time being, we take a description to be a set of such formulae, interpreted as their logical conjunction.

(13) **Def'n**: Basic Vocabulary of the Description Language

- (a) Constants: Nodes, Attributes, Values
  (Nodes arbitrary, Attributes & Values according to one's theory of categories.)
- (b) Paths = $\langle N \times \text{Attributes}^* \rangle$
- (c) 2-Place Predicate Symbols = $\{\sqsupset, <, :, \doteq\}$

(14) **Def'n**: Formulae of the Description Language $\mathfrak{D}$

- (a) $(\alpha \sqsupset \beta)$, $(\alpha < \beta)$ are wffs of $\mathfrak{D}$, for $\alpha, \beta \in$ Nodes,
- (b) ($\mathbf{v}$:a) is a wff of $\mathfrak{D}$, for $\mathbf{v} \in$ Paths, a $\in$ Values,
- (c) ($\mathbf{v} \doteq$ v) is a wff of $\mathfrak{D}$, for $\mathbf{v}$,v $\in$ Paths,

(15) **Def'n**: Descriptions

A *description* is a set of description-language formulae.

This basic vocabulary is sufficient for describing constituent structures. Given our formalization of constituent structure tree, the 'satisfies', or 'describes' relation will hold between a description and some individual constituent structure just in case the conditions in (16) hold.

(16) *The 'Describes' Relation.*

For $T = \langle N, \mathbf{D}, \mathbf{P}, \mathcal{I}, f \rangle$ (a tree),

(a) $T \models (\alpha \sqsupset \beta)$ iff $\{\alpha, \beta\} \subseteq N$ & $(\alpha, \beta) \in \mathbf{D}$.

(b) $T \models (\alpha < \beta)$ iff $\{\alpha, \beta\} \subseteq N$ & $(\alpha, \beta) \in \mathbf{P}$.

(c) $T \models (\langle \alpha, \mathbf{v} \rangle : \mathrm{a})$ iff $\alpha \in N$ & $S(A(f(\alpha), \mathbf{v})) = \mathrm{a}$.

(d) $T \models (\langle \alpha, \mathbf{v} \rangle \doteq \langle \beta, \mathrm{v} \rangle)$ iff $\{\alpha, \beta\} \subseteq N$ & $A(f(\alpha), \mathbf{v}) = A(f(\beta), \mathrm{v})$.

(e) For a description Δ, $T \models \Delta$ iff $\forall \varphi \in \Delta . T \models \varphi$.

It should be clear that the relation between constituent structure trees and descriptions is quite tight. Indeed, using our formalism for constituent structures, it is quite easy to prove that descriptions inherit most of the properties of trees, in the sense that they are only satisfiable if they have analogs of most of the properties which hold of trees. However, in order to guarantee satisfiability, it is not necessary for descriptions to be rooted, nor do the immediate ancestors of description-nodes need to be unique, nor do the ordering statements (either dominance or precedence) need to be exhaustive, as long as they are exclusive.

Another way of looking at the relation between descriptions and the trees they describe is given in (17).

(17) For Δ a description, $[\![\Delta]\!] = \{T : T \models \Delta\}$.

From this it is easy to verify that descriptions are rightly so-called, in that the more detail we add to a description, the fewer objects it refers to.

(18) For Δ, Γ descriptions, $\Delta \subseteq \Gamma \rightarrow [\![\Gamma]\!] \subseteq [\![\Delta]\!]$.

The formalism as presented is incomplete. It bears a relation to the full calculus of descriptions much like the relation between the propositional calculus and first-order logic. Nonetheless the basic observation should have been made at least plausible, that the 'licenses' relation is not formally so different from the 'rewrites' or 'derives' relation.[4] Thus the distinction between a grammar of rules and one of licensing conditions may be largely rhetorical. There are however significant distinguishing properties of GB-style principles which emerge once we look at them in this way. In particular, in standard string-rewrite grammars there is a 1-to-1 relation between rules and constituents. The relation between GB principles and constituents is many-to-many, owing to the non-construction-specific nature of those principles. In terms of this formalism, it takes several licensing steps to determine any particular constituent, and any particular licensing condition will contribute to numerous types of constituents. This is a distinction concerning not the form of principles, perhaps, but their content, and has to do with the way in which the grammar describes trees, and not in the way in which the description of trees relates to their generation. This distinction has, I believe, profound consequences for parsing, and also for the way in which GB-style grammars model human parsing, and it is to these problems, given a solid mathematical foundation and a clear grasp of the true versus the rhetorical problems, that we are now prepared to turn.

Notes

1 Note that it is not strictly accurate to use the subset relation to express "φ is present in Δ", though it is close enough at an intuitive level so as not to mislead us. It is accurate for the system presented here, essentially a sort of propositional calculus, but a more powerful system is required to express interesting grammars, closer to a restricted First Order Logic. That is, in order to express grammars of any interest, it is necessary to introduce variables, so that 'subset' becomes 'subset under a particular substitution for variables'. And to express GB, at least one 'pseudo-quantifier' is necessary which expresses, for some sub-description with free variable x, the minimal x such that that sub-description is in the full description. In an actual implementation the closeness of this 'found in' relation to the subset relation presumably has an inverse effect on complexity.

2 In the case of a GB grammar, a structural description would actually be a set of three or four constituent structure trees, with referential indexings, which correspond at least to s-structure, d-structure and logical form. The structure corresponding to phonological form might or might not be syntactically relevant. If not, then we would take PF to be the string of phonologically realized elements of s-structure. So we would either have '$\exists$

DS,SS,LF,PF, sd(DS,SS,LF)$\wedge$wf(DS,SS,LF,PF)' or '$\exists$ DS,SS,LF,PF, sd(DS,SS,LF,PF)$\wedge$wf(DS,SS,LF,PF)'. For my purposes in this paper, we can just think of sd() as picking out trees.

[3] Note that I have not actually offered a formal definition of description, except that it should be an expression in a formal, logical language, which can be interpreted in one or more ways as a constituent structure.

[4] At least within a strictly configurational theory of grammar. If the grammatical relations on which licensing depends are not ulitmately computed from basic constituent structure, then constituent structure cannot be recovered from licensing conditions in the way outlined here. If there are non-configurational languages, which instantiate some or all of the grammatical relations (thematic relations, binding, etc.) in some system other than constituent structure, it might still be possible to recover that other system in the way discussed here, but obviously the details of the description language would have to be very much altered.

References

Barton, G.E. & R.C. Berwick (1985). Parsing with assertion sets and information monotonicity. *Proceedings of IJCAI-85.*

Berwick, R.C. (1987). *Principle-based parsing.* MIT, AI Tech. Report 972.

Fong, S. (1989). A principle-ordering parser. In Tenny, C., ed. *MIT Parsing Volume 1988-1989.* Center for Cognitive Science, MIT.

Johnson, M. (1988). *Attribute-Value Logic and the Theory of Grammar.* CSLI, Stanford, CA.

Johnson, M. (1989). Parsing as deduction: the use of knowledge of language. *J. Psycholinguistic Rsrch. 18,* No. 1, pp. 105-128.

Kasper, R.T. (1987). Feature Structures: A Logical Theory with Application to Language Analysis. Univ. of Michigan, Ann Arbor Ph.D. dissertation.

Kasper, R.T. & W.C. Rounds (1986). A Logical Semantics for Feature Structures. *Proceedings of the 24th Annual Meeting of the ACL.*

Marcus, M.P., D. Hindle & M.M. Fleck (1983). D-Theory: Talking about talking about trees. *Proceedings of the 21st Annual Meeting of the ACL.*

Moshier, M.D. & W.C. Rounds (1987). A Logic for Partially Specified Data Structures. *Proceedings of ACM Symposium on the Principles of Programming Languages.*

Stabler, E.P., Jr. (1989). The Logical Approach to Syntax: Foundations, Specifications and Implementations of Theories of Government and Binding. Ms. Univ. of Western Ontario & UCLA.

Stabler, E.P., Jr. (1990). Relaxation Techniques for Principle-Based Parsing. To appear in the Proceedings of the Geneva Workshop in GB Parsing.

ON FLOATING CONSONANTS IN FRENCH

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1. Introduction

This paper is concerned with latent consonants in French, more recently also called floating consonants. The characteristic property of latent consonants is that they are realized before vowel-initial words only, and never before consonant-initial words or phrase finally. This is illustrated under (1) and (2):

1)	chez_eux	'with them'	[ʃezφ]
	petit_ami	'little friend'	[pətiṭami]
	il est_allé	'he has gone'	[ilɛṭale]
	jeux_olympiques	'Olympic Games'	[ʒφzolɛ̃pik]
2)	chez / lui	'with him'	[ʃelɥi]
	petit / rat	'litte rat'	[pətira]
	il est / parti	'he has left'	[ilɛparti]
	jeux / bizarres	'bizarre games'	[ʒφbizar]
	il est petit	'he is small'	[ilɛpəti]

In the first example under (1), chez 'with' is a word ending in a latent consonant: this latent consonant is pronounced, because the following word, eux 'them', is vowel-initial. Hence, chez eux 'with them' is pronounced as [ʃezφ]. In the first example under (2), however, chez is followed by a consonant-initial word, so chez lui 'with him' is pronounced as [ʃelɥi], that is, without phonetic realization of the latent consonant.

Not all word-final consonants in French are floating, as is illustrated under (3):

3)	avec elle	'with her'	[avɛḳɛl]
	avec lui	'with him'	[avɛklɥi]
	perte importante	'important loss'	[ynpɛrṭɛ̃pɔrtɑ̃t]
	c'est une perte	'it is a loss'	[sɛtynpɛrt]

The final /k/ of the preposition avec 'with' is always pronounced, both before vowel-initial (as in (3a) and (3c)) words and before consonant-initial words (as in (3b) or phrase-finally (3d)).

Though latent consonants and non-latent consonants are different in that the former are realized before vowel-initial words only, both types of consonants also share a property, which is that they are both (re)syllabified to the onset of the following word. This is illustrated by means of the parentheses in the transcriptions under (4) for latent consonants. and under (5) for non-latent consonants:

4)	chez_eux	'with them'	[(ʃe)(zɸ)]
	petit_ami	'little friend'	[(pe)(ti)(ta)(mi)]
	il est_allé	'he has gone'	[(i)(lɛ)(ta)(le)]
	jeux_olympiques	'Olympic Games'	[(ʒø)(zo)(lɛ̃)(pik)]
5)	avec elle	'with her'	[(a)(vɛ)(kɛl)]
	petite rate	'little rat'	[(pə)(ti)(trat)]
	avec Léo	'with Leo'	[(a)(vɛ)(kle)(jo)]

More recently, Encrevé (1983, 1988) has observed that latent consonants in French do not always syllabify to the next word: in the formal French of some people (especially in the radio and TV discourses of politicians), latent consonants are optionally syllabified as coda-consonants. This also holds good for word-final non-latent consonants (Encrevé 1988: 173). Leftward syllabification of latent consonants is illustrated under (6):

6)	j'avais_un rêve	'I had a dream'
	[(ʒa)(vez)(ɛ̃)(rɛv)]	
	qui sont_en vérité	'which are in reality'
	[(ki)(sɔ̃t)(ɑ̃)(ve)(ri)(te)]	
	il faut_encourager	'one must encourage'
	[(il)(fot)(ɑ̃)(ku)(ra)(ʒe)]	
	il est_inscrit	'he is inscribed'
	[(i)(ɛt)(ɛ̃)(skri)]	

So, for instance, the latent /z/ of avais in (6a) is not syllabified as (j'avais) (z-un rêve), but rather as (j'avais-z) (un rêve). Envrevé observes that in most of these cases, leftward syllabification is accompanied by glottal stop insertion before the vowel of the word which triggered liaison. He also observes that leftward linking occurs only in contexts where liaison is optional, and never in contexts where it is obligatory.

A final fact about liaison is that some phonetically vowel-initial words block liaison. This concerns the so-called h-aspiré words, illustrated under (7):

7)	les / haricots	'the beans'	[leariko]
	un petit/Hollandais	'a little Dutchman	[ɛ̃pətiolɑ̃dɛ]
	un / héros	'a hero'	[ɛ̃ero]

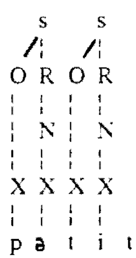
For instance, in the second example under (7), petit Hollandais 'little Dutchman' is pronounced as [pətiolɑ̃dɛ] without liaison, and not as *[pətitolɑ̃dɛ] with liaison. This implies that French not only has two types of word-final consonants (latent and non-latent), but also two types of vowel-initial words: those triggering liaison, and those blocking liaison.

A first problem is how to distinguish between latent and non-latent consonants. Within the framework of non-linear phonology, it has been proposed that latent consonants be represented as floating consonants, in a way very similar to floating tones (see Goldsmith 1990). Two different models have been proposed for the representation of floating consonants. The first model to be examined here is similar (but not completely identical) to the one defended in Prunet (1986), whereas the second one is that of Encrevé (1988). The goal of this paper is to examine these two models.

2.1 Word-final consonants and empty onsets

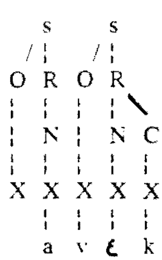
The first way of representing floating consonants is illustrated under (8) for petit 'little':

8)



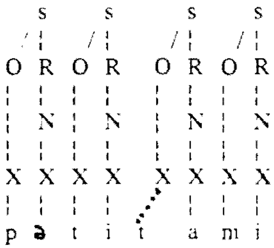
In representation (8), the floating, word-final /t/ has no skeleton position. It is untimed, and therefore also unsyllabified. This contrasts with word-final non-floating or 'fixed' consonants, illustrated under (9):

9)



Representation (9) illustrates the way in which the word-final fixed consonant of the preposition avec is represented: as any other non-floating consonant, it is associated to a skeleton position, and it is also normally syllabified. Representation (9) also illustrates the way in which the onsets of vowel-initial words are represented. Following claims made among others in Kaye & Lowenstamm (1984) and Lowenstamm & Kaye (1986), syllables obligatorily consist of an onset and a rime. For vowel–initial words, however, no consonant is available for the word–initial onset. In the absence of a word–initial consonant, the onset of the word–initial syllable is said to remain empty. Usually, the empty onset node dominates a skeleton position, as in (9). The role of this skeleton position is to trigger liaison. That is, when such a vowel–initial word is preceded by a word ending in a floating consonant, the floating consonant automatically associates to it. This is illustrated under (10) for petit ami 'little friend', where the dotted line indicates the association of the floating /t/ of petit to the skeleton position of the empty onset of ami:

10)

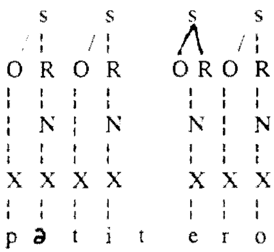


This association does not have to be stipulated separately in the grammar of French, because it follows automatically from one of the most basic assumptions of autosegmental phonology, namely the Association Convention.[1]

2.1.1 /h/–apiré words

As said above, French also has a set of vowel–initial words which block liaison. This can be very simply accounted for in this model when it is assumed that these words simply lack a skeleton position in their word–initial onset.[2] This is illustrated under (11) for petit héros 'little hero':

11)

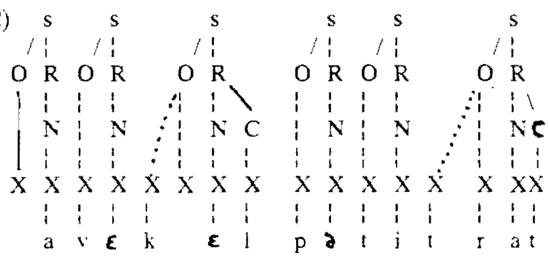


The word héros is a word blocking liaison. It has no skeleton position in its word-initial onset, so when it is preceded by a word like petit. the floating /t/ has nothing to associate to, it cannot be timed, and is deleted by the end of phonological derivation.

2.1.2 Enchaînement[3]

With respect to fixed consonants, their association to the first onset of the following word is not a matter of timing, but rather of resyllabification.[4] It can be accounted for by the Well-Formedness Conditions (WFCs) on syllable structure of French. That is, when resyllabification of a fixed consonant across a word-boundary yields a well-formed syllable, resyllabification will occur. This is illustrated under (12) for avec elle 'with her' and petite rate 'little rat':

12)



The example on the left shows resyllabification before a vowel-initial word. The example on the right shows that resyllabification of fixed consonants is also possible before consonant-initial words, when this yields a well-formed syllable.[5] This clearly illustrates the difference between fixed and floating consonants: the former become part of the onset of the following word because the WFCs on syllable structure allow for it; the latter become part of the following word, because they associate to a skeleton position made available by the onset of the following word. That is, enchaînement is triggered by the WFCs on syllable structure, whereas liaison is triggered by the Association Convention.

2.2 An alternative account

The principal difference between the preceding representation of floating consonants and that proposed by Encrevé (1988), is that the latter argues that every floating consonant is accompanied by a floating skeleton position, as in (13):

```
13)  O R O R        O R O R
     | | | |          | | |
     | N | N C        N | N
     | | | |          | | |
     X X X X X        X X X
     | | | |          | | |
     p ə t i t        a m i
```

In this model, floating consonants have their own skeleton position, whereas empty onsets usually lack such a position. Liaison, then, is defined as the association of a floating consonant to its own skeleton position: Encrevé (1988: 179) formulates a separate condition that this happens before vowel-initial words only. After association of the floating consonant to its own skeleton position, this skeleton position is assumed to usually syllabify rightward to the following, available onset node (Encrevé 1988: 186).

2.3 Comparison of the models

Prunet's account has the advantage that it very nicely illustrates the "No Rules Approach", which has become increasingly popular in the past decade. Liaison follows entirely from a single condition on representations, the Association Convention. Though Encrevé also advocates the "No Rules Approach", his account seems to be less straightforward in that it has to be explicitly stated that a floating consonant associates to its own skeleton position before vowel-initial words only. Such a condition has to be stated, because the skeleton position is available before consonant-initial words as well, as is illustrated by the following example:

```
14)  O R O R      O R
     | | | |      | |
     | N | N C    | N
     | | | |      | |
     X X X X X    X X
     | | | |      | |
     p ə t i t    r a
```

According to the Association Convention, the floating /t/ is expected to associate to its own, available skeleton position. This never happens, which is the very reason why Encrevé has to formulate the condition that association takes place before vowel-initial words only. This immediately raises the question why this would be so. Encrevé appeals to the Obligatory Contour Principle (henceforth OCP) to answer this question. He observes that the association of floating consonants is blocked before consonant-initial words. Encrevé (1988: 179–80) makes this follow from the OCP, which he formulates as follows (Encrevé 1988: 165):

15) Obligatory Contour Principle
On an autosegmental tier, for every pair of adjacent autosegments a and b, a is different from b.

Following McCarthy (1986), Encrevé (1988: 167) assumes that the OCP is a constraint on derivations; he furthermore argues that the OCP not only operates morpheme internally (as is maintained by McCarthy 1986), but can also operate at the juncture of words. In that case, the fact that floating consonants cannot be associated to their own skeleton position before consonant-initial words, follows from the OCP, because such an association would imply the creation of a [+Cons][+Cons] sequence. Under the assumptions made by Encrevé, the OCP forbids the creation of such sequences.

However, a problem for Encrevé's OCP based analysis of liaison is that the association of floating consonants is not only blocked before consonant-initial words, but also phrase finally (cf. the last example under (2)). This cannot be explained via the OCP, because phrase finally there is no [+Cons] segment which can block the association of the floating consonant to its own skeleton position. This seriously flawes Encrevé's model. His condition on liaison can at most be partially motivated by the OCP, which means that the condition on liaison is arbitrary as compared to Prunet's solution. In fact, it closely resembles to a rule, or a paraphrase of a rule, which, in a 'No Rules Approach' is unacceptable.

3. Liaison with Leftward Syllabification (LLS)

A final aspect to account for is LLS. In Encrevé's model, liaison invariably begins with the timing of a floating consonant to its own skeleton position before vowel-initial words only. The next step, however, may vary. Syllabification is usually rightward (to the following onset), but may also be leftward (as a coda consonant). This can easily be accounted for in Encrevé's model. In the case of forward syllabification, the skeleton position to which the floating consonant has associated, associates to the immediately following, available onset node; in the case of leftward syllabification, it associates leftward to the preceding, available rime node. An advantage of Encrevé's model is that LLS is accounted for in a quite straightforward fashion. The goal of section 3.1 is to show that LLS can equally well be accounted for in the model developed in section 2.1 above (see Prunet (1986: 135-41) for another solution).

3.1 An alternative account

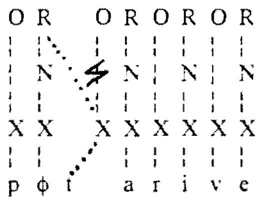
A first thing to be realized is that liaison consists in two processes: timing and syllabification. LLS concerns the second aspect only: LLS has to do with the syllabification of word-final consonants in French. Therefore, it seems quite natural to formulate a well-formedness condition which says that in formal French of some people word-final, timed consonants can be syllabified leftward. This condition is a well-formedness condition on the syllable structure of formal French. Under (16) it is formulated in a preliminary version:

16) Word-final Consonant Syllabification (Formal Style)
Word-final timed consonants are realized as coda consonants.

Thus, we can account for LLS in the following way. First, the Association Convention links the floating consonant to the following empty onset (as in (10)). In formal French, this leads to a violation of condition (16). A repair strategy is triggered, which delinks the skeleton position to which the floating consonant had been associated, and, in accordance with condition (16), it reassociates to the final rime node of the first word.

This can be illustrated as follows for peut arriver:

17)



According to the Association Convention, the final /t/ of peut first links to the available skeleton position. This is in formal French a violation of condition (16), which forbids syllabification across word-boundaries. A repair strategy is triggered, which delinks the skeleton position to which the word-final /t/ had been associated and associates it leftward to the preceding rime-node.

Condition (16) also accounts for the leftward syllabification of fixed consonants, because it simply blocks rightward syllabification in formal speech. It must be noted, that after the leftward linking of both fixed and floating consonants, we end up with an empty onset node. This empty onset node nicely accounts for the fact that leftward linking is often accompanied by the presence of a glottal stop in the onset of the following word. Glottal stop insertion follows from the Empty Structure Principle which Encrevé (1988: 198) formulates as follows:

18) Empty Structure Principle
A prosodic constituent which has remained without phonetic interpretation after application of all association conventions, can be phonetically filled in by epenthesis of a segment.

Encrevé (1988: 185) furthermore considers the glottal stop as the default epenthetic consonant of French:

19) Convention on epenthetic segments

In French, the unmarked epenthetic consonant is [?], the unmarked epenthetic vowel is schwa.

Conditions (16), (18) and (19) account for LLS. Nevertheless, one more aspect has to be accounted for, which is Encrevé's observation that LLS occurs exclusively in contexts where liaison is optional, and never in contexts where it is obligatory.

3.2 The domains of LLS

I have argued elsewhere (in De Jong 1990), that liaison is obligatory within the Clitic Group (also called Prosodic Word). Clitic Groups mainly consist of a clitic (or a sequence of clitics) and a following word. Some examples are given under (20). In all of these examples, the word ending in an (underlined) floating consonant is in the same clitic group (henceforth CG) as the following word:

20)a. mon ancien patron 'my former boss' [mɔnɑ̃sjɛ̃patrɔ̃]
b. leurs amis 'their friends' [lœrzami]
c. ils en ont parlé 'they have talked about it' [ilzɑ̃nɔ̃parle]

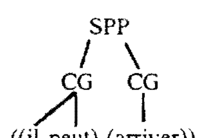
So if indeed Encrevé's observation is correct that LLS is excluded in contexts of obligatory liaison, this means that LLS cannot occur within the Clitic Group.

I have also argued (in De Jong 1990) that liaison is optional in the larger prosodic domain of the Small Phonological Phrase (henceforth SPP). An SPP can consist, among others, of a preposition, a perfective auxiliary or a modal auxiliary followed by something else.[6] This is illustrated under (21):

21)a. c'est affolant 'it is bewildering' [sɛtafɔlɑ̃]
b. ils doivent accepter 'they must accept' [ildwavtaksɛpte]
c. il peut arriver 'it may happen' [ilpøtarive]

In all of the examples under (21), the word ending in a floating (underlined) consonant is in a single SPP with the following word. Within this domain, liaison is optional. It must be noted that an SPP may consist of two (or more) CG's, as is illustrated under (22):

22)



In this example, il and peut are in a single CG, and arriver is in another. Both CG's are on the next higher level dominated by an SPP-node, which delimits a domain of optional liaison. So in fact optional liaison occurs between two CG's which are both dominated by an SPP-node. LLS occurs only in contexts of optional liaison. This means that LLS affects floating consonants which are CG-final. So condition (16) has to be reformulated as (23):

23) CG-final Consonant Syllabification (formal speech)
Timed CG-final consonants are realized as coda consonants.

(23) accounts for the leftward syllabification of both fixed and floating consonants. With respect to CG-final fixed consonants, they enter post-lexical phonology as timed coda consonants.[7] Normally, they are resyllabified to the onset of the following word when the WFCs of French allow for it. In formal speech, resyllabification between CG's is blocked, so there fixed consonants simply remain coda consonants. With respect to CG-final floating consonants, they are first timed; when timing takes place within a CG, nothing else will happen; if, however, timing takes place between two CG's dominated by an SPP-node, (23) will delink the skeleton position to which the floating consonant had associated, and will re-associate it leftward to the preceding rime node. The remaining empty onset node is optionally filled in by a glottal stop, according to (18) and (19).

NOTES

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1. See section 3.2, and especially De Jong (1990) for a discussion of the syntactic / prosodic domains within which a floating consonant can associate to the skeleton position of a following empty onset.

2. This position is somewhat different from Prunet (1986: 48-9), who, following Piggott & Singh (1985: 431-3), posits an empty segment for representing the /h/-aspiré.

3. Prunet (1986) makes no claims on enchaînement.

4. See Wetzels (1987: 302-3) for further discussion of this point.

5.In this paper, I assume that enchaînement is a matter of resyllabification and coda-erasure (see Rubach & Booij 1990ab). It may also be that coda syllabification takes place only in the post-lexical phonology (see Rice 1990), in which case enchainement is not a matter of resyllabification, but rather of postlexical syllabification.

6. For formal parsing statements of the CG and the SPP, see De Jong (1990: 78-82).

7.Cf. however footnote 4 of this paper.

References

De Jong, D. (1990). 'The syntax-phonology interface and French liaison'. Linguistics 28. Pp.57-88.

Encrevé, P. (1983). 'La liaison sans enchainement'. Actes de la recherche en sciences sociales 46. 39-66.

Encrevé, P. (1988). La liaison avec et sans enchaînement. Paris: Le Seuil.

Goldsmith, J. (1990). Autosegmental and Metrical Phonology. Oxford & Cambridge, Mass.: Blackwell.

Kaye, J. & J. Lowenstamm (1984). 'De la syllabicité'. In: F. Dell, D. Hirst & J.-R. Vergnaud (eds.). Forme sonore du langage. Paris: Hermann. Pp.123-159.

Lowenstamm, J. & J. Kaye (1986). 'Compensatory lengthening in Tiberian Hebrew'. In L. Wetzels & E. Sezer (eds.). Studies in Compensatory Lengthening. Pp.97-132.

McCarthy, J. (1986). 'OCP effects: gemination and anti-gemination'. Linguistic Inquiry 17. Pp. 207-263.

Piggott, G. & R. Singh (1985). 'The phonology of epenthetic segments'. Canadian Journal of Linguistics 30: 415-451.

Prunet, J.-F. (1986). Spreading and Locality Domains. Ph.D. Thesis. Montréal: McGill University.

Rice, K. (1990). 'Predicting rule domains in the phrasal phonology'. In: S. Inkelas & D. Zec (eds.). The Phonology-Syntax Connection. Chicago and London: University of Chicago Press. Pp. 289-312.

Rubach, J. & G. Booij (1990a). 'Syllable structure assignment in Polish'. Phonology 7. Pp.121-158.

Rubach, J. & G. Booij (1990b). 'Edge constituent effects in Polish'. Natural Language and Linguistic Theory 8. Pp.427-463.

Selkirk, E. (1986). 'On derived domains in sentence phonology'. Phonology Yearbook 3.

Wetzels, L. (1987). 'The timing of latent consonants in modern French'. In: C. Neidle & R. Nunez Cedeno (eds.). Studies in Romance Languages. Dordrecht: Foris. Pp.283-317.

Sub X^{o} Saturation: the Case of Italian Deverbal Compounds[1]

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0. Introduction

This paper examines the argument properties of deverbal compounds and shows how they follow from the theory of grammar. The proposed analysis contrasts in spirit with the tradition in the analysis of deverbal compounds, be it transformational or lexical, in that no additionnal constraint is required for their analysis.

1. English deverbal compounds

Several constraints have been proposed in the past to account for the properties of English deverbal compounds (the First Sister Principle (Roeper and Siegel 1978), the Argument Linking Principle (Lieber 1983), the First Order Projection (Selkirk 1982), the Constraint on the Projection Principle (Sproat 1985)). Basically, they insure that the internal argument of the verb is saturated within the compound and exclude the external argument from saturation inside. However, a close look reveals that the compound specific constraint approach is not desirable.

The constraints correctly account for the fact that compounds such as (1a), where the internal argument is incorporated, are well-formed, whereas compounds such as (1b), where the external argument is incorporated, are excluded. However, they all fail to account for the well-formedness of the compounds in (2). In (2a) the external argument variable is saturated inside, and in (2b) the noun included in the compound is related to the external argument variable of the base verb, as will become clear below.

(1) a. Flower-arranging (by experts is nice to watch.)
    b.*Expert-arranging (of flowers is nice to look at.)
(2) a. (The) house-painter (just came in.)
    b. (This can of soup is) expert-tested.

Moreover, the constraints exclude compounds formed with a verb with two obligatory internal arguments, such as the ones in (3),[2] but they do not account for the fact that the compounds in (4), where one of the internal argument of the verb is optional, are well-formed, with the Theme inside and the Goal outside.

(3) a.*Book-putting on shelves (is dull.)
    b.*Shelf-putting of books (is better than throwing them away.)
(4) a. Book-selling to students (should be encouraged.)
    b.*Student-selling of books (should be encouraged.)

More recently, Grimshaw (1990) argues that Roeper and Siegel's First Sister Principle follows from Prominence Theory, which she proposes. Prominence Theory accounts for the Theme/Goal asymmetry observed in deverbal compounds and exemplified in (4) and (5), a fact not covered by the preceding constraints. (4b) and (5b) are excluded, since the Theme, which is the lowest theta-role in the hierarchy, and thus should be satisfied in the compound, is satisfied outside.

(5) a. Gift-giving to children (is always rewarding.)
    b.*Child-giving of gifts (is not so frequent.)

According to Grimshaw, the external argument never can be saturated within a compound, otherwise, the compound could no longer be a well-formed predicate, i.e. have an open position to saturate in the syntax. It could never be used as an adjective, given that [ADJ N] structures involve theta-identification (Higginbotham 1985) or participate in Predication. Another fact, according to Grimshaw, suggesting that the external argument is not saturated inside is that if a verb has only one argument, it cannot form a deverbal compound. This is evidenced in (6), where the deverbal compounds include an unergative (6a) or an ergative verb (6b).

(6) a. *Baby-crying / *Man-sleeping (is sometimes noisy.)
    b. *Student-arriving / *Sun-rising (is nice to watch.)

Thus, Prominence Theory, as well as the other constraints on English deverbal compounds exclude the external argument from saturation inside the compound. However, we noted that there are cases, namely compounds such as the ones in (2), which escaped the constaints. The fact that the external argument of a verb is saturated within the domain of English deverbal compounds in some cases and not in others must be accounted for. Section 4 offers a solution to this question in terms of the argument structure of the parts of the compound, assuming that an argument must be saturated when the relevant conditions are met (cf. Di Sciullo 1990b, in press). In section 2, Italian deverbal compounds, whose properties are telling with respect to our problem, are analysed. In section 3, an account of the differences between Italian and English deverbal compounds is presented.

2. Italian deverbal compounds

As we shall see, Italian provides evidence that the external argument can be saturated within a deverbal compound. Consider the following compounds.

(7) taglia-carte, porta-ombrelli, lava-piatti
    cut-papers , carry-umbrellas, wash-dishes
    'paper-cutter', 'umbrella-stand', 'dish-washer'

It is clear from the opacity facts evidenced in (8) to (10) that Italian deverbal compounds are X^os and not XPs, even though they look very much like VPs.

A deverbal compound constitutes an opaque domain. In addition to the fact that no element can be inserted within the compound, as in *porta-grandi-ombrelli 'big-umbrella-carrier' no chain can include both an element from within this domain and an element from outside. The noun in the domain of the compound cannot be wh-moved or NP-moved, as in (8); it cannot be the antecedent of a lexical anaphor, as in (9). Furthermore, there is no agreement between the determiner and the noun included in the compound, as shown in (10).[3] The opacity of deverbal compounds should follow from the theory of grammar.[4]

(8) a.*Che$_i$ ha Maria un [taglia t$_i$]
'What does Maria have a cut?'
b.*Carte sono state [porta(te) t$_i$] da Gianni
'Child was carried by Gianni.
(9)*Questi [gira-dischi$_i$] si mettono [gli uni su gli altri]$_i$
'These turn-tables are put one on top of the other.'
(10) a. un taglia-carte
'a (masc./sing.) cut-paper (fem./sing.)'
b. una lava-piatti
'(a (fem./sing.)'wash-dishes (mas./plur.)'

In the following paragraphs, I will focus on the argument properties of deverbal compounds. However, the proposed analysis will also account for their categorial properties.

The compounds in (7) include a noun, which is interpreted as the internal argument of the verb. Even though it is not referential, as a DP is, it still satisfies the semantic requirements imposed by the verb on its internal argument. As for the external argument of the verb, there is no overt manifestation of its presence inside the compound. I would like to propose here that it is realized as pro. Pro is licensed by the verb without the presence of an AGR node in the structure of a deverbal compound,[5] and its content is identified by theta-marking. According to Rizzi (1986), pro can be licensed in the syntax under government by a Case-marking head. But, Case is assigned to NPs and not to N^os, and there are no strong arguments for the application of Case Theory within X^os. Thus, if pro is licensed in Italian deverbal compounds it must be independently from Case-marking. Given that pro can be licensed by a theta-marking head in Italian, I propose that it can also be licensed in Italian compounds with a predicative head.

Basically, pro is required by Theta Theory in the structure of Italian deverbal compounds,[6] and I propose that they are analysed as in (11), where both the internal and the external argument of the verb are saturated within the compound. The internal argument is assigned to the noun governed by the verb and the external argument is assigned to pro-N. The compound as a whole has a non thematic R argument and it is a concrete noun; it resembles result nominals since it has no associated thematic argument.

```
(11)          N (R)
              / \
            V_i  pro-N
           / \    (R_i)
          V   N
      porta  ombrelli
      (x_i,y_j)  (R_j)
```

That Italian deverbal compounds are similar to result nominals with respect to argument structure can be seen by the fact that the properties of their specifier and complement systems are those of result nominal and not those of complex event nominals, which do have thematic arguments, assuming that some of Grimshaw's (1990) tests for distinguishing result from complex event nominals in English hold for Italian as well. Thus, as is the case for result nominals, but not for complex event nominals, deverbal compounds in Italian can be introduced by definite as well as indefinite determiners, by numerals and demonstratives (12a). They can occur predicatively (12b). There is no complex event interpretation which can be associated to these compounds, as shown by the fact that agent-oriented adjectives such as deliberato 'deliberate' (12c) or aspectual modifiers such as costante 'constant' and frequente 'frequent' cannot be licensed (12d). Moreover, no phrase corresponding to an argument of the verbal head is tolerated: in (12e), the by-phrase cannot be interpreted as an agent, and in (12f) the of-phrase cannot be interpreted as a theme.

(12) a. Il/un/questo taglia-carte è sempre utile.
'The/a/this paper-cutter is always useful.'
b. Questo è un taglia-carte.
'This is a paper-cutter.'
c. *Il taglia-carte deliberato di Maria.
'The paper-cutter deliberate of Mary.'
d. *Questo costante/frequente taglia-carte.
'This constant/frequent paper-cutter.'
e. *Il taglia-carte da parte di Gianni.
'The paper-cutter by Gianni.'
f. Il taglia-carte di Gianni
'Gianni's paper-cutter'

Thus, given the admissibility of pro in Italian deverbal compounds, and the assumption that pro is associated to a non-thematic R argument, it is possible to account for the fact that deverbal compounds in Italian are concrete nouns and not complex event nominals, even though the verb they include has a complex event structure.

Moreover, given Uniqueness, our analysis predicts that the internal argument of the verb cannot be saturated outside. This is the case, as evidenced in (13a). Thus <u>di</u>-phrases cannot be licensed in the syntax. However, modifiers, such as <u>per</u>-phrases are admissible, as in (13b). Assuming Grimshaw's (1990) distinction between complements and modifiers, the <u>per</u>-phrase is a modifier, since it can be separated from the compound by a copula, as in (14), whereas the <u>di</u>-phrase is a complement, since it cannot. If the internal argument of the noun is saturated inside, structures such as (13a) are excluded by the Theta-Criterion.

(13) a.*un tempera-matite di carboncino
   'a pencil-sharpener of charcoal'
  b. un tempera-matite per carboncino
   'a pencil-sharpener for charcoal'
(14) a.*Questo tempera-matite è di carboncino.
   'This pencil-sharpener is of charcoal.'
  b. Questo tempera-matite è per carboncino.
   'This pencil-sharpener is for charcoal.'

Likewise, the external argument of the verb included in the compound cannot be saturated outside, as in (15a), which is a Theta-Criterion violation as well, even though modifying goal-phrases, such as the <u>per</u>-phrase in (16b), are allowed, and a similar contrast can be observed with respect to the possibility of a copula. Instead, the external argument of the base verb must be saturated inside.

(15) a.*un tempera-matite da parte di Gianni
   'a pencil-sharpener by Gianni'
  b. un tempera-matite per Gianni
   'a pencil-sharpener for Gianni'
(16) a.*Questo tempera-matite è da Gianni.
   'This pencil-sharpener is by Gianni.'
  b. Questo tempera-matite è per Gianni.
   'This pencil-sharpener is for Gianni.'

The analysis proposed here accounts for the properties of compounds with a verbal head and it also covers deprepositional compounds, such as in (17). Prepositions such as <u>senza</u> 'without' and <u>contro</u> 'against' are dyadic predicates: they appear independently in syntactic structures such as (19) where the preposition is the head of a predicative PP.

(17) un senza-vergogna, un contro-argomento
   'a without-shame', 'a counter-argument'

(18)
```
        N (R)
        / \
      Pi  Pro-N
     / \   (Ri)
    P   N
senza  vergogna
(xi,yj) (Rj)
```

(19) a. Un caffè senza zucchero
'A coffee without sugar'
b. Questo caffè è senza zucchero.
'This coffee is without sugar.'
c. Una manifestazione contro la violenza
'A meeting againts violence.'
d. Questa manifestazione è contro la violenza.
'This meeting is against violence.'

Assuming that deverbal and deprepositional compounds are given a unified account, the existence of deprepositional compounds brings support to the hypothesis that _pro_ is not licensed by AGR in compounds including a predicative head: prepositions are not related to AGR as verbs are. In the structure of deverbal compounds, the presence of _pro_ is independent of AGR.

Thus, the argument properties of Italian compounds with a predicative head follow from independently-needed principles of the grammar. This is also the case for their categorial properties, if we assume that the categorial and the predicative heads of a constituent can be disjoint. In structure (11), the categorial head is in final position and the predicative head is in initial position. The verb is the predicative head, it has thematic arguments, whereas the _pro_-N is the categorial head, it has no thematic arguments. This situation is expected, given the notion of relativized head, proposed in Di Sciullo and Williams (1987), and in Di Sciullo (1990a).

(20) Relativized head
The head$_F$ of an X^o is the e element of X^o which is F-marked.
e= initial/final; F= grammatical features (categorial, predicative, etc.)

The definition in (20) is parametrized with respect to position and with respect to grammatical features, allowing greater flexibility than the original definition. So for instance, it can also cover the fact that the categorial head in Italian root compounds is in initial position (_cassa_-forte 'safe', _blu_-notte 'night-blue'). Thus, the categorial properties of deverbal compounds also follow from the theory of grammar, even though there might be an asymmetry between the position of the categorial head in X^o and in XP which does not follow directly from the generalized versions of X' Theory, as the one proposed by Lieber (1989) for instance.[7]

3. English and Italian deverbal compounds

The compounds in (7) are typically not found in English, and this gap deserves an explanation. I propose that this should be attributed to a general property of affixes and to the fact that pro is not available in English grammar, a parametric difference between English and Italian.

First, if pro is not available in the grammar of English, the external argument of a predicative head must be saturated by another means, either an XP in a maximal projection, or a noun or a suffix in a lexical projection. The latter situation is obtained in deverbal compounds with -er for instance. The suffix -er saturates the external argument-variable of the predicate it joins to (cf. Di Sciullo & Williams 1987, Rappaport and Levin 1988). Given Uniqueness, it follows that deverbal compounds in Italian should exclude suffixes such as -ore '-er' which otherwise have the property of saturating the external argument-variable, given that pro is available in that language. This prediction is correct, as evidenced in (21). (21b) is excluded since the external argument of the verb is saturated twice, (21c) is excluded also because it violates directionality of theta-role assignment.

(21) a. tagliatore
'cutter'
b. *tagliatore-carte
'cutter-paper'
c. *carte-tagliatore
'paper-cutter'

Thus, given this independent difference between Italian and English, the availability of pro, no Italian deverbal compound may include an argument saturating suffix, whereas deverbal compounds in English must include such a suffix.

Second, the difference between Italian and English with respect to the position of the internal argument in deverbal compounds follows from independent properties of affixes. In particular, from the strict adjacency requirement imposed by an affix on the category it selects. This property of affixes is generally assumed in the literature, and it can be expressed as in (22). Current proposals diverge however with respect to the level at which (22) holds.

(22) An affix is a sister of the category it selects.

Consequently, if a suffix selects a verbal category, as is the case of -er in English, the suffix must be a sister of the verbal category at some level of representation. Thus, structures such as (23a) and (23b) are excluded: the suffix is not a sister of the verb that it selects.

```
(23) a.*  N              b.*   N
         / \                  / \
        N   suffix           V   N
       / \                      / \
      V   N                    N   suffix

    c.    N              d.    N
         / \                  / \
        V   suffix           N   N
       / \                      / \
      N   V                    V   suffix
```

On the other hand, structures such as (23c) and (23d) are both possible structures for English deverbal compounds. Both give the right ordering of the internal argument with respect to the verb.
However, (23c) is the correct structure, given that the intermediate N in (23d) does not have selectional properties: it does not select its sister N, whereas both the suffix and the V on the right periphery of the tree in (23c) do have selectional requirements: the lower V selects its sister N, and the suffix selects its sister V.[8]

Thus, the differences between Italian and English follow from independent properties: the availability of _pro_, a crucial difference between Italian and English, and the general requirement imposed by the selectional properties of affixes, a property shared by both languages.

4. English deverbal compounds revisited

Contrary to what has usually been assumed, I have argued that the external argument can be saturated in English deverbal compounds. Now, deverbal compounds in English do not form an homogeneous class with respect to argument saturation. In fact the properties of the suffix included in the compound determine whether the external argument is saturated inside or outside the compound. These properties are correlated with the result or the event nature of nominals, assuming as in Grimshaw (1990) that event nominals take thematic arguments, but result and concrete nominals do not.

For _-er_ deverbal compounds, the external argument of the predicative head is saturated inside the compound, since _-er_ has the property of saturating the external argument-variable of the predicate (Pr) it selects, as shown in the lexical representation of this suffix in (24). Moreover, the suffix _-er_ has inherent properties, it is a nominal element and it is associated to the referential, non-thematic, argument R, which is part of the argument structure of result nominals and concrete nouns.

(24) *-er*: [+N,-V], [PrV(x_i,y) __], (R_i)

Thus, when *-er* composes with a V, the resulting compound is a N with only one argument: a non-thematic R. It is a concrete noun.

(25)
```
            N (R)
           / \
         Vi   N
        / \   -er
       N   V  (Ri)
    taxi drive
    (Rj) (xi,yj)
```

-ed deverbal compounds are different from *-er* deverbal compounds with respect to both categorial and argument structure properties. As exemplified in (26) *-ed* deverbal compounds can be used as verbs or adjectives. Moreover, they allow subjects as well as *by*-phrases corresponding to the external argument of the base verb and they can occur in ADJ-N structures.

(26) a. John expert-tested the soup.
b. This soup was expert-tested (by John).
c. Expert-tested soups are dull but safe.

The basic argument structure properties of *-ed* compounds are derived from the properties of the suffix *-ed*, whose lexical entry includes the specifications in (27). *-ed* is a [+V] suffix: it maps a verb onto a verbal category. It does not bind any argument variable of the base verb. The argument of the base verb cannot be saturated inside, and the noun included in the compound is interpreted as a modifier. Moreover, the suffix *-ed* has an inherent non-thematic event argument (E). The event properties of *-ed* deverbal compounds allows them to license agent oriented adverbs (28a) as well as aspectual modifiers (28b).

(27) *-ed*: [+V], [Pr __], (E)

(28) a. These soups were intentionally/deliberately expert-tested.
b. Their soups were constantly/frequently expert-tested.

-ing deverbal compounds are different from both *-er* and *-ed* deverbal compounds, because the properties of the suffixes are different. The suffix *-ing* is nominal, it has an eventive non-thematic argument (E), and it does not saturate any argument of the predicative head it joins to. However, the internal argument of the base verb is saturated inside by the noun included in the compound.

(28) -ing: [+N,-V], [Pr __], (E)

When -ing joins with a verb, the resulting deverbal compound is an event nominal and the external argument of the verb is not saturated inside the compound because this argument cannot be assigned to, bound by or identified with a category in the structure.[9]

```
(29)       N (E(x))
            / \
           V_x  N
          / \  -ing
         N   V  (E)
       taxi drive
       (R_j) (x,y_j)
```

The -ing compounds have the specifier and complement properties of complex event nominals, as exemplified in (30). As in the case of complex event nominals, -ing deverbal compounds allow only the definite determiner (30a), cannot pluralize (30b), cannot occur predicatively (30c), can license a by-phrase corresponding to the Agent of the verbal head (30d), allow Agent-oriented adjectives (30e) as well as aspectual modifiers (30f).

(30) a. The/*a/*one/*that taxi-driving John did exhausted him.
     b. *The taxi-drivings John did were fun.
     c. *That is a taxi-driving.
     d. Taxi-driving by Mary can be dangerous.
     e. Mary's deliberate/intentional taxi-driving is unexpected.
     f. John cannot stand her constant/frequent taxi-driving.

Thus, -ing deverbal compounds are event nominals and their external argument can license by-phrases, as in (31a); this is not possible for -er deverbal compounds, as evidenced in (31b), which is a Theta-Criterion violation.

(31) a. Book-reading by students (should be encouraged.)
     b.*A book-reader by students (should be encouraged.)

The proposed analysis also provides an explanation of the fact that compounds with unergatives or ergatives are excluded.

(32) a. *Man-worker/*Man-swimmer (is nice to watch.)
     b. *Rain-faller/*Student-arriver (is nice to watch.)

The -ing deverbal compounds in (6) above are excluded because the event nominals would have no thematic argument-adjunct to license outside; whereas the -er deverbal compounds in (32) are excluded because, in the unergative cases (32a) -er would saturate an already saturated argument-variable, and in the ergative cases

(32b) -er would have no external argument variable to saturate. Thus the fact that these compounds are not possible is not due to the exclusion of external argument saturation inside a deverbal compound, but to independent principles of the grammar.

Finally, there is no need to appeal to the Thematic Hierarchy to account for the fact that a Goal argument is excluded within compounds when the base verb is ditransitive, as in (5) above. Within the proposed account, child-giving is excluded with child interpreted as a Goal because give cannot directly assign the Goal argument, whereas it can assign the Theme directly, as is generally the case for verbs. As expected, child-giving is well formed if the nominal category is interpreted as the Theme on a par with gift-giving. Similarly, truck-loader and hay-loader are well-formed, where the nominal category is interpreted as the Theme.

5. Summary

Assuming that an argument must be saturated whenever the relevant conditions are met (Di Sciullo 1990b, in press), it is possible to relieve deverbal compounds from construction specific constraints, the effect of which is to exclude the external argument from saturation inside. In the case of Italian deverbal compounds, argument saturation occurs normally within the compound and the well formedness of the structure basically relies on independent principles of the grammar. In English deverbal compounds, the fact that the internal argument is, all things being equal, saturated inside a deverbal compound is attributed to the general requirement for saturation imposed on arguments. Moreover, I have proposed that the differences between Italian and English deverbal compounds rest upon the availability of pro in each grammar, and on a basic property of affixes shared by both languages.

Footnotes

1. Many thanks to the members of the Argument Structure Project at UQAM for discussions, in particular to Elizabeth Klipple and Ilan Hazout. This work was supported by a grant from the Social Sciences and Humanities Research Council of Canada (#410-88-0624).

2. Sproat (1985) attributes to Case Theory the fact that a deverbal compound cannot contain two internal arguments. Thus, in (i)*[bank money put er] bank is assigned no Case, since the verb has only one Case to assign. In defense of the hypothesis that Case Theory applies within compounds, Sproat points out the fact that unaccusative verbs are excluded from compounds. Thus deverbal compounds with ergative verbs such as *student-arriving and *sun-rising are excluded: the verb they contain is not a Case assigner. However, as noted in Mead (1989), this argument does not hold if

we assume Belletti's (1988) proposal that ergative verbs do assign Case, partitive Case to their objects. If Case Theory does not apply within X^0s, as assumed here, compounds such as (i) are excluded because the indirect internal argument is not theta-marked.

3. The form of the noun included in the compound is fixed. The fact that the noun is plural can be attributed to its generic interpretation and not to agreement.

4. The opacity in question follows if modularity, the idea that principles of the grammar interact in the analysis of grammatical representations, applies to a specific domain within the limits imposed by the vocabulary of the domains, as discussed in Di Sciullo (1990a). So for instance, there are reasons to believe that the set of categories available within X^0s is not coextensive with the set of categories available within XPs. If a functional category such as D is excluded from X^0 domains, it is possible to derive the fact that a nominal expression within an X^0 is not referential, as well as the fact that no referential chain can be formed which include categories from both X^0 and X^{max} domains, as in (9). Moreover, if AGR is not part of X^0 domains, the facts in (10) can also be accounted for; furthermore, if Case is not part of X^0 domains, it follows that no empty category subject to the ECP can appear within these domains, thus wh-t as well as NP-t are excluded from X^0 domains, accounting for the facts in (8).

5. The form of the verb, though apparently inflected (3rd person, present), is invariant. There is no well-formed deverbal compounds that includes an inflected verb: *<u>tagliera-carte</u> 'will-cut-paper'. I will assume that the final <u>a</u> in the example in (5) stands for the verb class and that it is not an inflexional marker. An AGR node cannot be justified in the structure because there is no paradigm to justify it.

6. That compounds with a predicative head in Italian include <u>pro</u> and not the null morpheme $\emptyset$ is supported by the fact that deverbal compounds are Ns in Italian, independently of the categorial nature of the predicative head (V or P). This follows if <u>pro</u>, and not $\emptyset$, is the categorial head of a deverbal compound. <u>pro</u> is nominal, but $\emptyset$ can be any category. Furthermore, <u>pro</u> being a nominal category, is associated to an R argument, whereas $\emptyset$ is not, otherwise by stipulation. Moreover, <u>pro</u> can independently be theta-marked in the syntax, which is not the case for $\emptyset$.

7. Lieber's (1989) Generalized X' Theory is intended to account for the properties of both words and phrases. It predicts that the setting for a given parameter is done once and for all for the syntax and the morphology. However, languages which have the same value with respect to the directionality of theta-role assignment

in the syntax may differ with respect to the properties of words; this is the case of Italian and English. In both languages, theta-role assignment is to the right in the syntax; however, the position of the argument with respect to its head differs in compounds. In Italian, as well as in other Romance languages, the argument follows the head in compounds, whereas it precedes the head in English. In Lieber's analysis, deverbal compounds in English are derived by movement of the N^o to preverbal position. However, the fact that compounds such as *autobus-conduttore 'bus-driver' are excluded in Italian is left unexplained.

8. Grimshaw (1990) offers two arguments for analyzing compounds such as gift-giving as having a nominal, and not a verbal head. First, the fact that they exist at all, given that, according to Grimshaw, there is no verbal headed compound in English, and second the fact that they take nominal and not verbal modification: (i) His unexpected [gift-giving]

(ii) *His unexpectedly [gift-giving]

According to Grimshaw, that theta-marking inside the lexical category is possible even for nouns, which she assumes are not theta-markers in the syntax, is related to the fact that compound internal arguments do not have to receive Case. However, these arguments can be countered given that i) compounds with a verbal head such as bar-tend, carol-sing, grocery-shop do exist in English, and ii) assuming the opacity of X^o, it follows that only (i) is possible, the X^o in question being a noun.

9. In some cases, a result reading is also associated to -ing nominals, such as building in a tall building. However, -ing deverbal compounds generally have an event reading.

References

Di Sciullo, A.M. (in press) Modularity and the Mapping from the Lexicon to the Syntax. Probus 2.3.

Di Sciullo, A.M. (1990b) Multi-Level Saturation. Lexicon Working Papers 33, Center for Cognitive Science, Cambridge, MIT.

Di Sciullo, A.M. (1990a) Formal Relations and Argument Structure. in U. Dressler, H.C. Luschutzky, O.E. Pfeiffer, J.R. Rennison (eds.) in Contemporary Morphology. Berlin: Mouton de Gruyter.

Di Sciullo, A.M. and E. Williams (1987) On the Definition of Word. Mass.: MIT Press.

Grimshaw, J. (1990) Argument Structure. Mass.: MIT Press.

Higginbotham, J. (1985) On Semantics. Linguistic Inquiry 16. 547-595.

Lieber, R. (1983) Argument Linking and Compounds in English. Linguistic Inquiry 14, 251-285.

Lieber, R. (1989) Deconstructing Morphology: Word Formation in a Government-Binding Syntax. ms. University of New Hampshire.

Mead, J. (1989) Argument Structure and the Interpretation of

Deverbal Compounds. M.A., McGill University.
Rappaport, M. and B. Levin (1988) What to Do With Theta-Roles. Lexicon Project Working Papers 11. Center for Cognitive Science, Cambridge, MIT.
Rizzi, L. (1986) Null Objects in Italian and the Theory of pro. Linguistic Inquiry 17. 501-557.
Roeper, T. and M. Siegel (1978) Transformations and the Lexicon. Linguistic Inquiry 9. 199-260.
Selkirk, E. (1982) The Syntax of Words. Mass.: MIT Press.
Sproat, R. (1985) On Deriving the Lexicon. Doctoral Dissertation, MIT.
Williams, E. (1981) Argument Structure and Morphology. The Linguistic Review 1. 81-114.

The formal complexity of word-internal structure

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0. Introduction

In this paper I will be concerned with the formal complexity of morphological systems, and more specifically, with the difficulty of the problems posed by morphology for computational models of processing, or parsing. Unlike syntactic parsing, which typically involves identifying which rules in a grammar contributed a sentence's phrase structure, morphological parsing involves determining the operations which contributed to the surface form of a *word* during the course of a derivation.

For example, given the Quechua word in (1), a morphological parser should be capable of determining the constituent structure indicated in (1b) and producing as its output what is given as (1c) -- the stem meaning "watch" and a list of inflectional features associated with it. Clearly, the task of morphological analysis will be much more complex in languages with nonconcatenative morphological processes or in languages where phonological processes act to obscure boundaries between formatives.

(1) Quechua (Wallace, 1987)

a)	<u>input</u>:	[qhawawarqayku] "you/she/he/they watched us (excl.)."				
b)		qhawa -	wa -	rqa -	yku	
		watch	1 obj	past		1 pl. past excl
c)	<u>output</u>:	/qhawa/, [1 obj, past, 1 pl. past excl]				

The motivation for developing a general model of morphological parsing comes from its potential for use as a tool in investigating the adequacy of linguistic models of morphological organization. Part of the task of producing a working parser involves rigorously describing the formal representations and operations allowed by the model being implemented; often this process will point up redundancies or flaws in the model which go unnoticed in informal descriptions. In addition, this focus on a complete and rigorous description of the claims of a theory makes it possible to investigate the costs in processing complexity associated with including particular kinds of formal devices in a morphological description. Investigating the processing characteristics of a particular morphological model, then, can potentially reveal otherwise-unnoticed sources of complexity inherent in the model.

This paper will examine in detail one such source of processing complexity in generative models of morphology. The general structure of the paper is as follows. First, I will briefly review the formal characterization of linguistic models and the parsing complexity associated with different types of grammar formalisms. Next I will turn to morphology to discuss a reduplication process in the Niger-Congo language Bambara which appears to require a morphological operation of such formal power that it will not yield to efficient processing strategies.

Finally, I will show that if this Bambara reduplication process is properly formalized, then it ceases to represent an efficiency problem for parsing models. This result can be extended to other languages with similar apparently-problematic reduplication processes.

I. Grammars and processing complexity

Languages can be characterized according to the formal power of the grammar needed to describe them. The Chomsky Hierarchy of formal languages (Chomsky, 1957) defines four classes of grammars, ranging in complexity from the simple finite state grammars to unrestricted rewrite grammars (which have full transformational power.)

(2) The Chomsky Hierarchy of Formal Languages

Unrestricted Rewrite grammars (i.e., transformational)
Context-Sensitive grammars/languages
Context-Free (CF) grammars/languages
Finite-State grammars/languages

A good deal of research into the mathematical characterization of natural language has centered around the class of CF languages. The reason for this focus stems from the processing complexity associated with this class: known algorithms, such as the Earley algorithm (Earley, 1970) are capable of efficiently parsing any formal language which can be characterized in terms of a CF grammar description. Strings from CF languages are known to be parseable (in the worst case) in time proportional to the cube of the length of the input string. Simplifying somewhat, this amounts to a guarantee that the length of time required to parse a string using a CF grammar will be bounded.

This is an important limitation, because no such guarantee exists for grammars belonging to the more powerful mathematical classes (that is, grammars instantiating rules of context-sensitive or transformational power.) Strings from languages belonging to these classes may be effectively unparsable, since it can be shown that parsing time can grow exponentially with the length of the input string. One way of producing a general proof that a linguistic description (of, for example, syntax or morphology) can be efficiently processed, then, is to show that it can be mapped onto a CF grammar.

A few syntactic constructions have been identified which cannot be described with the relatively limited mathematical power of a CF formalism. For instance, Shieber (1985) describes a construction in Swiss German subordinate infinitival clauses which is like that schematized in (3).

(3) Swiss German Crossed Serial Dependencies

```
 __________________
|                  |
|     _____________|_____
|    |             |     |
|    |     ________|_____|_____
|    |    |        |     |     |
NP1  NP2  NP3      V1    V2    V3
John Peter Mary    saw   make  swim
```

"John saw Peter make Mary swim"

This structure involves crossing discontinuous crossing dependencies between an arbitrarily-large number of verbs and their subjects. Although CF grammars are capable of handling some forms of discontinuous dependencies, they are not capable of describing structures with unlimited numbers of crossing dependencies.

II. Non-CF word structures

Turning again to morphology, the issue is whether or not it is possible to map linguistically-motivated descriptions of morphological and related phonological operations onto a CF descriptive formalism. Demonstrating that this is possible would amount to a claim that these descriptions can be straightforwardly implemented in efficient parsing devices. Problematic cases, then, are those constructions which appear to require a representation which is beyond the descriptive power of a CF formalism.

One such case can be found in Bambara. Culy (1985) describes a process of full reduplication in this language which copies a noun stem N to produce a compound noun "N-o-N" meaning "whatever N". Thus, for example, (4):

(4) Bambara noun reduplication (Culy, 1985)

wulu	"dog"
wulu-o-wulu	"whatever dog"

Another word-formation process in Bambara which compounds a noun and a transitive verb and adds the suffix "-la". The result is an agentive N meaning "one who TV's N's".

(5) Bambara agentive noun formation

Noun (N) + Transitive Verb (TV) + /la/ "one who TVs Ns"

wulu	*file* + *la* =	<u>wulufilèla</u>	"dog watcher"
dog	watch		
wulu	*nyini* + *la* =	<u>wulunyina</u>	"dog searcher"
dog	search for		(i.e., one who searches for dogs)

This compounding process can apply recursively, in principle producing agentive nouns of arbitrary length. (Culy suggests that interpretability is the sole constraint on this process.)

(6) Recursive application of agentive noun formation

wulu-filela-nyinila "dog watcher hunter"
(i.e., "someone who hunts for someone who watches dogs")

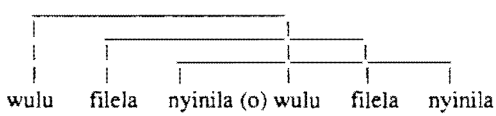
Crucially, compounding can feed noun reduplication with input stems of arbitrary length and internal complexity, as illustrated in (10):

(7) agentive noun formation + reduplication

wulufilelanyinila-o-wulufilelanyinila "whatever dog watcher hunter"

Informally, the result of reduplicating complex words like (7) appears to be a structure like that in (8).

(8) Non-CF structure within the Bambara lexicon



"whatever dog watcher hunter'

The apparent result of this rule is a noun whose internal structure includes an arbitrary number of crossing dependencies linking each base morpheme with its reduplicated copy. Bambara word structures thus appear to be complex in just the same way as Swiss German syntactic structures. Culy notes these Bambara words have a structure identical to one described hypothetically by Langendoen (1981) as one which would render the entire word-set of a language non-CF. Culy demonstrates that the language which results is of the form $\{a^m b^n a^m b^n \mid m, n \geq 1\}$, where the elements a and b correspond to individual morphemes, and the values for m and n are greater than or equal to 1. This language--and thus the Bambara lexicon--is demonstrably non-CF.

It should be noted that the simple observation that morphological systems may fall outside the class of CF languages does not automatically preclude the possibility of analyzing them with an efficient parsing strategy. If the non-CF constructions which occur in morphological systems could be shown to fall within sharply defined limits, then it might be possible to augment efficient CF parsing strategies with some simple additional check or test aimed at identifying just the class of non-CF structures which do occur. Such augmented CF parsing strategies might be capable of efficiently parsing systems encompassing some specified subset of non-CF languages. This sort of approach might thus avoid the potential for exponential growth in processing time that could result from a wholesale shift to some more powerful descriptive formalism.

Gazdar and Pullum (1985) describe a proposal made by Carl Pollard for augmenting a *recognition* device to enable it to handle constructions like Bambara reduplications. Pollard noted that all reported examples of non-context-freeness in the lexicon involve full reduplication. Since it is possible to determine whether the first half of some substring is identical to its second half in time proportional to the length of the string, Pollard reasoned that a standard CF language recognition algorithm could be augmented with a check of this sort. Unlike a parser, which must assign an appropriate representation to a string, a recognition device simply makes a "yes/no" decision about a string's grammaticality. Augmenting an algorithm to check for reduplication would add only a linear element to the total amount of time required to recognition. As a result, the time complexity associated with recognizing strings from a CF language which also allows fully-reduplicated structures should be no worse than that associated with general CF language recognition.

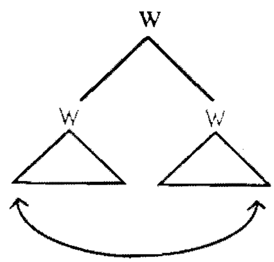
The problem with Pollard's suggestion is that it is restricted to claims about the difficulty of *recognizing* reduplicated strings. Results of this kind are not a particularly revealing measure of a language's formal complexity.[1] Since recognition is not carried out relative to any particular grammar, all a guarantee of efficient recognition tells us is that *some* CF grammar is capable of efficiently recognizing strings of the relevant type.

However, as mentioned earlier, we are not simply interested in whether a string like (7) is grammatical: an adequate morphological analysis must also describe the word's internal structure. This requires parsing, a more complex task than recognition, and one which *is* carried out relative to a specific (linguistically-motivated) grammar. Simply demonstrating that strings from some language can be efficiently *recognized* does not translate into a claim that those same strings can be efficiently *parsed* . Thus, Pollard's suggested augmentation of CF recognition algorithms is not directly relevant to the question of how difficult it is to parse these Bambara structures.

The obvious question is whether CF *parsing* algorithms might be augmented with a reduplication check of this sort while still retaining their efficiency. Problems with such a strategy arise immediately, however. Parsing a structure like (8) is a far more complex task than simply recognizing it, and the difficulty of this task cannot be eliminated by some simple augmentation to CF parsing techniques.

I will describe the reason for this complexity in informal terms. In order to recover the structure given in (8) for the input string (7),*wulufilelanyinila-o-wulufilelanyinila*, the parser must first parse the sequence *wulufilelanyinila*, corresponding to the first half of the reduplication. Next, it must parse the second half of the reduplication, again corresponding to *wulufilelanyinila*..[2] Finally, the parser must check to be certain that the two phonological and morphological complexes are in fact identical. Only after it has confirmed this can it identify the twin structures as having been produced by the reduplication word formation rule illustrated in (4). This process is diagrammed in (9), where each W corresponds to half of the reduplicated word.

(9)
CF parser augmented with a check for structural and phonological identity



It is this comparison stage which poses the potential for explosive costs in processing complexity for a CF parser augmented to handle such reduplications: if one or both of the structures being compared are structurally ambiguous, then all the various possible pairs of analyses must be checked against one another. This could involve a great deal of costly bookkeeping, growing with the complexity of the input string. Of course, it might be possible to limit the extent of this task by imposing some arbitrary cap on the length and morphological complexity of inputs to the reduplication rule, but there appears to be no principled motivation for such a limitation. As a result, it appears impossible to guarantee that morphological structures of the sort described by Culy can be efficiently parsed.

III. Reduplication Revisited

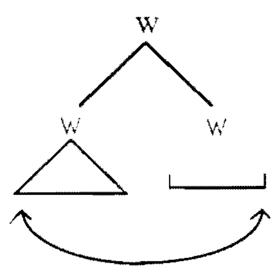
However, Culy's demonstration is incorrect in one fundamental detail: he assumes that the Bambara reduplication process establishes twin morphologically complex structures, with crossing dependencies linking morphemes in the two. However, current theoretical accounts of reduplication (e.g. Marantz, 1982; McCarthy and Prince, 1986; Steriade, 1988) view this as a strictly phonological process which copies melodic and possibly prosodic material from the base *but not information about lexical identity or internal morphological structure.*[3]

Given this view of the formal character of reduplication, the structure we assumed in (8) is incorrect. Instead of crossing dependencies between morphemes in the two halves of the reduplication, the only dependencies in this structure are at the phonological level. The stem copy should be viewed simply as a phonological shell which contains neither lexical nor morphological information.

This observation does not affect Culy's basic claim that this reduplication process takes the Bambara lexicon outside the class of CF languages.[4] The reason for this is even if we move to a view of reduplication in which copying is purely phonological, this process remains beyond the descriptive capability of a CF grammar formalism. The only formal means of describing a reduplication rule which is capable of copying an unboundedly large number of segments (or prosodic units) is with a transformation of the form 'X-->XX'. The phonological structure of the Bambara lexicon is thus genuinely non-CF.

However, shifting to a view of the reduplicated material as simply a noncompositional phonological shell has profound implications for parsing models. Since the reduplicated material has no internal morphological structure, the parser is no longer faced with the task of identifying this structure and comparing it to the structure recovered for the first half. Instead, the parser needs only to perform a relatively superficial comparison of some sequence of phonological segments to a corresponding number of following segments, as I have schematized in (10). As with the recognizer augmentation suggested by Pollard, this simple check for phonological identity does not run the risk of exponentially increasing parsing time as the length and complexity of the input grows.

(10) CF parser augmented with a check for phonological identity



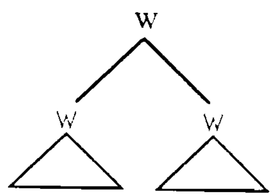
In effect, what this means is that there is no significant difference between the task of (a) identifying the presence of a reduplication on a word and (b) assigning it an appropriate representation. That is, once a morphological analyzer has *recognized* a reduplicated structure, no more computation is necessary to *parse* it. This claim is plausible from a psycholinguistic standpoint: it seems unlikely that hearers should actually reparse the second copy of a reduplicated morphologically-complex word and then compare its internal structure to that of the original.

IV. Unbounded reduplications and parsing complexity

It is now possible to determine the degree of complexity structures like (8) pose for processing models, by comparing the task in (10) -- what I'm assuming the parser must do in order to recognize structures like (8) -- with the normal-case complexity associated with CF parsing.

Figure (11) sketches the task a standard CF parser would have to perform if faced with a structure like (8). The two structures would be parsed in sequence, but no check for identity could be performed. As a result, the output of the parse would be deficient, since the reduplication could not be identified.

(11) Unaugmented CF parser



It appears that the task represented in (10) -- parsing the first half of a reduplication and then performing a phonological check for reduplication -- is no more complex than the normal CF parsing procedure in (11). The reason for this is that the formal cost of performing the check for reduplication is probably no greater than the cost associated with actually parsing the second structure. In fact, depending on the complexity of the structures to be parsed, the task in (10) might actually be *less* complex than the task sketched in (11).

It should be possible to demonstrate these claims empirically using an parser implementing a suitably-augmented version of an efficient CF parsing algorithm. Evidence of this kind would indicate that despite Bambara's non-CF reduplication construction, the worst-case time complexity associated with parsing Bambara words is no worse than than that associated with the general complexity of parsing CF languages.

This claim is an interesting one, because it has been generally assumed that the class of "copying languages" which includes reduplicated structures is quite costly from processing standpoint. Given this, we might expect such structures to be extremely rare cross-linguistically. However, Alexis Manaster-Ramer is quoted by Gazdar and Pullum as reporting reduplications which have no length bound in Turkish and a number of other languages.

The implication is that constructions like Bambara reduplication are not unusual. This should not be a particularly surprising fact: a number of languages exhibit recursive affixation rules, and many languages have processes of full reduplication. The interesting feature of Bambara is that it exhibits both, with recursive affixation capable of feeding reduplication with arbitrarily-long input stems. Since generative theory suggests no principled constraints which might be placed on such interactions, it would be extremely troubling to find that a guarantee of efficient for the resulting structures could be achieved only by stipulating some ad hoc upper bound on the length of reduplications.

V. Conclusion

In this paper I have suggested a simpler alternative: structures involving unbounded reduplications are simply not problematic for efficient parsing models. The basis for this argument is that reduplication, which as Pollard noted is implicated in all known cases of non-CF word structures, does not copy word internal structure. As a result, these structures present the parser with a sharply simpler task than is suggested by analyses which posit crossing dependencies between morphological elements in the base and its copy. Empirical support for this claim is expected to come from a computational implementation of the Earley algorithm, augmented with a reduplication check of the sort described above.

Notes:

I would like to express my appreciation to a number of people for their help with various aspects of this paper: Bruce Bagemihl, Kathy Hunt, Pat Shaw, and Donca Steriade. In particular, I would like to thank Ed Stabler for his many invaluable comments and suggestions. All errors are of course my own.

[1]For a discussion of this claim, see Weinberg (1988).

[2]I ignore the /o/ which intervenes between the two halves of these Bambara reduplications for two reasons. First of all, Culy shows that the presence of this segment is irrelevant to the mathematical properties of the construction. Secondly, while Bambara listeners may well depend on the presence of this segment as a heuristic in identifying reduplications, I take this to be an accidental property of this particular reduplication rule in this language. Full reduplication in many languages involves simple copying with no "morphological glue", so any general approach to parsing should presumably not be dependent on cues of this sort.

[3]D. Steriade (p.c.) points out a reduplication process in Kinande (Mutaka and Hyman, 1989) which appears to require access to information about the internal morphological structure of its input form. Mutaka and Hyman claim that the mapping of a melody to a reduplicative template in this language is subject to their "Morpheme Integrity Constraint": if the whole of a morpheme cannot be mapped onto the template, then none

of it is copied. However, as far as I know there is no basis in Kinande or any other language for assuming that information about morphological structure is carried over from the base into its copy.

[4]Thanks to Ed Stabler for pointing this out.

References:

Chomsky, N. (1957) *Syntactic Structures*, Mouton The Hague.

Culy, C. (1985) "The Complexity of the Vocabulary of Bambara," *Linguistics and Philosophy* 8, 345-351.

Earley, J. (1970) "An Efficient Context-Free Parsing Algorithm," *Communications of the Association for Computing Machinery* 13, 94-102.

Gazdar, G. and G. Pullum (1985) "Computationally Relevant Properties of Natural Languages and their Grammars", *CSLI Report* CSLI-85-24, Stanford.

Langendoen, D. T. (1981) "The Generative Capacity of Word-Formation Components," *Linguistic Inquiry* 12, 320-322.

Marantz, A. (1982) "Re Reduplication," *Linguistic Inquiry* 13: 435-482.

McCarthy, J. and A. Prince (1986) "Prosodic Morphology", ms. Univ. of Massachusetts, Amherst, and Brandeis Univ.

Mutaka, N. and L. Hyman (1989) "Syllables and Morpheme Integrity in Kinande Reduplication" to appear in *Phonology*, 7:1.

Steriade, D. (1988) "Reduplication and syllable transfer in Sanskrit and elsewhere", *Phonology*, 5: 73-155.

Weinberg. A. S. (1988) "Mathematical Properties of Grammars," in F. Newmeyer, ed., *Linguistics: The Cambridge Survey* , v. I: 416-429, Cambridge University Press, Cambridge.

Movement and the Case of the Irish Verbal Noun.*

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Here I will consider certain aspects of the Irish non-finite verb form, known in the traditional literature as the "verbal noun". In particular, I investigate the possibility of positing a uniform underlying structure for this verb-form whose various reflexes appear in all non-finite structures in Irish, including the bare "small clause" constructions, discussed in Chung & McCloskey (1987), aspectual clauses, selected by the substantive verb "be", exemplified in (2) below, and embedded clauses, selected by a matrix verb, as illustrated in (3). It can be noted immediately that the surface word order of non-finite clauses differs from that of finite clauses, as in (1): as is well known, finite clauses in Irish, whether matrix or embedded, display surface VSO word order:

(1) **Faigheann sí a cuid tae.** (VSO)
makes she-NOM her tea-ACC.
She makes her tea.

(2) **Tá sí ag pósadh an fhir.** (SVO)
Be she PROG marry-VN the man-GEN
She's marrying the man.

(3) **Ba mhaith liom, í an fear a phósadh.** (SOV)
I-would-like her-ACC the man-ACC ptc marry-VN
I would like her to marry the man.

Verbal noun structures are particularly interesting from the point of view of current linguistic theory for what they may reveal about the notion of "Case as Visibility", about nouns as proper governors, and about the referential/non-referential distinction in current formulations of the Empty Category Principle (ECP). In this connection, it is worth pointing out that in Irish multiple wh-structures -- the usual testing-ground of argument vs. adjunct asymmetries -- are unavailable. However, the possibilities for extraction from verbal noun structures offer an interesting correlate of multiple-wh diagnostics.

As a point of departure, consider the surface SOV structures, found in Northern dialects of Irish, illustrated in (3) and treated most recently by McCloskey & Sells (1988). These structures, like their finite counterparts in (1) are assumed to be derived from an underlying structure, in this case by a rule of object-fronting. In determining the nature of this derivation, two questions arise: what is the landing site of this movement, and why is this movement possible or necessary? In addressing these questions, it is important to note a number of important syntactic, morphological and thematic restrictions on this fronting process, first pointed out by McCloskey & Sells. These restrictions are illustrated in (4) through (10) below. First, comparing (3) with (4), the object-fronting rule only applies to "referential" complements (in the sense of Rizzi (1989)): non-referential objects, such as the complements of measure verbs, may not be fronted.

(4a) **Ba mhaith liom, [an fhéile mairstean seachtain].**
I-would-like the festival last-VN a-week-GEN
I would like the festival to last a week.

(4b) * **Ba mhaith liom, [an fhéile seachtain mairstean/a mhairstean].**
I-would-like the festival a-week last-VN/ptc last-VN
I would like the festival to last a week.

The fronting rule affects only direct object complements of the verb: indirect objects, such as *léi* (to her) in (5a) must remain in situ.

(5a) **Labhróidh sí leat [ach [tú teagmhail léi in am]]**
will-speak she with you but you contact with-her in time
She will speak to you if you contact her in time.

(5b) * **Labhróidh sí leat [ach [tú léi teagmhail in am]]**
will-speak she with you but you with her contact in time
She will speak to you if you contact her in time.

Notice also that there is an obligatory and quite direct relationship between the transitivity of the verb, and the presence of the particle *a* which triggers initial consonant mutation on the following verbal noun in (6) converting *pósadh* to *phósadh*. This mutation is obligatory in (6) and impossible in (7b) for example, where *cruinniú* "assemble" is intransitive. (This condition applies strictly to Northern dialects of Irish, which are the focus of inquiry here; Southern dialects behave somewhat differently in this respect).

(6a) * **Ba mhaith liom, [í an fear pósadh/phósadh]**
I-would-like her-ACC the man-ACC marry-VN
I would like her to marry the man.

(6b) * **Ba mhaith liom, [í an fear a pósadh]**
I-would-like her-ACC the man-ACC ptc marry-VN
I would like her to marry the man.

(7a) **B'éadóiche [iad criunniú]**
Would-be-improbable them-ACC assemble-VN
It would be improbable that they would assemble.

(7b) * **B'éadóiche [iad a chriunniú]**
Would-be-improbable them-ACC ptc assemble-VN
It would be improbable that they would assemble.

Finally, note that although the complement of the verbal noun receives accusative case when it follows the verb in finite structures (8) or when it is fronted, as in (9a), that in (10), in Southern dialects with a slightly different fronting rule, the post-VN object receives genitive rather than accusative case:

(8) **Níor cheannaigh mé an teach sin/*an tí sin.**
NEG-PAST buy I that-house-ACC/that-house-GEN
I did not buy that house.

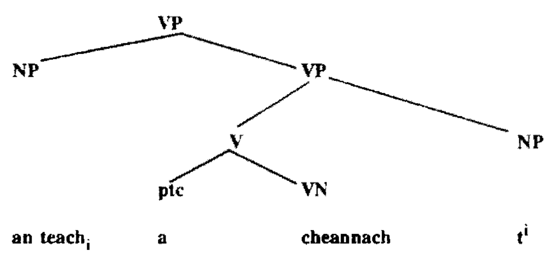
(9a) **Ba mhaith liom [í an teach a cheannach]**
I-would-like her-acc the house-ACC ptc buy-VN
I would like her to buy the house.

(9b) * **Ba mhaith liom [an tí a cheannach]**
I-would-like the house-GEN ptc buy-VN
I would like to buy the house.

(10) **Ba mhaith liom [í a cheannach an tí]** (Southern dialect)
I-would-like her-ACC ptc buy-VN the house-GEN
I would like her to buy the house.

It would be desirable if the syntactic structure proposed to underlie (3) could yield some account for the type of movement operation involved; for the thematic restrictions on object-fronting (the referentiality constraint); for the lenition (consonant mutation properties of the particle *a*; and for the assignment of genitive, rather than accusative mophological case to the post-VN object. McCloskey & Sells (1988) propose a Case-motivated account for this movement. This is the sole common feature shared by the present analysis. They propose (11) as the underlying representation for SOV structures: in that structure, the object NP is raised and adjoined to the VP from which it is extracted, to be assigned Case by the particle *a*:

(11) **Previous treatment:**

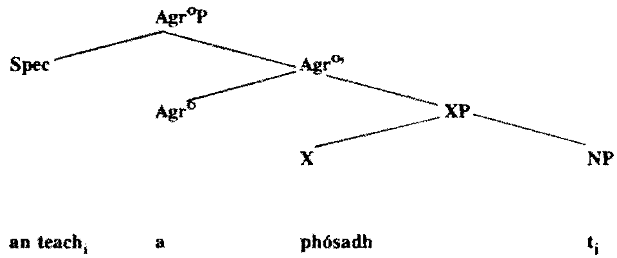


There are a number of reasons for being unhappy with this structure. First, there are Case-theoretic considerations. It is usually assumed, following for example, Koopman & Sportiche (1988) that structural Case assignment is achieved in one of two possible ways: either via the {Specifier, Head} relation (as is argued to be the case for the usual case-marking of English subjects, taken to raise to the {Spec,IP} position) or under directional government by a lexicalized structural Case Assigner (arguably the case of Irish subjects in finite clauses. Under standard assumptions, the only licensed NP-movement for Case reasons is "A-movement" to a non-thematic Specifier position. Once case-marking by adjunction as is admitted as a third mechanism, much of the restrictiveness of Case theory is lost.

The second problem comes with the proposal that *a* is a structural case-assigner in these clauses, assigning Case leftward. In the first place, it is less than clear that *a*, lexically inserted under VN, is in any position to assign case structurally; even if it were, this would be the only instance of case assignment under government to the left in a language which is strongly head-initial.

Next, there are binding-theoretic considerations. The structure in (11) shows an A'-relation between the fronted object and its trace, yet thematically and syntactically, this movement has the characteristics of Passive or Raising structures, instances of A-movement. Indeed, this rule operates in Irish raising structures also (cf. Duffield, (1991)). If this were an A'-movement, one might expect the freedom seen in scrambling structures, rather than the extreme restrictiveness found here. Nor does the structure in (11) provide any explanation for the consonant mutation properties of the particle or the assignment of genitive case to post-VN objects. Consider now the structure diagrammed in (12):

(12) Proposed structure for SOV:



In this structure, the particle *a* heads its own functional projection which we might call object agreement: the object is fronted and raised to the Specifier position of this projection, where it receives accusative case under {Spec,Head} Agreement. (This is structurally and functionally equivalent to the assignment of nominative case to "subjects" in English). Utilizing this structure, it is possible to preserve the restrictiveness of current Case theory: Irish object-fronting is then just an instance of Movement to Spec to get case by {Spec,Head} Agreement. We can also include Irish raising as just a regular case of A-movement; thus it has no special status or consequences for the theory of grammar.

Additionally, it is possible to provide a principled explanation for the consonant mutation properties of the particle *a*. Previously, it has been proposed that initial consonant mutation is strictly syntactically conditioned: the consonant mutation trigger is necessarily lexicalized head of some functional projection (see Duffield 1990, 1990b for details). This approach has been shown to achieve interesting results with proclitic preverbal elements in finite constructions, with determiners and with other functional heads. By taking a to be a functional head, in this instance the head of an object agreement projection, its mutation behavior is accounted for in a principled way.

Moreover, the restriction on referential objects is explained if we take seriously the idea of "Case as Visibility". It has been proposed that Case Theory is ultimately reducible to the Theta Criterion (Aoun 1979, Chomsky, 1981): that only referential NPs require Case to be theta-identified at LF: therefore, only referential objects need move to or though a Case-marked position. The primary motivation for the projection of object agreement in these structures is naturally that the verbal noun has the general nominal characteristic of being unable to assign accusative Case to its complement position. AgrO then can be seen as a "Case as visibility" rescue strategy, the Modern Irish correlate of "of-insertion", the dummy case-marking strategy found in English and Romance, inter alia). The crucial difference between the two is that of-insertion allows the affected NP to remain in situ, whereas the Irish mechanism requires movement. Notice that although this movement is akin to Passive NP-movement in many languages, that the projection of object agreement allows Irish to "sidestep" Burzio's generalization, since the VN still continues to assign a subject/external theta-role.

Moving now from the Case properties of the verbal noun to its government properties, it might be expected that if this verb-form acts as a derived nominal with respect to accusative case assignment, that it might also behave as a nominal with respect to the ECP. Specifically, we might expect that the verbal noun should not permit extraction from its complement position. This prediction is borne out quite dramatically in the progressive structures, given in (13), based on the data of McCloskey (1985). Example (13a) illustrates the normal expression of the progressive construction when no extraction is involved. In (13c) however, we can observe the operation of the so-called *ag--> a* rule; the particle spelled <ag> in (13a) is replaced by the particle *a* which it seems reasonable to suppose is structurally and functionally equivalent to the *a* particle of the SOV structures. Here, it is proposed that direct extraction of theta-marked VN-complements is impossible not strictly for reasons of proper government, but again for Case reasons, and that only when the object is moved to the {Spec,AgrO} position and receives Case, is extraction possible. What is interesting in this regard is that the ag --> a rule may not apply to non-referential objects, as illustrated in the contrast between the sentences in (13), and those in (14):

(13a) **Bhí siad ag cuartú an leoin.**
Were they PROG look-for the lion-GEN
They were looking for the lion.

(13b) * **Caidé bhí siad ag cuartú ?**
What were they PROG look-for-VN
What were they looking for ?

(13c) **Caidé bhí siad a chuartú ?**
What were they ptc look-for-VN
What were they looking for ?

(14a) **Beidh an fhéile ag mairstean seachtain.**
Will-be the festival PROG last-VN week-GEN
The festival'll be lasting a week.

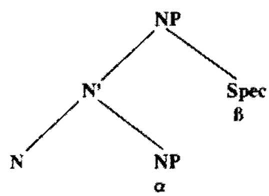
(14b) **Cá fhad a bheidh an fhéile ag mairstean.** **(cf. 13b)**
How long that will-be the festival PROG last-VN
How long will the festival be lasting?

(14c) * **Cá fhád a beidh an fhéile a mhairstean?** **(cf. 13c)**
How long that will-be the festival ptc last-VN
How long will the festival be lasting?

Thus, the contrast between referential and non-referential objects noted with respect to SOV order in embedded clauses is directly paralleled by the behavior of these objects under extraction in progressive constructions. This extraction behavior suggests perhaps the possibility of a disjunctive formulation of the ECP in which, in which non-theta-marked (non-referential) objects function as adjuncts, requiring only antecedent government, whilst referential object require theta-government, and by the "Case as Visibility hypothesis" therefore require case-marking. (At this stage, it is too early to draw any firm conclusions on this point, however). In the absence of multiple wh-movement in Irish, the verbal noun may be the only type of structure in which to investigate argument/adjunct asymmetries of this sort.

So far, nothing has been said about how genitive Case is assigned in Irish. Given the data presented so far, there is no reason -- apart from theory-internal considerations of simplicity and elegance -- not to suppose that it is a stipulative property of verbal nouns that they assign genitive Case to their complements in the complement position labelled α in (15). I would like to suggest, however, that this position is never realized at s-structure; whenever the object is not fronted to receive accusative Case, that it raises to the {Spec,NP} position; that as in many other languages, genitive case is associated with a Specifier position.

(15)



Some evidence for this comes from a consideration of the conjunction possibilities for verbal noun complements. Internally, verbal noun phrases are strikingly similar, structurally and functionally, to possessor noun-phrases in Irish. Furthermore, both of these structures have a parallel behavior in many respects to the action nominal and construct state structures of Semitic languages, as discussed by Aoun (1978), Mohammad (1988) and Ritter (1988), amongst others. (This question is developed in greater detail in Duffield 1991).

Joseph Aoun (p. comm.) has pointed out that possessor NPs which vary in definiteness may not be conjoined in Arabic. This is understood to be a function of their occurrence in the {Spec,NP} position, that position which determines the definiteness properties of the head-noun. Consider in this regard the examples in (16) through (20). In (16), we can see that the only elements which may precede the head noun within the noun phrase are the determiner *an* and the so-called possessive adjectives *my, your, his* etc. which it can be argued head the DP dominating NP (see Duffield (1990b) for details). This restriction on pre-nominal modification also holds true for the verbal noun, shown in (17):

Prenominal modification:

(16a) **teach an fhir**
house the man-GEN
the man's house

(16b) **mo theach**
my house
my house

(16c) **a dteach**
their house
their house

(17a) **ag cuartú tí** (***teach**)
PROG look-for-VN house-GEN *house-ACC*
looking for a house

(17b) **mo chuartú** (***cuartú mé**)
my look-for-VN *look-for me-ACC*
looking for me

(17c) **á (= ag + a) gcuartú** (***ag cuartú iad/a**)
their look-for-VN *look-for them-ACC*
looking for them.

From (18) and (19) it is clear that the conjunction restriction found in Semitic applies equally to possessor noun-phrases and to the verbal noun complements in progressive constructions in Irish. Notice that in the finite equivalent of (19), namely (20), there is no such restriction on complement conjunction.

(18a) **teach an fhir agus na mná**
house the man-GEN and the woman-GEN
the house of the man and the woman

(18b) * **teach an fhir agus mná**
house the man-GEN and woman-GEN
the house of the man and a woman

(18c) * **teach fhir agus na mná**
house man-GEN and the woman-GEN
the house of a man and the woman

(19a) **Bhí mé ag glanadh an cathaoire agus an bhoird.**
Was I PROG clean-VN the chair-GEN and the table-GEN
I was cleaning the chair and the table.

(19b) * **Bhí mé ag glanadh cathaoire agus an bhoird.**
Was I PROG clean-VN a chair-GEN and the table-GEN
I was cleaning a chair and the table.

(19c) * **Bhí mé ag glanadh an cathaoire agus bhoird.**
Was I PROG clean-VN the chair-GEN and a table-GEN
I was cleaning the chair and a table.

(20a) **(do) ghlan mé an chathaoir agus an bord.**
(past) clean I the chair-ACC and the table-ACC
I cleaned the chair and the table.

(20b) **(do) ghlan mé cathaoir agus an bord.** (cf. 20b)
(past) clean I a chair-ACC and the table-ACC
I cleaned a chair and the table.

(20c) **(do) ghlan mé an chathaoir agus bord.** (cf. 20c)
(past) clean I the chair-ACC and a table-ACC
I cleaned the chair and the table.

This interesting contrast between (19) and (20) above suggests that the genitive-case-marked complements of verbal nouns occupy a specifier position to the right of the head noun at s-structure. Following on from this suggestion, a rather obvious and tempting possibility presents itself: one could preserve cross-categorial harmony with respect to the position of Specifiers -- all to the right or all to the left -- by following Mohammad (1988), Ritter (1989) and others in moving the head noun to the head of DP in these cases; a head-movement account of VN O order.

For a number of reasons, I believe that this temptation, however theoretically elegant, should be avoided for Irish at least until all the evidence is in. The data from pronoun-postposing, from the case-marking of structures with embedded possessors and from the position of demonstratives and adjectives modifying the head noun all differ in interesting ways from the Semitic facts and suggest instead the post-head Specifier position given in (16). However, space constraints prevent further discussion of this question here, which is treated at greater length elsewhere (Duffield, 1991).

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References:

Aoun, J, 1978. "Structure interne du groupe nominal en arabe, l'?idaafa." *Analyses Theories* 1, Paris VIII, Vincennes.

Aoun, J, 1979, "On government, Case-marking, and clitic placement" ms. MIT.

Chomsky, N, 1981, *Lectures on Government & Binding. The Pisa Lectures*, Foris, Dordrecht.

Chung, S. & J. McCloskey, 1987, "Government, Barriers & Small Clauses in Modern Irish" *LI*, 18,2.

Duffield, N, 1990, "Movement and Mutation in Modern Irish", *MIT Working Papers in Linguistics*, Vol 12.

Duffield, N, 1990b, "Movement and Mutation Processes in Irish" ms, USC.

Duffield, N, 1991, "Visible Arguments: Referentiality and Movement in Irish", ms, USC.

Koopman, H. & D. Sportiche, 1988, "Subjects" ms. UCLA.

McCloskey, J, 1983, "A VP in a VSO Language?" In Gazdar et al, *Order, Concord and Constituency*, Foris, Dordrecht.

McCloskey, J. & P. Sells, 1988, "Control and A-chains in Modern Irish", *NLLT*, 6, 143-189.
Mohammad, M.A., 1988, "On the parallelism between IP and DP" *Proceedings of WCCFL 7*.
O Huallcháin, C., & M. O Murchú, 1981, *Irish Grammar*, Coleraine: New University of Ulster.
O Siadhail, M, 1989, *Modern Irish: grammatical structure and dialectal variation*, Cambridge University Press, Cambridge.
Ritter, E, 1988, "A head-movement approach to construct-state noun-phrases," *Linguistics*, 26, 909-929.
Rizzi, L. 1989, *Relativized Minimality*, Cambridge University Press.

THEMATIC ROLES AND ASPECT

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1. In recent Government and Binding literature, a number of linguists have argued that thematic roles have no grammatical significance (cf. Zubizaretta 1986; Belletti and Rizzi 1986; Levin and Rappaport 1986; Rappaport and Levin 1986; Grimshaw 1987, Rappaport, Laughren and Levin 1987; Tenny 1988 and 1989).

In particular, it has been argued that thematic roles are irrelevant for determining the mapping between thematic and syntactic structure (cf. Rappaport & Levin 1986:3; Tenny 1988 and 1989). In this paper, I will concentrate on one such proposal, namely on Tennys' Aspectual Interface Hypothesis. Tenny (1988 and 1989) proposes that the aspectual properties related to thematic roles constitute the interface between lexical semantics and syntactic argument structure. Non-aspectual elements of semantic representation -- thematic roles *Agent*, *Patient* as well as their semantic properties, such as affectedness, for instance -- have no significance for mapping and no status in syntactic theory. In short, Tenny argues for a mapping from aspectual properties to syntax. This view is summed up as the

Aspectual Interface Hypothesis

> The mapping between thematic structure and syntactic argument structure is governed by aspectual properties. A universal aspectual structure associated with internal (direct), external and oblique arguments in syntactic structure constrains the kinds of event participants that can occupy these positions. Only the aspectual part of thematic structure is visible to the syntax (Tenny 1989:3).

The main principle connecting the thematic and syntactic structure is the aspectual constraint on internal direct object arguments:

Aspectual Constraint on Internal Direct Object Arguments:

> With verbs in which the internal argument undergoes any change or motion, all and only direct internal arguments, or D-structural objects of the verb, measure out events. The event can be delimited linguistically within the verb phrase, through reference to that 'measuring out' (Tenny 1989:35).

On Tenny's view, the internal direct object argument of a verb of change or motion can be defined in aspectual terms as that argument which measures out or delimits the event. For example, with such delimited verb phrases as *to write a book*, *to eat an apple*, *to destroy the city*, the boundaries of an event are determined by the spatial *extent* or *volume* of the referent of the internal direct object argument: its gradual coming into existence or disappearance is correlated to the temporal extent of an event. In *the ice melted*, to take another example, the boundaries of the event are determined by the consistency of the referent of the internal direct object argument *the ice*.

2. The prominent role of the internal direct object argument in the delimitation of an expressed event has often been analyzed in aspect and Aktionsart literature. The distinction between *delimited* and *non-delimited* event types is also known as *accomplishment* vs. *activity* (Vendler 1957 and 1967), *telic* vs. *atelic* (Garey 1957), *cyclic* vs. *noncyclic* (Bull 1963) and *terminative* vs. *aterminative* (Maslov 1959) distinction, to name just the most common among many more labels.[1] Despite the different traditions within which these terms originated, there is a striking agreement in so far as they essentially refer to the same two opposing concepts, and they have the same two major classes of verbal expressions as their extensions. All of them are intended to capture a semantic distinction which is important for its interaction with aspect in the narrow sense.[2] Roughly, a verbal expression is considered to be *delimited*, to use Tenny's term, if its denotation involves an inherent terminus at which the event exhausts itself and gives rise to a new state-of-affairs. A verbal expression is *non-delimited* if it has no inherent terminus.

What is new in Tenny's approach is that she uses the prominent role of the internal direct object argument in the delimitation of an expressed event as a general mapping principle connecting the thematic and syntactic structure. I agree with Tenny that the semantic argument structure should include information about aspect, and in particular about such notions as a *delimiting argument*. However, in general, the mapping from thematic structure into syntactic structure cannot be constrained by any *single* property, regardless whether it is an aspectual property, or some other single property. Properties of thematic roles related to aspect of sentences are just one set among a number of other factors that constrain the mapping between thematic and syntactic structure.

Apart from this basic objection, the main problem with the Aspectual Interface Hypothesis is the assumption that aspect is a purely syntactic phenomenon. Tenny argues that a certain argument has a privileged aspectual status of being a delimiting argument simply by virtue of being an internal direct object argument. This problem, of course, stems from the limitations imposed on the Aspectual Interface Hypothesis by the Government and Binding Theory within which it is formulated. The Aspectual Interface Hypothesis is motivated by the desire to have both a rigorous connection between lexical semantics and syntactic argument structure and, at the same time, by the need to preserve the autonomy of syntax and semantics.

By allowing syntax and semantics to interact only through a restricted aspectual/syntactic interface, Tenny believes to have arrived at the appropriate solution.

In the next sections of the paper, I will show how the Aspectual Interface Hypothesis works and substantiate some of the above objections. If my objections are valid, the Aspectual Interface Hypothesis together with the aspectual constraint on internal direct object arguments should be refuted

3. Tenny claims that all and only internal arguments, that is, only constituents inside the VP in the D-structure, can delimit the event, "and they can do this only by reference to the measuring performed by the direct internal argument" (Tenny 1989:11). Direct internal arguments are distinguished arguments in this respect. External subject arguments are not constrained in this way. This asymmetry of the external argument and internal argument(s) is of crucial importance to Tenny's Aspectual Interface Hypothesis. It is clearly manifested in the following examples in which the count/mass distinction of noun phrases in the internal direct object position interacts with the aspect of a sentence:

(1-a)	*He drank beer.*	non-delimited
(1-b)	*He drank a bottle of beer.*	delimited
(2-a)	*Chocolate melted in the sun.*	non-delimited
(2-b)	*A bar of chocolate melted in the sun.*	delimited

In order to preserve the claim that all and only internal direct objects determine the aspectual properties of sentences, Tenny is forced to exclude all the data in which the singular/plural distinction of external subject arguments interacts with the aspectual properties of a sentence. Consider the following pair of sentences:

(3-a)	*Birds flew in.*	non-delimited
(3-b)	*A/the bird flew in.*	delimited

So even though bare plurals often behave in a similar way as mass nouns do, they are not covered by the Aspectual Interface Hypothesis, because they do not comply with the alleged subject/object asymmetry. This assumption also leads to the exclusion of the data in which the singular/plural distinction of an internal direct object argument interacts with the aspectual properties of a sentence that do not contradict the Aspectual Interface Hypothesis, as in:

(4-a)	*He drank many bottles of beer.*	non-delimited
(4-b)	*He drank a bottle of beer.*	delimited

The different treatment of bare plural and mass nouns leads to a serious and counterintuitive complication in grammar: sentences with plural nouns (3a, 4a) and the corresponding sentences in which the same nouns occur in singular (3b, 4b) are governed by different mapping mechanisms. On the other hand, if all the data with plural noun phrases are included, as they should be in any empirically well-grounded theory of mapping, the claim that there is an asymmetry of external and internal arguments with respect to their interaction with aspectual properties of sentences proves to be false.

Yet another problem arises if the grammar treats the count/mass distinction in a different way than the singular/plural distinction. We would also miss the generalization that, regardless of the argument's grammatical function, both the mass and bare plural nouns refer to non-delimited (or non bounded) expressions, and therefore they can give rise to a non-delimited reading of the whole sentence, as in (2a) and (3a). The choice of a noun phrase that denotes a delimited (bounded) quantity of something, as in (2b) and (3b), on the other hand, gives rise to a delimited reading of the whole sentence.

In order to preserve the claim that **all and only** direct internal arguments of verbs denoting any change or motion measure an event, Tenny makes an important distinction between arguments that **measure** events and those that **delimit** events. To illustrate this distinction, consider the following examples:

(5) *to push the cart* non-delimited

(6) *to push the cart to New York* delimited

(5) and (6) differ in so far as in (6), the indirect internal argument, the Goal-PP, *to New York*, delimits the event by reference to the measuring inherent in the direct internal object argument, that is, by reference to the location of the referent of *the cart* (cf. Tenny 1989:10).

The fact that these two notions are not well-defined considerably weakens the predictive power of the Aspectual Interface Hypothesis. The distinction *delimited vs. non-delimited* event is an important aspectual distinction that has syntactic and semantic reflexes. However, Tenny does not give any explicit characterization of this distinction. The notion *an argument that measures out the event* is somewhat nebulous. It is not clear in which sense *the cart* in *to push the cart* should measure out the event, if *measuring out* is used "in an informal sense, as a convenient metaphor for uniform and consistent change, such as change along a scale" (Tenny 1989:7). *To push the cart* expresses a non-directional change; and since there is no overt (or implied) indication of a terminal point of the denoted motion, we cannot interpret the expressed change of location as a change that can be measured along a scale with that terminal point as its upper bound.

Another problem connected with the notions *measuring* and *delimiting* of an event is posed by the following example:

(7) *Martha danced into the room.*

The event expressed in (7) is delimited by the Goal-PP *into the room*. (7) does not contain any internal direct object argument. By the same line of reasoning as in (6) *to push the cart to New York*, we should be able to say that the Goal-PP *into the room* delimits the event by reference to the measuring inherent in the location of *Martha*. This represents an obviously undesirable result, because the subject seems to function here in a similar way as the internal direct object in (6). Nothing in Tenny's apparatus seems to prevent such an analysis, except for the stipulation that it is all and only internal direct object arguments, and not external arguments, that can measure out events. If we allowed that the event be delimited through reference to the property of the external subject argument, then the claim that there is an asymmetry of external and internal arguments with respect to their interaction with aspectual properties could not be upheld and, by the same token, we would have to give up the Aspectual Interface Hypothesis, as well.

Tenny (1989:19, Fn. 8), suggests one way out of this difficulty: namely, that in such examples as *Martha danced halfway* "the property which is measuring out the event (location), although it is changing in the external argument (Martha), can only be expressed in its pure form through an internal argument, as in *Martha danced half the distance (home)*." However, this would lead to the ad hoc and unwarranted assumption that all the verbs of change or motion have an internal direct object argument in the D-structure that measures out the event and that may remain unexpressed on the syntactic surface (as with intransitive motion verbs).

The notion of an argument that *measures out an event* becomes even more obscure, when Tenny proposes that internal direct object arguments of such verbs as *to pound* that do not "measure out an event", because they do not undergo any particular change as a result of the verb's action, can "be forced to be understood as undergoing a change that delimits the event" (Tenny 1989:34). Compare (8a) and (8b):

(8-a) *George pounded the wall.*

(8-b) *George pounded the wall to pieces.*

In (8b), the delimitation is achieved by a resultative prepositional phrase *to pieces*. In order to account for the aspectual difference between the above examples (8a) and (8b), Tenny (1989:34) proposes an even stronger hypothesis than the original aspectual constraint on internal direct object arguments:

(9) "All verbs of change (simple non-stative verbs) have latent in them the aspectual structure in which an internal argument can measure out the event" (Tenny 1989:34).

Such a broad generalization hardly has any predictive power. It is questionable, to say the least, whether it can provide a basis for a rigorous connection between syntax and lexical semantics.

First, it is a well-known fact that aspect of a sentence is a function of both the obligatory arguments and various optional adjuncts. Virtually any non-delimited expression containing a dynamic verb of change can behave like a delimited expression in the context of an appropriate optional adjunct.[3] However, in order to describe aspectual properties of sentences that represent significant generalizations that have reflexes elsewhere in grammar, it is crucial to distinguish between aspectual properties of basic atomic sentences (i.e. sentences containing a main verbal predicator and all of its obligatory arguments) and aspectual properties of sentences containing various optional adjuncts.

Second, in order to describe aspectual properties of sentences representing significant generalizations, we need to constrain the semantic notion of change; we need to specify what it means for an entity to be affected in such a way that it delimits the event. So the problem is to distinguish such expressions as

(10) *to paint a wall* delimited

(11) *to eat a cake, to drink a glass of beer*

(12) *to build a house*

(13) *to play a sonata, to read a speech*

(14) *to copy a paper*

(15) *to run a mile, to drive from San Francisco to Berkeley*

(16) *the lake froze, the candle melted, the barn collapsed, he died*

on the one hand, from such expressions as

(17) *to wash a shirt* non-delimited

(18) *to push a cart*

(19) *to scratch the table top*

(20) *to poke the cloth*

on the other. However, instead of constraining the two notions of change, *measuring* and *delimiting* of an event, Tenny resorts to postulating that

(21) "An affected argument measures the event by virtue of its being a direct internal argument. What is special about it is that it also delimits the event" (Tenny 1989:13).

Obviously, this postulation along with the notion *measuring of an event* cannot account for the difference between (10) - (16) and (17) - (20), because all these examples contain an affected argument of a verb of change in the direct object position, and therefore all of them should "measure out" the expressed event, as the constraint on internal direct object arguments predicts. However, only in (10) - (16), the direct object is a delimiting argument, whereas in (17) - (20), it is not.

Tenny's assumption (21) presupposes that affected arguments always delimit events (cf. Tenny 1989:17). This does not hold, because it is only a subclass of affected direct object arguments, such as those in (10) - (16), that can delimit the event. Obviously, the grammatical function direct object together with the notion *affectedness* (understood in the sense of being changed in some way or moved) is too broad to serve as a criterion to select the right class of verb-direct object relations expressing delimited events. And consequently, it cannot hold that "An affected argument can be more adequately described in aspectual terms, as an argument which measures out and delimits the event described by the verb" (Tenny 1989:13). On the other hand, the notion *delimited event* comprises a much wider class of predicators than just those taking affected objects. Such predicators may take consumed objects (11), effected objects (12), objects of performance (13), representation-source objects (14), paths (15), and also Themes of one-place predicators of change or motion (16).

With some verbs, the claim that the internal direct object argument measures the event does not follow in any obvious way from linguistic facts, but rather it only follows as a prediction of the Aspectual Interface Hypothesis. As a case in point, take the verbs of cognition, perception and other psychological states. For example, the difference in meaning between *to frighten* and *to fear* in (22a) and (22b)

(22-a) *John fears ghosts.*

(22-b) *Ghosts frighten John.*

is predicted, according to Tenny, by an aspectual theory of argument structure: when the Experiencer is an internal argument, as in (22b), it measures out the event, and when it is an external argument, as in (22a), it does not. According to Tenny, the aspectual difference does not derive from differences in thematic structure, but rather it derives only from differences in syntactic structure. Such claims seem to be not only circular but also intuitively dubious. The only linguistic evidence in support of the claim that *John* measures and delimits the event in (22b) are such marginally acceptable examples as:

(23) *(??) The truth frightened John to Ohio.* (cf. Tenny 1989:30, Ex. 35)

And how plausible is the claim that the Experiencer realized as an internal direct object delimits the event in other lexical pairs? Consider, for instance, the following pairs of verbs:

(24-a) *John liked ghosts.*

(24-b) *Ghosts pleased John.*

(25-a) *John enjoyed the play.*

(25-b) *The play amused John.*

The Aspectual Interface Hypothesis also makes wrong predictions with respect to the well-known locative alternation illustrated by the following pair of sentences:

(26-a) *Bill loaded hay onto the wagon.*

(26-b) *Bill loaded the wagon with hay.*

The verbs participating in such a locative alternation as (26) take a Goal and a Theme argument, either of which can be realized as an internal direct object argument. If the Goal argument functions as a direct object, as in (26b), the whole sentence has a completive meaning, that is, it is interpreted as referring to a situation in which the wagon is full of hay, while this is not necessarily the case in (26a).

According to Tenny (1987), the locative alternation can be explained in analogy to the completive meaning in *Bill ate the apple* and the non-completive meaning in the prepositional variant *Bill ate at the apple*. Apart from the obvious similarity in the syntactic surface alternation 'DO : PP', the locative alternation and the alternation sanctioned by the verb *eat* do not work in the same way. The direct object variant in (26b) has a completive reading, whereas *Bill ate the apple* is not necessarily completive. So we may say without any contradiction: *Bill ate the apple, but he did not finish eating it.* On the other hand, the prepositional variant *Bill ate at the apple* asserts that the eating of the apple was not finished. The prepositional variant (26a) does not seem to entail that the wagon was not full with hay, that the event was necessarily not completed.

The locative alternation verbs describe events in which the Goal is a delimited object, and therefore it may be understood as delimiting the event: in filling a wagon with hay, the hay rises up to the top of the wagon and when the wagon is full, the event is completed. In this way, the volume of the wagon may be understood as delimiting the event.

The Theme argument in (26) denotes a mass noun. Mass nouns refer to unspecified continuums of stuff, and therefore cannot delimit events, and consequently cannot give rise to a completive reading of the whole verbal expression. Therefore, (26a) cannot have a completive reading. Notice also that neither (26a) nor (26b) implies that all the available hay was loaded onto the wagon.

However, according to the aspectual constraint on internal direct object arguments, both *the wagon* in (26b) and *hay* in (26a) should measure out and delimit the expressed event. This, of course, cannot be true, because only delimited, or bounded, nominal constituents can delimit the whole verbal expression. In short, the aspectual constraint on internal direct object arguments does not take into account the referential properties of nominal constituents in the internal direct object position, and in particular it does not take into account the 'delimited/bounded vs. non-delimited/non-bounded' distinction.

Another reason why Themes in locative alternations do not often delimit events derives from subcategorization facts the frames with the completive meaning can be interpreted as elaborations of *fill* and require a Goal argument as their direct object

(27-a) *fill the cup with coffee*

(27-b) **fill the coffee into a cup*

Notice also that the locative alternation provides a strong argument against the claim that syntax and semantics are autonomous. It is an alternation in syntactic argument structure that is manifested by a restricted class of verbs and it depends on very specific semantic properties of the Goal (or Source) and Theme roles: the Goal (or Source) is a surface or a container, and the Theme is a material which is applied to (or removed from) that surface or container.

4. One of the main results of the aspect (that is, aspect in Tenny's terms) research to date is a general agreement that aspect properties of sentences are to a large extent determined by the semantics of the main lexical verb. So instead of merely stipulating that the argument which in a semantic representation has a special aspectual role of delimiting the event must be realized as the verb's internal argument, the relevant aspect property must be described in semantic terms. It has been suggested (Dowty 1987 and 1989; Krifka 1986 and 1989; Hinrichs 1985) that an argument can delimit a given event by virtue of being an *incremental Theme* argument of a telic predicator. Roughly, it is the argument that the predicator entails to undergo a gradual change of location or state, regardless whether the change is caused by Agent or not. On this view, the influence of nominal constituents on the aspect properties of a whole verbal expression is accounted for in terms of a homomorphism from such Theme arguments into algebraically-structured telic events (*Krifka-Hinrichs Hypothesis*, cf. Dowty 1988).

Intuitively, the idea of homomorphism can be explained in the following way: take a delimited or telic expression such as *I drank a cup of coffee*. If you drink up only a part of the whole cup of coffee, you have 'affected' or consumed only part of the available coffee. The consumed portion of coffee can be correlated with the time interval during which drinking of that portion of coffee took place. The drinking of coffee ends when all the available coffee is consumed. In this sense, the direct object argument delimits the event.

This is not the case with such expressions as *I washed a shirt* if they have a non-delimited interpretation. Even if it were possible to determine what constitutes the first half of washing a shirt, when you have finished the first half of the washing, you have not necessarily washed the first half of a shirt. Here, there is no straightforward correlation between the change of state of a shirt and the time interval during which washing of that shirt took place.

A verb, verb phrase or sentence denotes a delimited or telic event if it has a definite end-state and if it involves a cumulative change; the delimited event is directed toward a specific goal or limit beyond which the event cannot continue, it exhausts itself at this point, so to speak. Event types, such as *drinking a cup of coffee* or *painting a wall*, are delimited and cumulative, whereas such event types as *washing a shirt* or *pushing a cart* are not. Only in the cumulative cases does the internal direct object delimit the event.

Tenny's Aspectual Interface Hypothesis represents one of the first attempts to use aspect phenomena in recent Government and Binding theory. However, it is riddled with a number of serious problems that seem to stem from the erroneous assumption that differences in aspect can be simply explained by differences in syntax. The syntactic properties of arguments may be necessary (the distinction between a direct and an oblique object, for instance) however, they are not sufficient for the determination of aspect properties of sentences. And more importantly, aspect properties of sentences cannot be reduced to one syntactic property of a single nominal argument. The notion "delimiting argument" cannot be characterized without taking into account the lexical semantics of the argument's governing verbal predicator. Aspect properties are not properties of individual nominal arguments, but rather they are determined by certain fine-grained semantic predicator-argument relations. And as such, they are properties of whole sentences (cf. examples (3a) and (3b) in which the subject determines the non-delimited and delimited reading of the whole sentence). The decision whether a given noun phrase can function as a delimiting argument crucially depends on its semantic properties: apart from being an incremental Theme argument, such distinctions as 'delimited/bounded entity vs. non-delimited/non-bounded entity', 'type vs. token', for example, come into play. In short, if it is not recognized that semantic factors provide the basis for any adequate description of aspect, the claim that a direct object position in the D-structure has a special "aspectual" status remains a mere stipulation. From such a stipulation it does not follow that thematic roles need not be accessible to syntax, because only aspectual properties that are attributed to them are "visible" to syntax. Given this conclusion, there does not seem to be any reason to believe that the Aspectual Interface Hypothesis represents any significant claim about the nature of the mapping between thematic and syntactic structure.

As a number of linguists (before Tenny) already observed, the prominent role of the direct object argument in the delimitation of an expressed event is one of the general mapping principles connecting the thematic and syntactic structure. This idea should be systematically investigated within a theory of mapping as well as within a comprehensive theory of aspect and Aktionsart. A promising suggestion in this direction has been made by Dowty (1988) who observes that the property of being an incremental Theme is one of the properties of the Patient Proto-Role.

Footnotes

1. There is a confusion in the use of the terms *aspect* and *Aktionsart* and in the use of a number of terms subsumed under these two general notions. Strictly speaking, the distinction between a *delimited event* and a *non-delimited event* is an Aktionsart distinction. The term *aspect* should be reserved for the distinction between the perfective and imperfective aspect in Slavic languages or between the progressive and non-progressive form in English, for example. Since the terminological distinction between aspect and Aktionsart is not crucial for the purposes of this paper, I will use Tenny's term *aspect* for a distinction that is usually labeled as an Aktionsart distinction. I will also continue to refer to Tenny's hypothesis as the *Aspectual Interface Hypothesis*. Where it is important to distinguish aspect from Aktionsart, I will use the term *aspect in the wide sense* for the term *Aktionsart* and *aspect in the narrow sense* for the aspect proper.

2. Cf. here footnote 1.

3. See, for example, Dowty (1979:28): "I have not been able to find a single activity verb which cannot have an accomplishment sense in at least some special context."

References

Allen, R. L. 1966. *The verb system of present-day American English.* The Hague: Mouton.

Belletti, A. and L. Rizzi. 1986. "Psych-verbs and Theta-theory". In: *Lexicon Project Working Papers.* Nr. 13. Cambridge, Mass.: MIT Center for Cognitive Studies.

Carlson, L. 1981. "Aspect and Quantification". In: Ph. J.Tedeschi & A. Zaenen (ed.), pp. 31-64.

Dowty, D. R. 1979. *Word Meaning and Montague Grammar. The Semantics of Verbs and Times in Generative Semantics and in Montague's PTQ.* Dordrecht: Reidel.

Dowty, D. R. 1988. "Thematic Proto-Roles, Subject Selection, and Lexical Semantic Defaults", ms. (Paper presented at the 1987 LSA Colloquium. The Twenty-Second Annual Meeting of the Linguistic Society of America, San Francisco; preliminary draft of January 1988).

Dowty, D. R. 1989. "On the Semantic Content of the Notion of 'Thematic Role'". In: Gennaro Chierchia, Barbara Partee and Raymond Turner (eds.), *Property Theory, Type Theory and Natural Language Semantics. Volume II: Semantic Issues.* Kluwer Academic Publishers. Dordrecht, Boston, London.

Fillmore, Charles J. 1968. "The Case for Case". In: Bach, E. and R. Harms (eds.), *Universals in Linguistic Theory*. New York: Holt, Rinehart and Winston, Inc. pp. 1-88.

Fillmore, Charles J. 1977. "The Case for Case Reopened." In: Cole, Peter & J.M. Sadock (eds.) Syntax and Semantics, 8. Grammatical Relations, p.59-81.

Grimshaw, J. 1987. "Psych-Verbs and the Structure of Argument Structure." ms., Brandeis University.

Gruber, Jeffrey, S. 1965. *Studies in Lexical Relations*. Ph.D. Thesis. MIT.

Hinrichs, E. 1985. *A Compositional Semantics for Aktionsarten and NP Reference in English*. Ph.D. Thesis, Ohio State University.

Jackendoff, R. S. 1972. *Semantic Interpretation in Generative Grammar*. Cambridge, Mass.: The MIT Press.

Jackendoff, R. S. 1974. "A Deep Structure Projection Rule". In: *Linguistic Inquiry*. Vol. 5. pp. 481-506.

Krifka, M. 1986. *Massenterme, Individualterme, Aktionsarten*. Unpublished Doctoral Thesis. University of Munich. Federal Republic of Germany.

Krifka, M. 1989. *Nominalreferenz und Zeitkonstitution. Zur Semantik von Massentermen, Individualtermen, Aspektklassen*. München: Wilhelm Fink Verlag.

Levin, B. and Rappaport, M. 1986. "The Formation of Adjectival Passives". In: *Linguistic Inquiry*. Vol. 17. pp. 623-661.

Rappaport, M., Laughren, M. and Levin, B. 1987. "Levels of Lexical Representation". In: *Lexicon Project Working Papers*. Vol. 20. Cambridge, Mass.: MIT Center for Cognitive Science.

Rappaport, Malka and Beth Levin. 1986. "What to do with Theta-roles," Lexicon Working Papers #11. MIT: Center for Cognitive Science.

Ryle, G. 1949. *The Concept of Mind*. Barnes and Noble. London.

Talmy, Leonard. 1985. "Lexicalization Patterns: Semantic Structure in Lexical Forms." In: Shopen, T. (ed.) *Language Typology and Syntactic Description*. vol. 3. Cambridge: Cambridge University Press.

Tenny, C. 1987. *Grammaticalizing Aspect and Affectedness*. Doctoral Dissertation, MIT. Cambridge: Mass.

Tenny, C. 1988. "The Aspectual Interface Hypothesis: The Connection between Syntax and Lexical Semantics. In: *Lexicon Project Working Papers*. Nr. 24. Cambridge, Mass.: Center for Cognitive Science at MIT.

Tenny, C. 1989. "The Aspectual Interface Hypothesis. In: *Lexicon Project Working Papers*. Nr. 31. Cambridge, Mass.: Center for Cognitive Science at MIT.

FEATURE COOCURRENCE CONSTRAINTS, UNDERSPECIFICATION, AND VOWEL GEOMETRY

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1. Introduction.*

Early work in generative phonology, e.g. Chomsky & Halle (1968) and Kisseberth (1970), pointed out that the Morpheme Structure Rules of Halle (1959) did more than constrain underlying representations: they functioned to curb the output of phonological rules as well. This observation naturally led to a formal problem: How should constraints be encoded? This question has played a significant role in recent work, both on underspecification theory (see e.g. Archangeli & Pulleyblank 1986 and Steriade 1987 for two divergent views) and, perhaps to a lesser extent, on feature geometry (e.g. Clements 1985, Sagey 1986).

In this paper, I undertake to resolve two negative effects of the encoding of constraints in such work. One problem is that underspecified representations duplicate the information expressed in the constraints from which they are derived. For instance, it is common in languages with contrastive [atr] for low vowels to bear [-atr] only; in Akan, low vowels are opaque to the (lexical) spreading of [+atr] (Clements 1976, 1981). To account for Akan, Archangeli & Pulleyblank (1986:28) suggest the following constraint, informally given as "[+atr] cannot be connected to a segment X if X is connected to [+low]". (See Clements 1976:61 for a similar proposal.) The constraint results in no lexical [atr] specification for low vowels, [-atr] being later supplied by a redundancy rule of the sort [+low] —> [-atr].

A second problem is that the calculus provided by feature geometry results in the arbitrary formulation of some constraints. Geometric models group together under a common node those features which function as a class. For instance, in Archangeli & Pulleyblank's (1989) model in (1), an extension of Sagey's (1986) articulator-based model, [high], [low], and [back] dock into a single node Dorsal as against [atr] which docks into Tongue Root.

(1) Place Node of A & P (1989:193) (partial geometry only):

```
             Place
            /     \
         Dor       TR
        / | \       |
     low hi  bk    atr
```

As can be seen, the structural relationship between [low] and [atr] is identical to that between [high] and [atr] or [back] and [atr]. [Atr] and [low], [high], [back] or, more accurately, the nodes which dominate them, are in a sister relationship. As such, the constraint *[+low, +atr] is formally identical to the nonconstraints *[-high, +atr], *[+back, +atr], etc.

To solve these problems, I suggest that the geometry for vowels include more structure among features. In particular, by expanding on Mester's (1986) idea of "dependent tier ordering" or, equivalently, on Archangeli's (1985) idea of "coplanar representations", coocurrence constraints such as *[+low, +atr] can be encoded directly into the geometry. For Mester, features involved in a cooccurrence constraint are arranged in a dependency relation as in (2)a, with one immediately dominating the other (cf. Kaye, Lowenstamm & Vergnaud 1985). The constraint is then interpreted as an effect of the Obligatory Contour Principle (McCarthy 1986; see also Steriade 1982) and need not be independently formulated: As like elements are fused on the head tier (F), they are by necessity fused on the dependent tier (G) as well. Features which are not involved in a constraint are in a sisterhood relation as in (2)b. In addition to (2)a and b, I assume that features may be involved in another relation, that of complementarity as in (2)c.

```
(2)a. Dependency Reln:    b. Sisterhood Reln:    c. Complementary Reln:
           F
           |                      /\                       |
           G                     F  G                     F/G
```

Within the context of (2), the geometry I propose is that in (3) where [low] and [atr] are in complementary distribution and each is dependent on [high]. Additionally, [back] and [high] are sisters under a dominating node Vo.

```
(3)  Vowel Geometry:
          Vo
          | \
          |   back
         high
          |
        low/atr
```

The features contained under Vo are essentially those of the Secondary Place node of Clements (1985) and Archangeli & Pulleyblank (1986). Dorsal is not an appropriate label given the inclusion of [atr] which, in articulator-based models, would dock into an independent node.

The problems above disappear within a model which incorporates both dependency and complementary relations. Regarding the arbitrariness problem, since the geometry in (3) governs possible combinations of features, constraints such as *[+low, +atr] are encoded directly, in a nonarbitrary fashion. Negative constraints are expressed as complementary relations between features: [low] and [atr] may never be specified for the same segment. Positive relations are expressed as dependencies between features: [low] and [atr] may only link to segments specified for [high]. The geometry then subsumes part of the role of Structure Preservation (Kiparsky 1985), where Structure Preservation is intended to prevent segments from being specified for non-contrastive features in underlying and lexical representations. I suggest that, because of learnability considerations, all relations are universal (cf. Mester 1986)<1>; however, like Structure Preservation, they need only hold of the lexical phonology. As for the duplication problem, the architecture in (3) eliminates this as well. Not only do the constraints need not be independently formulated, underspecification need not be tailored accordingly. There is no sense in which [atr] is unspecified for low vowels; redundancy rules of the sort [+low] —> [-atr] are then superfluous.

Unlike articulator-based models which necessarily have some phonetic justification, the organization of features in (3) is purely phonologically driven (see also Clements 1985). For instance, while [low] and [atr] are in a complementary relation, both being immediately dominated by [high], they in no way correspond to a single phonetic gesture<2>; and yet, as they occupy the same position in the geometry, they are in essence different manifestations of one feature. In the same vein, while clearly universal, the constraint against simultaneous [+high, +low] is not encoded as a complementarity between [high] and [low] because, unlike the constraint against [+low, +atr], it represents a physical impossibility.

Note that the only sisterhood relation under Vo is that between [back] and [high]. I suggest that this relation formally expresses that [back] and [high] (and the features [high] dominates) constitute independent planes which are anchored into the Vo node. As two planes, the spreading of [back] will not be blocked by specifications on the high plane and spreading on the high plane will not be blocked by [back]. In other words, spreading on different planes is not constrained by locality where locality is defined in (4) from Archangeli & Pulleyblank (1987):

(4) <u>Locality Condition</u> (Archangeli & Pulleyblank 1987):
A rule can apply only if a specified target is adjacent to a specified trigger.

Evidence for the independence of [back] from features on the high plane comes from Back Harmony in languages such as Turkish (Clements & Sezer 1982) and Chamorro (Topping 1968) and from Umlaut in German.

Within the high plane, Vo heads a line of positions, where each position may be filled by a dependent feature. Feature specifications for a given position across segments constitute a tier; all [high] specifications form a tier but, more interestingly, [low] and [atr] specifications together form a tier. Each tier is subject to locality. Thus, the spreading of [+atr] from [high] to [high] is blocked by a linked [+low]; this is precisely what happens in Akan (section 3). In cases where low vowels do not block the spread of [atr], [low] is either floating as in Igbirra (section 4) or unspecified as in Kinande (see Mutaka 1986, Schlindwein 1987). Features which are involved in a dependency relation are also subject to locality. The spreading of [high] is blocked by a linked

[+low] as in Chichewa Height Harmony (see e.g. Harris 1990). When low vowels do not block the spread of [high], [low] is either floating or unspecified at the point when harmony applies; the latter is the case in Pasiego (see Vago 1990, cf. McCarthy 1984).

2. Automatic Spreading and Dependency Relations.

In rule-based accounts of vowel harmony, rule statements explicitly mention (at least) two factors, the feature(s) which spread and the segments which are targetted. (Two other factors, the domain and direction of spreading may perhaps be reduced to the nature and direction of affixation.) There have been attempts to rid rules of the first factor. Halle & Vergnaud (1981, 1982; see also Clements 1976, 1981) draw a formal distinction between autosegments which are linked and those which are floating. While linked features may only spread by language specific rule, floating features are a property of the morpheme, and as such, they spread automatically to all bearers within their domain.<3,4> Regarding the second factor, a geometry like that in (3) which encodes dependencies between vowel features (usually) eliminates the need for explicit reference to target segments.<5> The dependency of [atr] on [high], for instance, necessarily results in the scanning of the high tier for targets in the linking of [atr].

Automatic spreading is often a direct consequence of the dependency relations in (3) combined with a particular view of underspecification, Radical Underspecification (e.g. Kiparsky 1982, 1985, Archangeli & Pulleyblank 1986). The prediction is that, in the unmarked case, in a symmetrical vowel system, where "symmetry" is determined on the head tier (both [+high] and [-high] segments contrast for the dependent feature), the dependent feature will spread in harmony. Since the linking of a dependent feature clearly depends on a specification on the head tier, if (in accord with Radical Underspecification) only one value of a contrastively used feature is initially present, the dependent feature will have to float. To illustrate, consider the nine vowel inventory in (5) where mid and high vowels both contrast for [atr] but only [+high] is specified underlyingly. (Features for a̲ are irrelevant.) Since [atr] docks into [high] and only [+high] is initially present, [atr] must float, at least for the mid vowels e̲ and o̲. We may then assume it floats everywhere, as indicated by the parentheses.

(5)		i	I	e	E	a	O	o	U	u
	high	+	+						+	+
	(atr)	+		+				+		+

The floating [atr] is interpreted as a property of the morpheme and automatically links to all bearers within its domain. Consistent with the geometry in (3), [atr] scans for vowels specified for [high]. In the case of the mid vowels for which [high] is underlyingly absent, [-high] will be supplied simultaneous with the linking of [atr] as dictated by the geometry.<6>

Within standard approaches to feature geometry (see e.g. (1)), where there is no dependency of [atr] on [high], a harmony rule must specify [αhigh] vowels as targets in the linking of [atr]. A constraint such as the Redundancy Rule Ordering Constraint (RROC) is also required to guarantee prior application of the default rule supplying [-high], the default value, as it will be explicitly referred to in the harmony rule. A version of the RROC is provided in (6), from Pulleyblank (1986).

(6) <u>Redundancy Rule Ordering Constraint</u> (Pulleyblank 1986:152).
A rule must not refer to [αF] in its structural description before a default rule assigns [αF] to all [F]-bearing units.

The RROC is not needed in a model which assumes dependency relations between features, at least for cases involving the spreading of dependent features.

3. <u>Akan</u>.

Automatic spreading of floating features is intuitive enough and yet there are problems with it in languages with segments which are opaque to harmony. Akan is one such language; high and mid vowels undergo Atr Harmony while low vowels are opaque. In this section, I argue against automatic spreading and motivate two parts of the geometry, the dependency of [atr] on [high] and the complementarity between [atr] and [low].<7>

Akan vowels are in (7).

(7) Akan Vowels:

Nonderived		Derived/[+atr]	
I	U	i	u
E	O	e	o
a			

Words containing only mid and high vowels suggest that [+atr] is a property of certain roots and links to all vowels within its domain, the word. Compare the derived forms in (8)b with those in (8)a. (All examples are from Clements 1981.)

(8) a.		b.	
E-bU-O	"stone"	e-bu-o	"nest"
tU	"to throw"	tu	"to dig"
O-bE-tU-I	"he came and threw (it)"	o-be-tu-i	"he came and dug (it)"

Initial feature specifications are as in (9); since [atr] is not underlyingly a property of any segment, it is not marked.

(9) Underlying specifications for Akan vowels.

	I	E	a	O	U
high		-	-	-	
low			+		
back				+	+

[-high] is specified underlyingly for both mid and low vowels. Low vowels are additionally specified [+low]. Default [+high] is supplied simultaneous with the linking of [+atr] as in (10).

```
(10) O - bE - tU - I   -->  o - be - tu - i
     |    |                 |    |    :    :
    -H   -H                -H   -H   +H   +H

             +A                    +A
```

The examples in (11) illustrate the opacity of low vowels. The roots, bisa and fumanI, are underlyingly [+atr], as indicated by the quality of their leftmost vowels. However, [+atr] cannot spread beyond a with the result that the final vowel in each case surfaces as [-atr].

```
(11)   o-bisa-I   "he asked (it)"      fumanI   "to search"
      *o-bisa-i                       *fumani
```

The opacity of a results from its representation in (9): [+low] is linked to [-high]. Since [low] and [atr] define a single tier, [+atr] cannot penetrate through the linked [+low] and spreading is effectively blocked. See (12).<8>

```
(12)     Vo    Vo    Vo
         |     |     |
         H    -H     H
         |     |
         |     |
        +A    +L
```

A problem for automatic spreading arises when it is discovered that [+low] blocks spreading of [+atr] to the left as well as to the right. Compare the derivations in (13), o-bisa-I "he asked (it)" and O-kari-i "he weighed (it)".

```
(13) a. b I s a   -->   o - b i s a - I
              |         |     |   |   |
             -H        -H    +H  -H  +H
              |                   |
         +A  +L              +A  +L

     b. k a r I   -->   O - k a r i - i
          |             |     |   |   |
         -H            -H    -H  +H  +H
          |                  |
         +L  +A             +L    +A
```

In (13)a, [+atr] must be to the left of the linked [+low] while in (13)b, it must be to the right. However, until it is linked, [+atr], a property of the morpheme, cannot be ordered with respect to [+low], a property of a segment contained within the morpheme.

One solution is to abandon automatic spreading in favor of cyclic spreading after each morphological operation. Of course, once the floating feature links within the morpheme of which it was underlying a property, it will only be able to spread by rule. Automatic spreading is then a spurious generalization.<9> On the root cycle in the derivations of o-bisa-I and O-kari-i, the floating [+atr] will link to the only possible bearer in each root, to the left of [+low] in bisa and to the right of [+low] in kari.<10> See (14).

```
(14) a. b I s a   -->   b i s a          b. k a r I    -->   k a r i
              |           :   |                 |                |   :
             -H          +H  -H                -H               -H  +H
              |           :   |                 |                |   :
             +L  +A       :  +L  +A            +L  +A           +L  +A
                          :       :
                          :.......:
```

4. Igbirra.

Igbirra, as discussed in Ladefoged (1964, 1971), is another language with Atr Harmony but, unlike Akan, low vowels do undergo harmony. Nevertheless, in accord with the constraint against a vowel being simultaneously [+low, +atr], a raises to e in [+atr] contexts. To account for raising (without delinking - see below), I propose that [+low] in Igbirra is a floating feature, but unlike [+atr] in Akan, it is a property of individual segments. It is ordered with respect to linked features and, in this way, may be interpreted as "extrasegmental", as occupying a particular position in the representation but as invisible unless licensed.

Igbirra vowels are in (15).

(15) Igbirra Vowels:

Nonderived		Derived/[+atr]	
I	U	i	u
E	O	e	o
a		e	

Examples of harmony are in (16) (from Ladefoged 1964:78; all vowels in the examples are high-toned). Note that the first person prefix ma surfaces as me in [+atr] environments, (16)b.

(16) Igbirra Atr Harmony.

a.		b.	
ma-zI	"I am in pain"	me-zi	"I expect"
ma-zE	"I agree"	me-ze	"I am well"
ma-tO	"I pick"	me-to	"I arrange"
ma-tU	"I send"	me-tu	"I beat"

To account for the alternations, I assume the specifications in (17). (+) indicates that [+low], while a property of a, is floating. As in Akan, since [+atr] is not underlying a property of any segment, it is not marked.

(17) Underlying specifications for Igbirra vowels:

	I	E	a	O	U
high	+				+
low			(+)		
back				+	+

Two notes are in order. First, it is crucial that [-back] be unspecified; when a raises, it surfaces as e and not as o, by later application of the default rule assigning [-back]. Second, while I assume that [-high] is initially unspecified, if upon further observation, evidence is found to support [+high] as unspecified, I will not incorrectly predict that a will raise to i. Low vowels along with mid vowels will have a [-high] component. Although a "loses" its (floating) [+low] specification in [+atr] contexts, it retains its (linked) [-high] specification and surfaces as mid.

Regarding the linking of [+atr] to mid vowels in harmony, assuming the specifications in (17), the dependency of [atr] on [high] will require that the redundancy rule supplying [-high] apply simultaneous with the linking of [+atr]. The case of a is similar to that of the mid vowels. Since [+low] is floating, a low vowel will be seen by Atr Harmony as a vowel unspecified for height. When [+atr] attempts to link to such a vowel, it will likewise trigger the redundancy rule supplying [-high]. Once [+atr] has linked, licensing of [+low] is impossible and e results. The analysis therefore relies crucially on low vowels having a [-high] component in addition to a [+low] component.

One might well ask what prevents the linking of [+low] to a before the linking of [+atr]. As the two are formally different entities, [+atr] a property of the morpheme and [+low] a property of the segment, an ordering can be imposed on their linking. I suggest that the licensing of [+low] is similar to the application of a redundancy rule; it applies late in the phonology. The linking of [+atr], on the other hand, applies early; it is triggered by the morphology in essence. In the nonderived cases, then, [+low] links at the end of the derivation since it is not competing with [+atr] for the same position in the hierarchy. The two cases are illustrated in (18).

```
(18) a. Harmony:  [ma [zI + atr] ]  --> mezi  "I expect"
          Vo        Vo
          :         |
         -hi       +hi
            `  - , '
        (+lo) +atr

     b. No harmony:  [ma [zI] ]  --> mazI  "I am in pain"
          Vo        Vo
          :         |
         -hi       +hi
          :
        (+lo)
```

An alternative analysis for Igbirra, where [+low] is underlying linked to [-high] and then delinked by the spreading of [+atr], eliminates the need for extrasegmental (floating) features. However, I suggest that because of considerations of locality, such an analysis is not viable. Delinking as a possible lexical operation (except under restricted conditions like resyllabification) undermines locality: It is impossible to tell from a representation whether a feature [F] will block the spreading of [G] or whether it will be delinked by [G]. This problem is not limited to a model like mine where two different features can occupy a single tier. It arises in any theory which allows both values of a single feature to be specified prior to spreading, e.g. Contrastive Specification (see Steriade 1987). To illustrate the problem within the framework developed here, see (19). If the delinking of [+low] by the spreading of [+atr] is allowed in Igbirra, (19)a, it cannot be prevented from incorrectly applying in Akan, cf. (19)b.

(19) a. Delinking: Igbirra.

```
-H  -H   -->   -H  -H
 |  /  ‡          \/
+A  +L            +A  +L
```

b. Blocking: Akan.

```
-H  -H   -->   -H  -H
 |   |          |   |
+A  +L         +A  +L
```

5. <u>Conclusion</u>.

In this paper, I have argued for a particular view of vowel geometry, one which directly encodes cooccurrence restrictions between features: Positive relations are expressed as dependencies between features; negative constraints are expressed as complementary relations between features. The framework is in a preliminary stage and, naturally, is the target of both conceptual and empirical problems.

For one, I adopted the theory of Radical Underspecification because it is compatible with the "no delinking" premise; for instance, the raising of <u>a</u> to <u>e</u> in Igbirra is accounted for by the absence of a specification for [back] on both segments, [-back] being later supplied by redundancy rule. Nevertheless, problems arise in adapting this theory of underspecification to a framework which encodes dependency relations. As might be expected, these problems are directly tied to the underspecification of head features. As discussed in footnote 6, there is no a priori reason why a dependent feature which spreads should see as targets vowels which are unspecified for features on the head tier, the tier it scans in linking. One solution would be to abandon underspecification in favor of a position similar to that proposed by Kaye, Lowenstamm and Vergnaud (1985).

On the empirical side, since the geometry governs possible combinations of features, it is particularly restrictive in what cross-linguistic variation it allows. Any representation involving a violation of the geometry in (3) must be derived post-lexically. Without weakening the proposal by introducing parametric variation into the geometry, there is no room for "exceptions". How then is Vata to be accounted for, where low vowels pattern with all other vowels in Atr Harmony?

Notes.

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1. There are some exceptions to the complementarity between [low] and [atr] for which I have tentative analyses. In Yoruba (Archangeli & Pulleyblank 1989), low vowels do not contrast for [atr] but do trigger Atr Harmony; in Vata (Kaye 1982), low vowels pattern alongside mid and high vowels in Atr Harmony.
2. Phonetic motivation may not be lacking entirely. Gorecka (1989) argues against [low] as a tongue height feature; in fact, she dispenses with [low] altogether, attributing its effects to the articulation site where low vowels are produced, Pharyngeal.
3. In fact, one could argue that because of indeterminacy, harmonic features must be floating; in a root where all vowels surface as [+F], it is impossible to determine from which vowel(s) [+F] originated.
4. As Mester's (1986) approach involves the OCP operating on the head tier with resultant fusion on the dependent tier, it is tantamount to automatic spreading.
5. This argument holds for rules which scan <u>minimally</u> for their targets, i.e. rules which scan the tier immediately dominating the spreading feature; see Archangeli & Pulleyblank (1987).
6. This assumption is not without problems. There is no a priori reason why a dependent feature like [+atr] should see as targets vowels which are unspecified for features on the head tier. In fact, it is equally possible that [+atr] would see such vowels as neutral. Structure Preservation cannot be appealed to. As pointed out by Archangeli & Pulleyblank (1986) (who cite Sproat 1985), it is difficult to determine whether or not a floating feature like [atr] is used contrastively in a language because a given level of representation may not yield any information on the combination of [atr] with other features.

   One solution, as pointed out to me by J.-R. Vergnaud, is as follows. Since the dependency of [atr] on [high] is equivalent to interpreting [atr] as inherently having a [high] component, the floating [atr] could be a matrix consisting of a zero-valued

[high] and a positive-valued [atr]: [ohigh, +atr]. The matrix then scans for vowels specified for [high] as well as those specified for a Vo node only. See (i).

```
    (i)a.  Vo          b.   Vo
           |                |
          |+H|             |oH|
           :               |+A|
          |oH|
          |+A|
```

In (i)a, the [ohigh] of the spreading feature is compatible with the [+high] of the target segment. In (i)b, where there is no overt specification for [high], the default rule which supplies [-high] will later convert [ohigh] into [-high]. This solution is not really in the spirit of underspecification theory. It is in fact a variant of the proposal in Halle & Vergnaud (1981, 1982; see also Kaye 1982) where an autosegmental feature is simultaneously represented on the segmental tier with the provision that the autosegmental specification, once linked, override the segmental specification. These works may in turn be seen as precursors to Kaye, Lowenstamm & Vergnaud's (1985) Element Theory.

7. Due to lack of space, the dependency of [low] on [high] is only briefly discussed in section 4 on Igbirra where it is seen that low vowels surface as [-high] in [+atr] contexts and as [+low] in neutral contexts. Low vowels function as [-high] in the phonology of other languages as well; in Vowel Coalescence, for instance, which is quite common cross-linguistically, adjacent low-high and low-mid vowels surface as mid, suggesting that low vowels have a [-high] component.

8. Recall from section 1 that the geometry, and the constraints it encodes, need only hold of the lexical phonology. For instance, while in Akan low vowels are opaque to the lexical spreading of [atr], Clements (1981) discusses a number of environments, both within and across words, where low vowels receive [+atr] through post-lexical spreading. Within the post-lexical component, then, branching of dependent features as in (i) is licit and, in this sense, the post-lexical component is not structure-preserving.

```
    (i)       Vo
              |
             -hi
            /   \
         +lo   +atr
```

9. Note that Pulleyblank (1986) rules out automatic spreading for independent reasons, to account for tonal phenomena in several languages.

10. In the case of roots involving more than one potential bearer of [+atr], e.g. *fumanI* "to search" and *pIrako* "pig", I assume extrasyllabicity, *fuma(nI)* and *(pI)rako*, where the vowels which surface as [-atr] are outside the domain of possible bearers for the floating [+atr].

References.

Archangeli, D. (1985) Yokuts harmony: Evidence for coplanar representation in nonlinear phonology. LI 16, 335-372.

Archangeli, D. & D. Pulleyblank (1986) The content and structure of phonological representations. Ms., UA Tucson and USC.

Archangeli, D. & D. Pulleyblank (1987) Maximal and minimal rules: Effects of tier scansion. NELS 17.

Archangeli, D. & D. Pulleyblank (1989) Yoruba vowel harmony. LI 20, 173-217.

Chomsky, N. & M. Halle (1968) The sound pattern of English. New York: Harper & Row.

Clements, G.N. (1976) Vowel harmony in nonlinear generative phonology. IULC.

Clements, G.N. (1981) Akan vowel harmony: A nonlinear analysis. Harvard Studies in Phonology 2, 108-177.

Clements, G.N. (1985) The geometry of phonological features. PY 2, 225-252.

Clements, G.N. & E. Sezer (1982) Vowel and consonant disharmony in Turkish. In H. van der Hulst & N. Smith (eds) The structure of phonological representations, Part II. Dordrecht: Foris. pp. 213-255.

Gorecka, A. (1989) Phonology of articulation. Ph.D. dissertation, MIT.

Halle, M. (1959) The sound pattern of Russian. The Hague: Mouton.

Halle, M. & J.-R. Vergnaud (1981) Harmony processes. In W. Klein & W. Levelt (eds) Crossing the boundaries in linguistics. Reidel. pp. 1-22.

Halle, M. & J.-R. Vergnaud (1982) On the framework of autosegmental phonology. In H. van der Hulst & N. Smith (eds) The structure of phonological representations, Part I. Dordrecht: Foris.

Harris, J. (1990) Reduction harmony. Paper presented at USC.

Kaye, J. (1982) Harmony processes in Vata. In H. van der Hulst & N. Smith (eds) The structure of phonological representations, Part II. Dordrecht: Foris. pp. 383-452.

Kaye, J., J. Lowenstamm & J.-R. Vergnaud (1985) The internal structure of phonological elements: A theory of charm and government. PY 2, 305-328.

Kiparsky, P. (1982) Lexical phonology and morphology. In Linguistic Society of Korea (ed) Linguistics in the morning calm. Seoul: Hanshin.

Kiparsky, P. (1985) Some consequences of Lexical Phonology. PY 2, 85-138.

Kisseberth, C. (1970) On the functional unity of phonological rules. LI 1, 291-306.

Ladefoged, P. (1964) Igbirra notes and word-list. Journal of West African Languages 1, 27-37.

Ladefoged, P. (1971) Preliminaries to linguistic phonetics. Chicago: University of Chicago Press. (2nd edition 1973).

McCarthy, J.J. (1984) Theoretical consequences of Montanes vowel harmony. LI 15, 291-318.

McCarthy, J.J. (1986) OCP effects: Gemination and antigemination. LI 17, 207-263.

Mester, R.A. (1986) Studies in tier structure. Ph.D. dissertation, UMass. Published (1988) by Garland.

Mutaka, N. (1986) Vowel harmony in Kinande. Ms., USC.

Pulleyblank, D. (1986) Tone in lexical phonology. Dordrecht: Reidel.

Sagey, E. (1986) The representation of features and relations in nonlinear phonology. Ph.D. dissertation, MIT.

Schlindwein, D. (1987) P-bearing units: A study of Kinande vowel harmony. NELS 17.

Sproat, R. (1985) On deriving the lexicon. Ph.D. dissertation, MIT.

Steriade, D. (1982) Greek prosodies and the nature of syllabification. Ph.D. dissertation, MIT.

Steriade, D. (1987) Redundant values. CLS 23, 339-362.

Topping, D. (1968) Chamorro vowel harmony. Oceanic Linguistics 7, 67-79.

Vago, R.M. (1990) Underspecification in the height harmony system of Pasiego. Phonology 5, 343-362.

*Level-Ordered Lexical Insertion**

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Function words in English are both stressless and reducible. Function words (FWs) are stressless even in careful speech (1a), and unreduced in normal to fast speech (1b):

(1) a. Stressless: He képt it in a lárge jár.
b. Reducible: Annétte'll be hóping Tóm's asléep.

In this paper I suggest that both the stresslessness and the reducibility of FWs is best modeled by level-ordering the insertion of function words into syntactic structure after stress assignment. According to Level-Ordered Lexical Insertion (LOLI), content words (CWs) are inserted into syntactic structure prior to stress assignment (2a); after stress assignment has taken place (2b), FWs are inserted into syntactic structure (2c), guaranteeing that they will not be stressed.

(2) Level-Ordered Lexical Insertion (LOLI)

a.	Insert CWs		kept				large	jar
b.	Assign Stress		képt				lárge	jár
c.	Insert FWs	he	kept	it	in	a	lárge	jár

FWs are carried through most of the derivation (1a,b) as feature-complexes (cf. Emonds 1985); the "insertion" of FWs is the lexicalization of these feature-complexes. Stress assignment is blind to feature-complexes because they contain no phonological material.

The paper proceeds as follows: first, I discuss non-phonological evidence for LOLI. Second, I discuss *unstressed* FWs in careful speech and argue that LOLI allows a simple way of deriving stressless FWs. Third, I show that LOLI is also able to treat the *reduced* FWs found in normal and fast speech.

Psycholinguistic and Syntactic Evidence for LOLI. Similar proposals for inserting FWs into the derivation late have been proposed outside of phonology by Merrill Garrett and by Joseph Emonds. Garrett (1975, 1980) has proposed a processing model in which CWs are entered into speech production at a different stage than FWs are in order to account for different types of speech errors. When people make speech errors, content words and grammatical words are affected in different ways (Bierwisch 1971; Fromkin

1971: Garrett 1975, 1980). People often switch the initial sounds of two content words in a sentence (*he lept it in a karge jar*), but hardly ever switch the initial sound of a content word and a grammatical word (*ke hept it in a large jar* does not represent a common type of speech error). This may be interpreted as evidence that there is a point in speech production at which only (the phonological forms of) CWs are inserted (cf. 2a above). Another type of speech error involves shifting words or affixes from one part of a sentence to another (*what that add ups to* instead of *what that adds up to*; or *you hafta do come* for *you do hafta come*). Such shift errors involve primarily FWs and inflectional affixes rather than CWs and derivational affixes; again, if FWs are entered into speech production at a different time than CWs (2c above), shirft errors can be modeled as a mis-placement problem at this stage of lexical insertion.

In later work (Garrett 1982, 1984), Garrett expanded his analysis to cover data taken from the speech of patients with agrammatic aphasia. *Agrammatism* is a type of acquired speech disorder in which patients generally omit FWs and inflectional affixes; CWs are less affected (Tissot et al. 1973, Kean 1985). Thus, an Italian agrammatic speaker asked to describe part of a film responds (in translation): "Ah! Policeman... ah.. I know!... cashier... money... ah! cigarettes... I know... this guy... beer... mustache..." (Luria 1970). Garrett takes this as additional evidence for the claim that CWs and FWs are inserted at different stages during speech production: it is at the level at which FWs are inserted that agrammatics have the most difficulty.

Emonds (1985) provides syntactic evidence for what he calls Late Lexical Insertion (LLI): according to LLI, the phonological forms of at least some FWs and all inflectional affixes are entered into syntactic structure after syntactic transformations have occurred, but all CWs (and the derivational affixes on them) are inserted prior to syntactic transformations.[1] Emonds' argument for LLI draws on the fact that many FWs and inflectional affixes satisfy insertion contexts which are only produced by transformation. Consider the distribution of the English coordinative morphemes *so* and *too*. Emonds argues that *so* and *too* are allomophs of a single morpheme he calls 'K'. K appears as *so* when it has been moved to COMP (3a), but as *too* when it appears in situ (3b):

(3) *so/too* alternations (Emonds 1985)

a. Mary will leave town, and so will John.
   *Mary will leave town, and too will John.

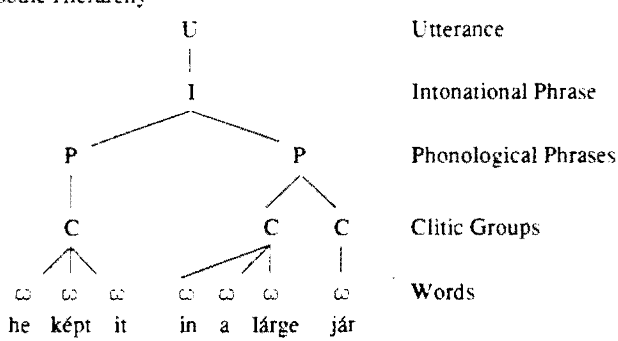
b. Mary will leave town, and John will too.
   *Mary will leave town, and John will so.

Emonds' claim is that the decision to insert *so* or *too* as the allomorph of K must be made after the transformation that fronts K has applied: if K is fronted, insert *so*; if not, insert *too*. Emonds cites Monaghan (1981) as providing evidence for the post-transformational insertion of a number of polarity items (*some/any*, *often/seldom*, *still/yet*, etc.) in English.[2]

LOLI is not exactly equivalent either to Garrett's proposed late insertion of FWs or to Emonds' LLI. What distinguishes LOLI from Garrett's proposal is that FW-insertion follows CW-insertion on the former model, but precedes CW-insertion on the latter. In addition, LOLI is meant to be both a model of processing and a model of competence, whereas Garrett's model is primarily a processing model and makes no claims about competence (1980:216ff). What distinguishes LOLI from LLI is that LOLI has all FWs inserted late, where LLI leaves open the possibility that some FWs are inserted at the same time as CWs are (Emonds 1985:177). I will not discuss these differences here. What LOLI shares with these other proposals is that (1) FWs are carried through the derivation as features and (2) that these features are lexicalized as FWs at a late stage in the derivation.

Stressless Function Words: Careful Speech. Recent work in Prosodic Phonology (Selkirk 1978, 1982; Nespor & Vogel 1982, 1986; Hayes 1989) treats sentence level stress by means of constructing a hierarchy of prosodic consituents above the word. The prosodic constiuency of (1a) may be represented as in (4), following Hayes (1989) and Nespor & Vogel (1986).

(4) The Prosodic Hierarchy



Each morpho-syntactic word in (4) constitutes a phonological word (ω). ωs are grouped into Clitic Groups (CGs), CGs into Phonological Phrases (PPs), PPs into Intonational Phrases (IPs), IPs into Utterances (Us). (See Nespor & Vogel 1986 for a more complete discussion of these prosodic constituents).

Of immediate concern here is the CG and the rules that create it. The CG does two things: first, it defines a domain in which certain phonological rules operate. Second, it creates a stress domain in which exactly one syllable receives primary stress. Hayes (1989) defines a clitic group "roughly as a single content word together with all contiguous grammatical words in the same syntactic constituent".[3] *kept*, *large* and *jar* belong to separate CGs and are the *hosts* of those CGs. *he*, *it*, *in* and *a* are incorporated into the CGs with which they share the most dominating syntactic nodes: *in* and *a* are dominated by the Prepositional Phrase node that dominates *large*, $[_{PP}$ in a large$]_{PP}$, and therefore form a CG with *large*; *it* is dominated by the VP node that dominates *kept*, $[_{VP}$ kept it$]_{VP}$, and so forms a CG with *kept*; *he* is dominated by the S node that dominates *kept*, $[_{S}$ he kept it...$]_{S}$, and so forms a CG with *kept* (and *it*).

Note that FWs are *irrelevant* for determining the distribution of CGs in a sentence and the stressed words in a sentence: CGs consists of exactly one CW, which is the stressed element, or head, of the CG. Since PPs consist exclusively of CGs, FWs are also irrelevant for determining the distribution of PPs in a sentence; likewise for IPs and for Us. FWs play no role in creating prosodic constituency:

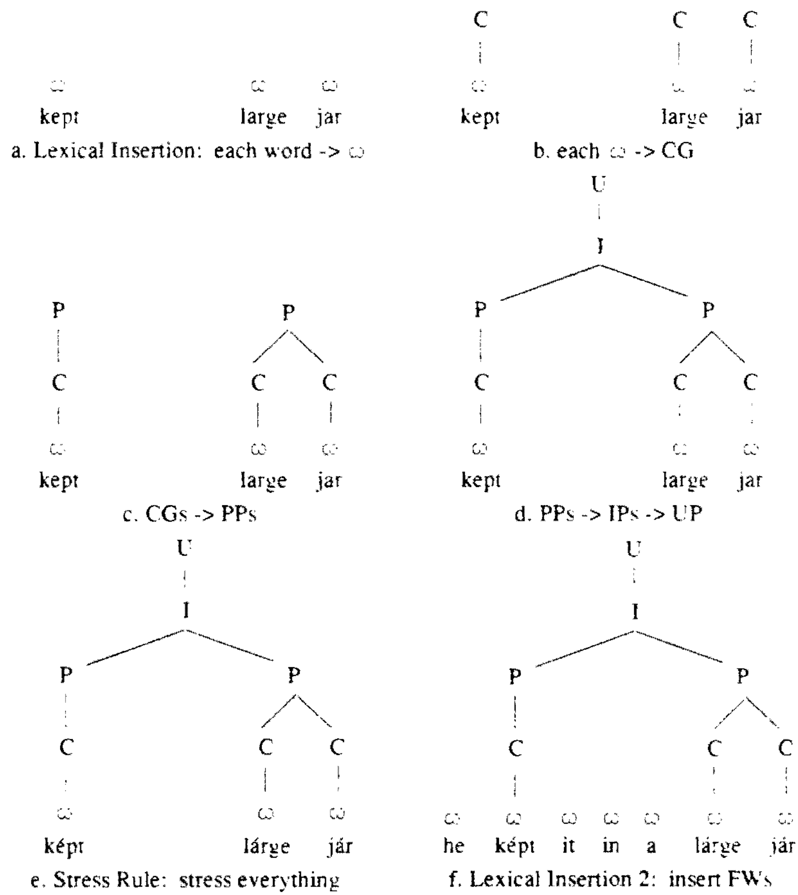
(5) The Prosodic Hierarchy without FWs

U	consists of one or more	IP
IP	consists of one or more	PP
PP	consists of one or more	CG
CG	consists of exactly one	Content Word

As is clear from (5), most of the constituents of the Prosodic Hierarchy in (4) may be constructed *without* Function Words. This is elevated to the status of a general principle in Selkirk (1984:343), who attributes the stresslessness of FWs not to their membership in CGs but to their invisibility to stress assignment: "What we suggest is that the syntactic category labels for function words are simply "invisible" to principles of the syntax-phonology mapping....This is the *Principle of the Categorial Invisibility of Function Words* (PCI)."

LOLI allows us to derive Selkirk's PCI rather than stipulate it. If FWs are not present in the derivation at the stage at which prosodic constituents are built, there is no need for the PCI. A derivation of (1a) without the PCI follows:

(6) Building the Prosodic Hierarchy with LOLI



a. Lexical Insertion: each word -> ω

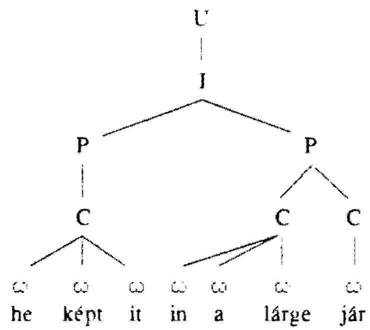
b. each ω -> CG

c. CGs -> PPs

d. PPs -> IPs -> UP

e. Stress Rule: stress everything

f. Lexical Insertion 2: insert FWs

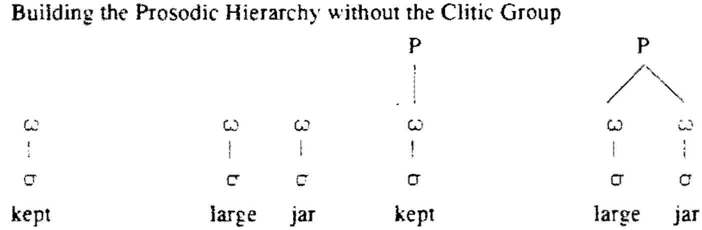


g. Stray adjoin ωs to CGs

In (6a, b), the effects of the PCI fall out from LOLI: FWs are not yet present in the structure and thus do not undergo rules that build prosodic structure. Stress (6e) fails to apply to FWs for the same reason. When FWs are finally entered into the derivation (6f), stress no longer applies and FWs are stray-adjoined into CGs.

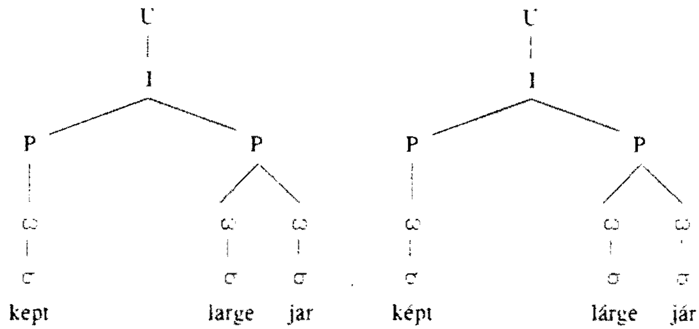
An alternative derivation is also possible, one which eliminates most of the need for the constituent CG. If FWs are entered into the derivation merely as syllables (σ), they can be adjoined to CWs (ω) in the same way as affixes are adjoined to words (cf. Berendsen 1986). CWs are inserted first, each as a ω dominating one or more σ (7a). The construction of PPs, IPs and a UP then proceeds as before (7b-c), except that the constituent PP now dominates prosodic words (ω) rather than CGs. Stress applies as before (7d); FWs enter the derivation as syllables (7e), and are stray-adjoined to adjacent CWs (7f).

(7) Building the Prosodic Hierarchy without the Clitic Group



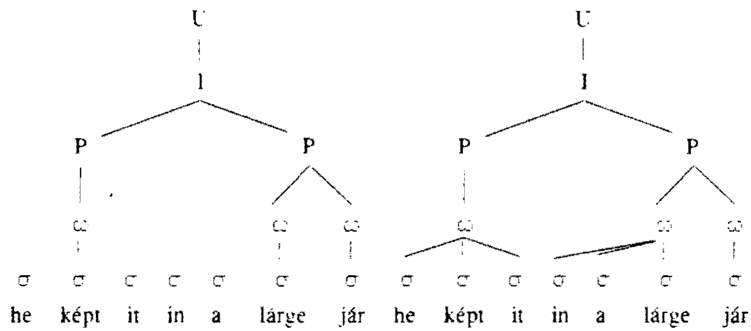
a. insert CWs as ω

b. ωs -> PPs



c. PPs -> IPs -> UP

d. stress rule: stress everything



e. insert FWs as *syllables*

f. stray adjoin σ to ω

For the analysis given in (7) to be adequate, two conditions must be met. First, it must be shown that FWs are indeed stressed like the stressless syllables of CWs, as predicted by (7d) - (7f). Evidence for this claim is given in (8).

(8) FWs sound like the stressless syllables of CWs (cf. Selkirk 1984)

a fénce	*cf.*	offénse	in cápable hands	*cf.*	incápable hands
to Léto	"	Tolédo	hátch it	"	hátchet
Sám or I	"	Sámurai[4]	gíve 'er	"	gíver
some ántics	"	semántics	at 'em	"	Adam

Second, it must be shown that rules whose domain of application is the CG may be restated as rules whose domain of application is ω. That is, rules which apply within clitic groups must be the same as those which apply within prosodic words[5], as argued in Inkelas (1989). For English, there seem to be two rules which may be said to apply within CGs: *v*-Deletion and Palatalization. *v*-Deletion deletes /v/ word-finally within a CG when the next word begins with a consonant (9)[6]. Palatalization palatalizes a word-final coronal obstruent before a palatal segment in the same CG (10)[7].

(9) *v*-Deletion (Selkirk 1972, Hayes 1989)

[give me]$_{CG}$ [a hand]$_{CG}$	>	['gɪmi ə'hænd]	(rhymes with *Timmy*)
[leave me]$_{CG}$ [alone]$_{CG}$	>	['limi ə'lon]	(sounds like *seamy*)

(10) Palatalization

[miss you]$_{CG}$	>	[mɪšš ju]	(sounds like *tissue*)
[hit you]$_{CG}$ [in the nose]$_{CG}$	>	['hɪč ju]	(sounds like *hitch you*)

As Nespor & Vogel point out, *v*-Deletion is not really a prosodic rule since it is lexically conditioned (as Hayes himself notes): *v*-Deletion does not apply to the final [v] of words like *have, perceive* or *involve*, as (11) makes clear.

(11) non-application of *v*-Deletion

[love me]	>	*['ləmi]
[have me fired]	>	*['hæmi]
[deceive me]$_{CG}$	>	*[də'simi]
[involve me]	>	*[ɪn'valmi]

Forms such as *gimme*, therefore, are best treated as lexicalized rather than derived by rule. Palatalization, on the other hand, is not lexically conditioned. But it is also a rule that applies within ω, as the data below show:

(12) Palatization ω-internally (Marchand 1969:350)

a. z -> ʒ	[close + ure]$_{\omega}$	>	[kloʒər]
	[expose + ure]$_{\omega}$	>	[ɛkspoʒər]
b. s -> ʃ	[press + ure]$_{\omega}$	>	[prɛʃər]
	[erase + ure]$_{\omega}$	>	[ɪresər]
c. d -> ǰ	[verd[8] + ure]$_{\omega}$	>	[vərǰər]
	[node + ule]$_{\omega}$	>	[naǰuəl]
d. t -> č	[depart + ure]$_{\omega}$	>	[dɪparčər]
	[legislate + ure]$_{\omega}$	>	[lɛǰɪslečər]

The data in (10), then, may be subsumed under the same ω-domain rule operative in (12), eliminating the need (in English) for the CG as a rule-domain.

I have tried to show that LOLI provides a simple and independently required mechanism for deriving unstressed FWs in careful speech. In the remainder of this paper I will extend the analysis to cover reduced forms of FWs such as *will* (*'ll*) and *am* (*'m*).

Reduced Function Words: Normal Speech. It should be noted, first, that not all FWs in English are reducible. Reduction is lexically idiosyncratic insofar as prosodically identical pairs of words may have reducible and non-reducible members (13).

(13)	Reducible	Non-Reducible	Prosodic Composition
	would ('d)	what	CVC
	has ('s)	his	CVC
	am ('m)	at	VC
	is ('s)	as	VC

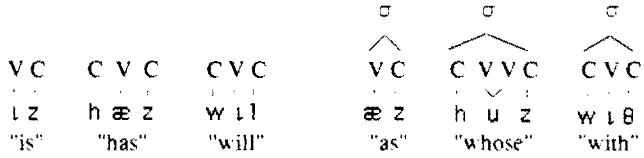
Those FWs that do reduce, however, tend to reduce in the same way: more sonorant segments are deleted, less sonorant segments retained and deletion proceeds from left to right (14).

(14) Reduction and Sonority

Obstruents never[9]:	should, this, to, does
Nasals never[10]:	in, on, can, than
Liquids never:	will, all, or, were
Glides, h sometimes:	would ('d), will ('ll), him ('im); but we, you, who
Vowels often:	am ('m), is ('s), or (r), and (n); at, off, as

Recall that unstressed FWs in careful speech were analyzed as strings of segments entered into syntactic structure as σs and later adjoined to CWs. In normal speech, only *non-reducible* FWs will be analyzed as CV strings dominated by σ: *reducible* FWs will be treated as strings of segments that are entered into syntactic structure without a dominating σ (15):

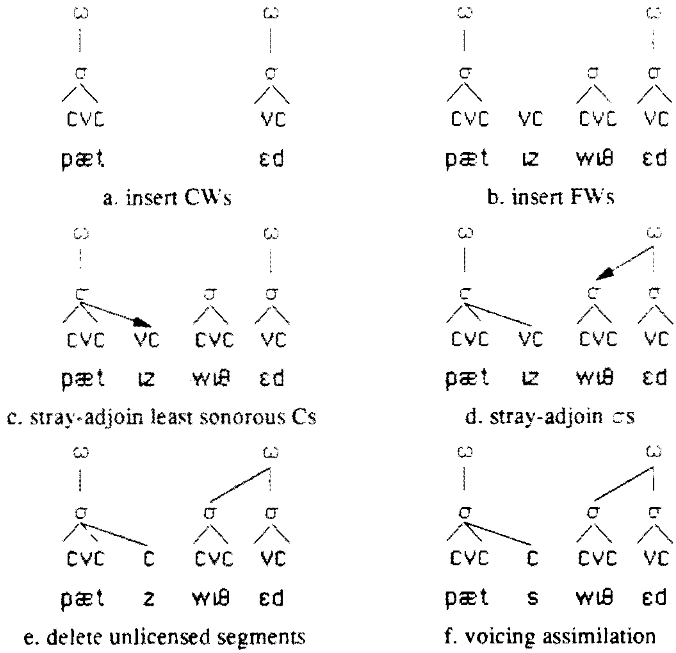
(15) Representation of reducible and non-reducible FWs



a. Reducible FWs b. Non-reducible FWs

The representations in (15) are introduced into syntactic structure (16--prosodic constituency above ω ommitted for clarity) when FWs are entered into the derivation (16b). Stray consonants are adjoined to the codas of preceding syllables (c) and stray syllables are adjoined in accordance with syntactic structure (d)[11].

(16) Derivation of "Pat's with Ed"



Any segments that have not been incorporated into prosodic structure (the vowel of *is*) are deleted (e), and syllable-internal processes such as voicing assimilation repair any ill-formed structured such as [pætz] (f).

The rules of stray adjunction operative in (c) and (d) help to explain an otherwise puzzling fact of unstressed and reduced FWs in English. Consider the prosodic phrasing of the normal (17a) and careful (17b) pronunciation of *Pat is winning*:

(17) Careful (a) and normal (b) phrasing
a. [Pat's] [winning]
b. [Pat] [is winning]

What is peculiar about (17) is the two-way nature of encliticization: *is* is enclitic (phrased with *Pat*) when it is reduced but proclitic (phrased with *winning*) when it is merely unstressed. This is the case generally with unstressed and reduced clitics, as the examples in (18) make clear.

(18) Careful and normal phrasing

a.	[Kate'd] [err]	[I'm] [eating]	[John'll] [eat]
b.	[Kate] [would err]	[I] [am eating]	[John] [will eat]

Two-way encliticization of this sort is captured straightforwardly on the present model: sub-syllable sized FWs are adjoined into prosodic structure without regard for syntactic constituency, syllable-sized FWs are adjoined according to syntactic constituency.

Conclusion. Level-Ordered Lexical Insertion offers a simple analysis of unstressed and reduced function words in English. A number of advantages accrue from such an analysis. (1) LOLI is independently motivated outside of phonology to account for types of attested and unattested speech errors, for the speech of agrammatic patients, and for some of the morpho-syntactic properties of function words. (2) LOLI treats both stressless and reduced function words as essentially the same phenomenon: stressless function words are stray syllables, reduced function words are stray segments. (3) The mechanism involved (stray adjunction) is a rule which *preserves* structure rather than one which *destroys* it: the negative notions 'destressing' and 'reduction' are therefore reduced to a more positive 'saving information'. (4) LOLI may allow us to dispense with the Clitic Group as a prosodic constituent and rule domain.

(5) The analysis makes sense of the 'two-way' encliticization of stressless (proclitic) and reduced (enclitic) function words.

Footnotes

* I would like to thank Cheryl Chan and Bruce Hayes for their comments on an earlier draft of this paper. Shortcomings are my own.

1. I will not discuss inflectional affixes here, but LOLI is intended to include the late insertion of inflectional affixes as well. It is consistent with Anderson's (1982, 1988) claim that 'Inflectional morphology is what is relevant to the syntax'.

2. I do not have access to this paper and am not able to discuss it further.

3. Hayes' formal statement of Clitic Group Formation follows:

a. Every content word (lexical category) belongs to a separate Clitic Group.

b. Def: The host of a Clitic Group is the content word it contains.
Def: X and Y share category membership in C if C dominates both X and Y
Rule: Clitic words are incorporated leftward or rightward into an adjacent Clitic Group. The group selected is the one in which the clitic shares more category membershiups with the host.

Nespor & Vogel (1986) add to this *directional clitics*, words which cliticize leftward or rightward against the direction predicted by their category membership.

4. Both *Sam or I* and *Samurai* have secondary stress on the ultima because of the diphthong; I have not marked it here as the secondary stress is not a function of the morpho-syntactic membership of the syllable in question.

5. Nespor & Vogel (1986:145ff) argue that CG-rules cannot always be reduced to ω-domain rules or to PP-domain rules, citing evidence from Italian. But all of the CG-domain rules they cite may be restated as PP-domain rules. The only evidence they cite that supports their contention that Italian pronominal clitics are not ωs is that "they may never occur alone...[and] they may not receive contrastive stress" (p. 149). Neither of these facts, however, may be construed as prosodically conditioned *rules*. In general, it seems that most clitics may be specified as either independent words (ω) or as dpeendent sub-words (ω or strings of ω, i.e., feet).

6. As Hayes notes, this occurs only with certain lexical items (e.g., *leave*, *give*) and mostly in fast speech.

7. Hayes' formulation of the rule applies only to stridents before palatal stridents; i.e., only to [s] and [z] before [ʃ] and [ʒ]. But palatalization of [s, z]

before a palatal *glide* occurs as well: 'as you know' [æʒjunow], 'knows you well' [nowʒjuwɛl]. And palatalization of coronal stops also occurs before palatals: 'got you' [gačə], 'hit yourself' [hičərsɛlf].
8. A bound root: cf. *verdant*.
9. The one exception is *of*, which generally deletes before C-initial words and is retained before V-initial words: *friend o' Bob's, friend of Ed's*. (see Selkirk 1972).
10. The one exception is *an*, clearly a sandhi form (see Rotenberg 1978).
11. That is, prepositions adjoin to the adjacent word in the following NP, articles adjoin to the adjacent word in the following N', etc. See footnote (3) for an explicit formulation.

Bibliography

Anderson, S. R., 1982. Where's morphology? *Linguistic Inquiry*, 13, 51-612.
----------. 1988. Inflection. In M. Hammond and M. Noon (eds.) *Theoretical Morphology*. San Diego: Academic Press.
Berendsen, E., 1986. *The Phonology of Cliticization*. Dordrecht: Foris.
Bierwisch, M. 1971. Linguistics and language error. In A. Cutler, ed. *Slips of the tongue*. Amsterdam: Mouton.
Emonds, J. E., 1985. *A Unified Theory of Syntactic Categories*. Dordrecht: Foris.
Fromkin, V. A., 1971. The non-anomalous nature of anomalolus utterances. *Language* 47:27-52.
Garrett, M. F., 1975. The analysis of sentence production. In G. Bower (ed.) *The Psychology of learning and motivation: advances in research and theory*, Vol. 9. New York: Academic Press.
----------. 1980. Levels of processing in sentence production. In B. Butterworth, (ed.) *Language production*, Vol I. *Speech and talk*. London: Academic Press.
----------. 1982. Production of speech: observations from normal and pathological language use. In A. Ellis (ed.) *Normality and pathology in cognitive functions*. London: Academic Press.
----------. 1984. The organization of processing structure for language production: application to aphasic speech. In D. Caplan (ed.) *Biological perspectives on language*. Cambridge, MA: MIT Press.

Hayes, B., 1989. The prosodic hierarchy in meter. In P. Kiparsky and G. Youmans. (eds.). *Rhythm and Meter.* Orlando: Academic Press.

Inkelas, S., 1989. *Prosodic Constituency in the Lexicon.* Doctoral dissertation. Stanford University.

Kean, M.-L., ed. 1985. *Agrammatism.* Orlando: Academic Press.

Luria, A.R., 1970. *Traumatic Aphasia.* The Hague: Mouton.

Monaghan, M., 1981. *Negation in English revisited.* University of Washington master's degree thesis.

Nespor, M., and I. Vogel. 1982. Prosodic domains of external sandhi rules. In H. van der Hulst and N. Smith (eds.), *The Structure of Phonological Representation.* Part I. dordrecht: Foris.

----------, 1986. *Prosodic Phonology.* Dordrecht: Foris.

Rotenberg, J., 1978. *The syntax of phonology.* MIT doctoral dissertation.

Selkirk, E. O., 1972. *The Phrase Phonology of English and French.* MIT doctoral dissertation. Published 1980 by Garland Publishing, New York.

----------, 1978. On prosodic structure and its relation to syntactic structure. Paper presented at the Conference on Mental Representation in Phonology. IULC, 1980. Published in T. Fretheim (ed.) (1981) Nordic Prosody II. Trondheim: TAPIR.

----------, 1980. Prosodic domains in phonology: Sanskrit revisited. In M. Aronoff and M.-L. Kean (eds.). *Juncture.* Saratoga, Calif.: Anma Libri.

----------, 1984. *Phonology and Syntax: The Relation between Sound and Structure.* Cambridge, MA: MIT Press.

Tissot, R. J., G.Mounin, and F. Lehrmitte, 1973. *L'agrammatisme.* Brussels: Dessart.

When Syntax Meets Rhythm

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This paper investigates syntactic influences upon rhythm, based on evidence from Chinese folk songs. Folk songs are one domain that has provided significant insight into the question of the phonology-syntax interface, which has attracted a great deal of attention (cf. Kaisse 1985; Selkirk 1984,1986; Nespor & Vogel 1986; Hayes 1989; Nespor 1990 and Chen 1987,1990). In Chinese dialects, folk songs, being derived from poetry, exhibit many of the metrical properties of the latter. Such stylized linguistic form is of interest in that it does not have such diverse structures as common speech, yet it is not as rigidly constrained as poetry (cf. Chen 1984b and Hsiao 1990a,c).

In my other paper (Hsiao 1990c), I proposed a set of Rhythm Principles to condition the well-formedness of Taiwanese folk songs. In this paper, I will first argue that some of the Rhythm Principles in fact demonstrate cross-dialectal truth, and then I will explore how metrical preference of the folk song rhythm may be sensitive to syntactic structure, and finally I will look into the relative timing of syllables involving functional pausing and syllable lengthening of silent beats.

Rhythm Principles and Metricality

Hsiao (1990c) shows that Taiwanese folk song lyrics have the charming property of allowing a mismatch between the number of audible beats and the number of syllables, i.e. a **syllable-beat mismatch**. To be specific, there may be fewer audible beats than syllables.[1] A set of Rhythm Principles are thus posited to account for the metricality of the lyrics in that event, three of which are reproduced in (1) and (2):

(1) Lexical Syllable Principle (LSP)
Only lexical syllables are aligned with a beat, if there is a syllable-beat mismatch.
(2) Stray Syllable Principle (SSP)
A stray syllable is aligned or adjoined to a left-adjacent beat.
(3) Immediate Constituent Principle (ICP)
Syntactic immediate constituents can form a polysyllabic beat if a syllable-beat mismatch is thereby resolved.

These principles are not limited to Taiwanese folk songs but rather are operative across Chinese dialects. Consider first the principles in (1) and (2), which reflect a discrepancy between the major syntactic categories (i.e., N, V and A) and the minor syntactic categories (i.e., P, COM, ADV, ASP, etc.). The former are here termed lexical syllables, and the latter functor syllables. Consider the Mandarin lyrics in (4) and (5):

(4) 'That the baby cries has broken the mother's heart.'
(Zhongguo Geyao Xuan: p. 102)

```
 1  2   3     4      5    6    7
 |  |   |     |\     |    |    |
Bao-bao ku  duan le  niang gan  chang
Baby     cry break PRF mom liver intestines
```

```
(5)* 'That the baby cries has broken the mother's heart.'
      1      2      3   4    5      6      7
      |     /\      |   |    |      |      |
     Bao-bao ku   duan  le  niang  gan   chang
     Baby    cry break PRF  mom   liver  intestines
```

Given a metrical pattern of 7 beats, when we apply this pattern to an 8-syllable line like (4) and (5), two syllables must share a beat. In this case, phonological facts alone are insufficient to determine which two of the syllables will share, i.e., how to include a pattern like (4) and yet exclude one like (5). The key to understanding the contrast between (4) and (5) is the way in which beats are aligned with functors, because in (4) there is a mismatch between the number of the beats and the number of syllables. This results in all of the syllables being aligned with a beat, except the third syllable *le*, which is a perfect marker (that is to say, a functor) and thus is adjoined to the left-adjacent weak beat, according to the LSP in (1) and the SSP in (2). (For further discussion of *le*, cf. Hsiao 1990b). Now compare (6) and (7):

```
(6)  'A little student came down the road.'
     (Beiping Tongyao Xuanji: p.9)
      1   2         3        4   5       6  7
      |   |         |\       |   |       |  |
     Luzhong      lai le    ge xiao   xuesheng
     Road        come DIR   CL little  student
(7)  'A little student came down the road.'
      1   2       3       4      5       6  7
      |   |       |       |\     |       |  |
     Luzhong     lai     le ge  xiao   xuesheng
     Morning    come     DIR CL little  student
```

In either rhythm, the LSP requires that all syllables be aligned with a beat except the two adjacent functor syllables, *le* and *ge*, that is to say, an extra beat would be left unaligned. The SSP would allow either *le* or *ge* to be aligned with the extra beat. (6) shows that *ge* is aligned with the extra beat, and *le* is left-adjoined to beat number 3; whereas in (7), *le* is aligned to the extra beat, and *ge* is then left-adjoined with the beat. (6) and (7) therefore are alternative readings. Consider also the Shanghai rhymes in (8):

```
(8)  '(One's) forehead touches the ceiling -- he is very lucky.'
     (Shanghai Qu Fangyian Zhi: p. 497)
               1          2       3       4  5  6
               /\         |       |\      |  |  |
          Ngoq-goq       de      ba zeq  ti-ho-be
     Forehead-corner   head   touch to   ceiling
                \/           /
                 N          /
                  \        /
                     NP
```

In (8), there are two disyllabic beats, that is, beat number 1 and beat number 3. Again, the functor *zeq* is adjoined to beat number 3, while beat number 1 is aligned with the Immediate Constituents (ICs) of the noun, which leads to the ICP in (3). This principle thus dictates that the ICs of the noun in (8), that is, ngoq-goq, form a disyllabic beat so that the syllable-beat mismatch can be resolved. (9) and (10) show that a nonmetrical rhythm may be derived in the absence of the ICP:

```
(9).  'Go to the Bridge of the Eight Gods.'
      (Shanghai Qu Fangyian Zhi: p. 508)
       1    2      3
       |   / \     |
      To  Paq Xi   jio
      Go Eight Gods Bridge
              \ /    /
               N    /
                \  /
                 NP
(10).* 'Go to the Bridge of the Eight Gods.'
        1    2     3
        |    |    / \
        To  Paq Xi   jio
        Go Eight Gods Bridge
               \ /
                N
```

In (9) the two syllables Paq Xi are ICs of the noun, so they form a beat and resolve the syllable-beat mismatch. In (10), the ICs of the noun fail to form a beat, and, as expected, the reading is not metrical. Notice that when ICs of a syntactic node form a beat, it can be thought of as the beat being aligned with the syntactic node.

Syntactic Structure and Metrical Preference

In most cases, rhythmic properties are sensitive to syntactic constituency. The ICP allows metrical beats to be aligned with syntactic nodes (N in (8-10), et cetera), and the lyric rhythm, in fact, can be thought of as a result of matching metrical and syntactic constituents. What is more is that such matching can frequently be extended to higher levels. Consider the Taiwanese lyrics in (11) and (12) and the Mandarin lyrics in (13) and (14): (6 = silent beat)

```
(11)  'Have peanuts after the meal.'
      (Taiwan Minyao: p. 192)
         f          f          f
        / \        / \        / \
        1 2       3   4       5 6
        | |       |  / \      |
      Jiat-ba   pui to-dao   zin
      eat-full have pea-nut  grain
        \ /      \    \ /    /
         V        \    N    /
                   \    \  /
                    \    NP
                     \  /
                      S
```

(12) 'Have peanuts after the meal.'

```
            f            f        f
           / \          /\       /\
        1       2     3  4      5  6
       /\       |     |  |      |
     Jiat-ba   pui   to-dao    zin
     eat-full have  pea-nut   grain
       \/        \     \/      /
       V          \    N      /
                   \    \    /
                    \    NP
                     \  /
                      S
```

(13) 'The wife rolls over the ground.'
(Beiping Tongyao Xuanji: p. 17)

```
        f             f
       /\           /   \
       1 2          3     4
       | |         /\     |
     Lao-puo    man-di    gun
      Wife    over-ground roll
       \/        \/       /
       N        ADV      /
                  \     /
                    VP
```

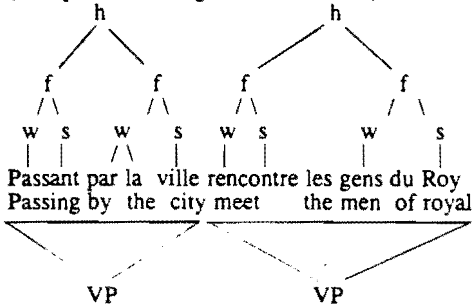
(14) 'The wife rolls over the ground.'

```
            f          f
           /\        /   \
        1       2   3     4
       /\       |   |     |
     Lao-puo  man-di     gun
      Wife   over-ground roll
       \/        \/      /
       N        ADV     /
                  \    /
                   VP
```

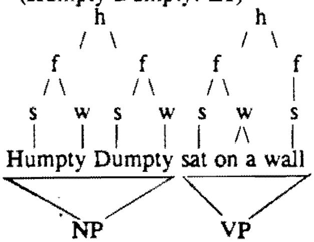
Although (12) is an alternative rhythm of (11), and (14) is an alternative rhythm of (13), the rhythms in (12) and (14) are heard less often, and they do not sound as good as those in (11) and (13). If we look at the largest syntactic breaks (SBs) in those lines, i.e., the break between V and S in (11) and (12) and that between N and VP in (13) and (14), we can find that the largest SBs in (12) and (14) are foot-internal, while those in (11) and (13) match the breaks between the feet. In other words, the SB mismatches in (12) and (14) create more 'metrical tension', with the result that these rhythms are not favored in oral rendering.

Syntactic breaks (SBs) are also an important factor in determining the rhythm in Western folk songs and nursery rhymes, particularly in forming the domains of metrical rules (cf. Gueron 1973,1974; Napoli 1978). The lyrics of the French Comptine in (15) and the English Mother Goose in (16) illustrate this well:

(15) 'Passing by the city, meeting the royal men.'
(Comptines de Langue Francaise: L2)



(16) (Humpty Dumpty: L1)



As the examples show, the two hemistichs in either line do not necessarily contain an equal number of syllables, but rather the cut between the hemistichs coincides with the major syntactic break (SB). That is, it falls at the VP-VP break in (15) and the NP-VP break in (16). The syntactically defined hemistichs serve as the domains to which metrical rules apply, e.g., two feet are formed in each hemistich. Moreover, in Western nursery rhymes there are usually realization rules mapping the underlying metrical pattern into the surface metrical output. The application of such realization rules may also be sensitive to the hemistichs, as shown in the following Italian tongue-twister:

(17) 'The tablecloth is not garlic.'
(Italian Trentino Rhymes: L3)
w w s w w w s w Surface
La tovaglia non e l'aglio
The tablecloth not is garlic

The first impression of (17) is that it has a rather irregular metrical pattern. However, when (17) is parsed into two hemistichs, as given in (18), a parallelism is found, i.e., each hemistich has a pattern of 'w w s w' on the surface.

(18) 'The tablecloth is not garlic.'

```
         h               h
        / \             / \
       f   f           f   f
      / \  /\         / \  /\
     s  w s w       s  w  s w      Underlying
     w              w              Realization Rule
     w  w s w       w  w  s w      Surface
     La tovaglia    non e l'aglio
     The tablecloth not is garlic

            NP            VP
```

The division of the hemistichs matches the NP-VP break. A relevant realization rule dictates that the stressed position (s) of a trochaic hemistich is optionally realized by an unstressed syllable (w). The hemistich-based analysis thus enables lines like (18) to have an underlying trochaic meter, which undergoes the realization rule and surfaces as in (17).

Pausing and Syllable-Lengthening

The final phenomenon of the folk song rhythm that I would like to address is the nature of pausing and syllable-lengthening involving silent beats. I will not attempt to give here an exhaustive account of the distribution of the silent beats, but rather I will explicate the function of the silent beat which is found between two adjacent lines, to further motivate the Rhythm Principles in (1-3). The silent beats are comparable to Selkirk's (1984) silent grid positions in the sense that they may correspond to pausing and syllable-lengthening. A principle of pausing given by Selkirk is reproduced in (19).

(19) Pause
A grid position not aligned with syllables is realized in time by an absence of phonation, namely a pause.

Given this principle, the underlined silent grid positions in (20) are interpreted as pauses.

(20) Pausing

```
   x            x
   x        x   x
   x x x    x x x  x  x
  traveling    tomorrow
```

Conversely, in Selkirk's autosegmental account of the syllable-lengthening, grids and syllables are treated as separate tiers, and the grid-to-syllable alignment is considered to be another case of association between elements on different tiers. Thus, (21) can be derived.

(21) Syllable-Lengthening

```
x           x
x       x   x
x x x   x x x x  x
| | |       | |  |
o o o       o o  o
| | |       | |  |
traveling   tomorrow
```

The silent beat in the lyrics of Chinese folk songs can be understood in the same way. Its occurrence may also indicate pausing or syllable-lengthening, as in (22) and (23).

(22) 'Bodhisattva Guan-Yim smiles.'
(Taiwan Minyao: p. 190)
Pausing

```
 1    2     3 4  5   6   7
 |    |     |    |   |   |
Guan-Yim   Ma  # bin qio qio
Kuan-Yim madam   face smile
```

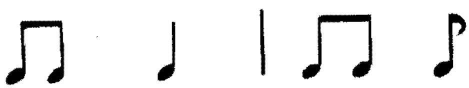
(23) 'Bodhisattva Guan-Yim smiles.'
Syllable-lengthening

```
 1    2     3 4  5   6   7
 |    |     |    |   |   |
Guan-Yim   Ma  # bin qio qio
Kuan-Yim madam   face smile
```

There are clear-cut pauses in (22), as the silent beat remains unaligned. On the other hand, this silent beat in (23) is thought of as being aligned with the left-adjacent syllables *Ma* and *qio*, and the duration of these two syllables is twice as long as the others. The relative timing of (22) and (23) can be represented by the musical notation in (24) and (25) respectively.

(24)

(25)



Lerdahl & Jackendoff (1983), Jackendoff (1989), Oehrle (1989), and Prince (1989), among others, suggest that the metrical beat contributes to linguistic rhythm in much the same way that the musical beat does to musical rhythm. The rhythmic properties of the silent beat are attributed to functional pausing and syllable-lengthening. A close analogy might be the musical **articulation mark** (also called a **breath mark**), which is usually represented by the symbol "v", as show in (26):

(26) (Antologia dei Cantid' Italiani: p. 6)

The occurrence of the articulation mark allows a singer to breathe before he/she sings the next note. When the singer breathes, there is a short pause for rest in the song; however, if the singer decides to ignore the articulation mark, he/she may lengthen the note preceding the symbol "v" and sing through the subsequent notes without pause.

Notice that the articulation mark in (26) is placed outside the staff; neither a rest mark nor a separate musical note is imposed on the staff because of it. What this means is that the articulation mark only functions to allow these two options, neither of which is meant to be perceived by the listener. Similarly, some experimental and theoretical studies such as in Martin (1970a,b), Lehiste (1979b) and Selkirk (1984) also show that listeners do not perceptually distinguish between pauses and syllable-lengthening of the silent beat. It is thus necessary to clarify that in the case of syllable-lengthening the silent beat is "functionally aligned" but not physically aligned with the syllable. In other words, such "functional alignment" does not make it an audible beat.

The concept of functional alignment, however, may explain why a silent beat is not totally taken when it is adjoined by a syllable, as in cases like (27) and (28):

(27) 'The old man carries a hoe to patrol the meadow.'
(Taiwan Minyao: p. 183)

```
 1    2     3   4  5  6        7      8  9
 |   /\     |   |  | / \       |      |  |
Lao  be-a  gia  di-tao # ki   sun    cao-bo
Old man-SUF lift hoe-head  COM patrol grass-land
```

(28) 'The little boy disguises (himself) as the police to catch the robber.'
(Mandarin; created line)

```
 1     2      3        4    5  6       7    8     9
 |    /\      |        |    | / \      |    |     |
Xiao hai-zi  ban      jing-cha # lai   zho qiang-dao
Tiny boy-SUF disguise  police   COM   catch  robber
```

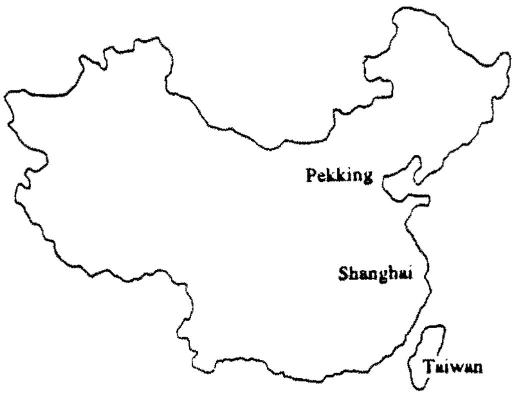
Notice that *ki* in (27) and *lai* in (28) take only half of the silent beat, That is to say, if a beat takes ***n*** msec, the *ki* or *lai* takes ***0.5n*** msec in terms of relative time value, and the other half of the silent beat (or the other ***0.5n*** msec) goes to the lengthening of the syllable *tao* or *cha*.

In general, we have observed that certain syntactic factors are crucial to the rhythm of Chinese folk songs.[2] Beat alignment is sensitive to the syntactic status of syllables, i.e., lexical syllables vs. functor syllables, and the information of IC sanctions the alignment of beats with syntactic nodes (N in (8-10), et cetera). The Rhythm Principles in (1-3), which serve to condition the metricality of the folk song lyrics, are cross-dialectally true in Chinese. (For further discussion of the Rhythm Principles, cf. Hsiao 1990c). In addition, metrical preference can be accounted for with reference to syntactic breaks. The matching (or alignment) between syntactic and metrical constituents may be extended to higher levels (foot and the like).

Footnotes

1. Hsiao (1990c) proposes the principles for selecting metrical patterns as follows: 1) the audible beat cannot outnumber the syllables, and 2) a metrical pattern cannot be selected if it would result in beat alignments violating the Rhythm Principles. It is worth noting that since the Rhythm Principles condition the well-formedness of the lyrics, it is only natural that a selected metrical pattern must facilitate those principles in terms of beat alignment.
2. In this paper, I sample three dialects of Chinese which I consider most representative, that is, Mandarin, Shanghai, and Taiwanese. The reason for selecting these three dialects is because of their geographic distance and linguistic distance. Mandarin is the Standard Mandarin dialect of Chinese, spoken in Peking and its neighboring areas. Shanghai is a Wu dialect of Chinese, spoken in Shanghai and its neighboring areas. As for Taiwanese, it is a Southern Min dialect of Chinese, spoken in Taiwan and on its neighboring islands, and when this dialect is spoken elsewhere, it is called by various names, e.g., Amoy, Hokkian, Xiamen and so on. In spite of slight differences, those regional variants are close enough to be considered a single dialect.

(30)



As shown in (30), Mandarin is a northern dialect, while Taiwanese is a southern dialect, and Shanghai is in between. These three dialects also show great differences in linguistic nature, for example, tone sandhi, as illustrated by (30-32): (T = base tone; t = sandhi tone; TS = tone sandhi)

(30) Mandarin TS (31) Shanghai TS (32) Taiwanese TS

```
[ o o o o o ]      [ o o o o o ]      [ o o o o o ]
    L L              |                  T T T T T
    |                T                  t t t t T
    HL
```

The Mandarin tone sandhi in (30) operates when two low tones in a tonal domain are adjacent, as the first low tone becomes a low-high. (31) shows that in Shanghai tone sandhi, within a tonal domain the tone carried by the first syllable spreads to the rest of the syllables. The Taiwanese tone sandhi in (32) then shows that within a tonal domain, only the rightmost syllable retains its base tone, and all the preceding syllables surface with sandhi tones. What is of interest here is that in spite of their geographic and linguistic distance, these three dialects display very similar rhythmic properties: they are sensitive to syntactic conditions.

Bibliography

Antologia dei Cantid' Italiani: Tenor 1. 3rd ed. 1980. Taipei: Semibreve Music Club.

Chen, M. 1984b. "Unfolding Latent Principles of Literary Taste: Poetry as a Window onto Language." *Tsing Hua Journal of Chinese Studies.* 16: 203-240.

Chen, M. 1987. "The Syntax of Xiamen Tone Sandhi." *Phonology Yearbook.* 4: 109-150. New York: Cambridge University Press.

Chen, M. 1990. "What must Phonology Know about Syntax?" *The Phonology-Syntax Connection.* Inkelas, S. and D. Zec, eds. Chicago: the University of Chicago Press.

Chen, Z., ed. 1968. *Beiping Tongyao Xuanji [Selections of Peking Nursery Rhymes].* Taipei: Cheng Chung Book Co., Ltd.

Chien, S. 1987. *Taiwan Minyao [Taiwanese Folk Songs].* 2nd ed. Taipei: Chung Wen Press.

Gueron, J. 1973. "Children's Verse and the Halle-Keyser Theory of Prosody." *The The Great Excluded.* 2: 197-208.

Gueron, J. 1974. "The Meter of Nursery Rhymes: an Application of the Halle-Keyser Theory of Meter." *Poetics.* 12: 73-111.

Hsiao, Y. 1990a. "The Bermuda Triangle of Syntax, Rhythm and Tone." Paper presented at the 7th Annual Eastern States Conference on Linguistics. The Ohio State University. To appear in *Proceedings of ESCOL '90.*

Hsiao, Y. 1990b. "The Polysemous Perfect Aspect in Mandarin." Paper presented at the 25th Anniversary of the Mid-America Linguistics Conference. The University of Kansas. To appear in *Proceedings of MALC 25.*

Hsiao, Y. 1990c. "A Prosodic-Syntactic Approach to Metricality: Evidence from the Rhythm of Taiwanese Folk Songs." Paper presented at the 16th Annual Minnesota Conference on Language and Linguistics.

Jackendoff, R. 1989. "A Comparison of Rhythmic Structure in Music and Language." *Phonology and Phonetics*. 1: 15-44.
Kaisse, E. 1985. *Connected Speech: the Interaction between Syntax and Phonology*.
New York: Academic Press.
Lerdahl, F., and R. Jackendoff. 1983. *A Generative Theory of Tonal Music*. Cambridge: MIT Press.
Lehiste, I. 1979. "Perception of Sentence and Paragraph Boundaries." *Frontiers of Speech Research*. B. Lindblom and S. Ohman, eds. New York: Academic Press.
Martin, J. 1970a. "On Judging Pauses in Spontaneous speech." *Journal of Verbal Learning and Verbal Behavior*. 9: 75-78.
Martin, J. 1970b. "Rhythm-Induced Judgements of Word Stress in Sentences." *Journal of Verbal Learning and Verbal Behavior*. 9: 627-633.
Napoli, D. 1978. "The Metrics of Italian Nursery Rhymes." *Language and Style*. 11: 40-59.
Nespor, M. 1990. "On the separation of Prosodic and Rhythmic Phonology." *The Phonology-Syntax Connection*. Inkelas, S. and D. Zec, eds. Chicago: the University of Chicago Press.
Nespor, M., and I. Vogel. 1986. *Prosodic Phonology*. Dordrecht: Foris Publications.
Prince, A. 1989. "Metrical Forms." *Phonetics and Phonology*. 1: 45-80.
Selkirk, E. 1984. *Phonology and Syntax: the Relation between Sound and Structure*. Cambridge: MIT Press.
Selkirk, E. 1986. "On Derived Domain in Sentence Phonology." *Phonology Yearbook*. New York: Cambridge University Press. 3: 371-405.
Shih, C. 1986. *The Prosodic Domain of Tone Sandhi in Chinese*. University of California, San Diego. Ph.D. Dissertation.
Shih, C. 1990. Mandarin Third Tone Sandhi and Prosodic Structure. To appear in *Studies in Chinese Phonology*. Wang, J. and N. Smith, eds. Dordrecht: Foris Publications.
Xu, B. 1989. *Shanghai Qu Fangyian Zhi [Data of the Dialects in the Shanghai Area]*. Shanghai: Shanghai Education Press.
Zhongguo Geyao Xuan [Selections of Chinese Folk Songs. 1978. 2nd ed. Shanghai: Shanghai Wunyi Press.

Consonant/Vowel Interaction in Maltese and its Implications for Feature Theory*

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0. Introduction

In this paper I discuss the patterning of the high front vowel [i] and coronal obstruents, both anterior and non-anterior, in the formation of the imperfective in Standard Maltese Arabic. I claim that by specifying these sounds with a common feature, an option which is not available in standard feature theory (based on Chomsky & Halle 1968, henceforth SPE), their patterning receives a natural explanation. It is shown that the parallelism observed between these segments is most insightfully accounted for as the result of vowel-to-consonant assimilation, a process in which the vowel acquires the feature value [+coronal] of a following coronal obstruent. I claim that this and other cases of consonant/vowel interaction in Maltese present strong evidence in support of a feature theory along the lines proposed in Clements (1989) in which consonants and vowels are specified for the same set of articulator features. This paper thus bears directly on issues concerning the feature specification of consonants and vowels, and in addition, on the representation of consonant/vowel interaction within a nonlinear model of feature organization.

The organization of this paper is as follows. In the first section, I lay out the general formation of the imperfective singular of the triliteral verb (first binyan) focussing, in particular, on the realization of the prefix vowel. Following this, I discuss imperfective verbs which evidence the patterning of [i] and coronal obstruents. I show that their apparent exceptional behavior is the expected consequence of the fact that these segments are members of a natural class. In the final section, I discuss other cases of consonant/vowel interaction as predicted by the model of feature geometry adopted in this work and propose an account of the observed lack of parallelism between velar and labial consonants and back, rounded vowels.

The data in this paper are drawn from a wide range of sources which include Aquilina (1959), Berrondonner et al (1983), Borġ (1973), Brame (1972, 1973), Bugeja (1984), Busuttil (1981), Butcher (1938), Puech (1978, 1979) and Sutcliffe (1939). These data are consistent with the variety of Maltese spoken by my consultants.

1. The Realization of the Imperfective Prefix Vowel (First Binyan)

In Maltese, as in other Arabic dialects, the triliteral strong verb is characterized by a root consisting of three radical consonants, e.g. ʔsm 'break'. As shown in (1), the third person masculine singular form of the perfective has the form CVCVC, e.g. ʔəsəm 'he broke'. This, as discussed further below, constitutes the base from which the imperfective stem is derived. The imperfective singular, as shown in (1), is made up of a CCVC stem to which a prefix of the form CV is added, e.g. yə+ʔsəm 'he breaks'. For reasons of simplicity, the examples in this text appear in the third person masculine singular.

(1)	Stem Vowel	Imperfective singular (3rd pers. m. sg.)	Perfective (3rd p. m. sg.)	Gloss
		CV + CCVC	CVCVC	
a)	/a/	ya+ʔsam	ʔasam	'to break'
b)	/e/	ye+ħmez	ħemez	'to pin'
c)	/o/	yo+krob	korob	'to groan'
d)	/i/	yi+rfed[1]	rifed	'to support'
e)	/i/	yi+lħaʔ	laħaʔ	'to reach'

As exemplified in (1), the quality of the imperfective prefix vowel varies. In (1a) it is [a], in (1b) it is [e], in (1c) it is [o] and in (1d) and (1e) it is [i]. In general, the imperfective prefix vowel is identical to the underlying vocalic melody of the stem (given to the left of the imperfectives in (1)). Note that each stem (perfective and imperfective), is associated with a vocalic melody of a single quality in underlying representation (Berrondonner et al 1983; Hume 1990b).

It will be noticed that the underlying vocalic melody of the verb 'to reach' in (1e) is /i/ which differs from the surface realization of the stem vowels. Due to the influence of an adjacent guttural consonant, /i/ surfaces as [a], e.g. /liħiʔ/ → [laħaʔ] 'he reached'. The rule accounting for this change, which I refer to as Guttural Assimilation (GA), is given in (2) (cf. Brame 1972).

(2) Guttural Assimilation: /i/ -> [a] % __ [ħ, ʔ]
The vowel /i/ is realized as [a] when adjacent to the pharyngeal fricative or the glottal stop.

Guttural Assimilation applies bi-directionally changing /i/ to [a] when adjacent to the pharyngeal fricative or glottal stop. I should note that although a nonlinear formulation of this rule is perhaps more insightful (see Hume 1990b), the linear form given in (2) is sufficient for our present purposes. Motivation for Guttural Assimilation comes in part from facts concerning the distribution of [i] within the base form of the verb, i.e. 3rd person masc. sing. perfective; there are no surface occurrences of [i] next to a guttural consonant, although all other vowels appear in this position. Moreover, as will be shown below, positing underlying /i/ also allows for a straightforward account of the quality of the prefix vowel in forms such as (1e).

Following Puech (1979), I assume that imperfective stem is derived from the canonical structure CVCVC, identical to the form of the third person masculine singular of the perfective verb. With the addition of the prefix CV-, the first stem vowel deletes resulting in the surface form CV+CCVC. Following Brame (1972), I state the rule of Syncope, which accounts for this vowel deletion, as in (3) below.

(3) Syncope: $\breve{V} \rightarrow \varnothing$ / __CV
An unstressed[2] vowel in a non-final open syllable deletes.

I suggest that Syncope is central in accounting for the realization of the prefix vowel. Based on independent evidence (see discussion of the plural imperfective in Hume, to appear), it is assumed that when Syncope occurs, the vocalic melody of the vowel target remains floating. By Universal Association

Conventions along the lines proposed in Goldsmith (1976), the floating melody links up to the prefix vowel which I claim enters into the derivation unspecified for features (see Hume 1990b). For the ease of exposition, I refer to the association of a floating melody as Vocalic Mapping as given in (4).

(4) Vocalic Mapping

```
  V          A floating vocalic melody maps onto
  ¦          an empty V-slot (where [ ]' represents
  ¦          an unassociated vocalic melody).
 [ ]'
```

The derivation in (5) illustrates these processes and shows what I assume to be the typical formation of the imperfective prefix vowel. On the left, only the prosodic template is given whereas on the right, a more concrete example is given based on the verb 'to reach'[3].

(5) e.g. /liħiʔ/ [laħaʔ] 'he reached'

```
                       C V́+ C V C V C        y V́ + l i ħ i ʔ
                              |
                             [ ]
Syncope                C V   C   C V C       y V   l   ħ i ʔ
                             [ ]'                  [i]'
Vocalic Mapping        C V   C   C V C       y V   l   ħ i ʔ
                             [ ]'                  [i]'
Guttural Assimilation                        y i   l ħ a ʔ
output                                         [yilħaʔ]
                                               'he reaches'
```

As illustrated in (5), Syncope deletes the first vowel slot of the stem leaving the vocalic melody floating. By Vocalic Mapping, the floating melody maps onto the empty V-slot of the prefix in a feature-filling manner. Guttural Assimilation crucially applies after these processes affecting, in the present case, the second vowel of the stem. Note that in the absence of Guttural Assimilation and other processes to be discussed below, the prefix vowel is identical to the underlying quality of the stem vowel.

Before concluding this discussion, one additional set of verbs needs to be presented. In the verbs in (1) above, the underlying quality of the stem vowel is the same for both the perfective and imperfective forms of a given verb. In a number of verbs, however, the stem vowel of the imperfective is [o] regardless of the quality of the perfective stem vowel. A few representative examples are given in (6). In the first two forms, the underlying vocalic melody of the perfective stem is /a/ whereas in the last two it is /i/. In all of these, the vowel of the imperfective stem is [o].

(6)

Stem Vowel (Imperfective)	Imperfective	Stem Vowel (Perfective)	Perfective	Gloss
[o]	yo+bsor	/a/	basar	'to predict'
[o]	yo+rbot	/a/	rabat	'to tie'
[o]	yo+ħrož	/i/	ħarež	'to go out'
[o]	yo+fto?	/i/	feta?	'to unstitch'

I have found that in the majority of cases evidencing this change in vowel quality, the surface stem vowel of the perfective is [a]. However, not all verbs with [a] in the stem change to [o]. In fact, it is impossible to predict in which verbs the vowel will change to [o] in the imperfective. Consequently, it is assumed that these verbs are lexically marked to this effect. The rule of Imperfective Vowel Change in (7) accounts for this change.

(7) Imperfective Vowel Change:
V -> [o] / ___]$_{\text{imperfective stem}}$

I would suggest that the simplest analysis is one in which Imperfective Vowel Change applies at the beginning of the formation of the imperfective as shown in (8), based on the verb [basar] 'he predicted'.

(8)

	/basar/	cf. [basar] 'he predicted'
	yV+basar	
Imperfective Vowel Change	yVbosor	
Syncope	yVbsor	
Vocalic Mapping	yobsor	
Guttural Assimilation	n/a	
output	[yobsor]	'he predicts'

As the derivation in (8) illustrates, after the application of Imperfective Vowel Change the prefix vowel is realized in exactly the same way as it is in (5) above. In other words, the first stem vowel deletes as a result of Syncope and the unassociated melody links up to the prefix V-slot by Vocalic Mapping.

2. The Patterning of [i] and Coronal Obstruents

2.1 General Description

In the preceding section, it was shown that the prefix vowel is typically identical to the following stem vowel of the imperfective. This is accomplished by a two-step operation involving Syncope and Vocalic Mapping. In the absence of additional processes, it is the underlying quality of the stem vowel that surfaces. This generalization holds regardless of whether or not the surface quality of the imperfective stem vowel differs from that of the perfective. Contrary to this generalization, however, the prefix vowel is systematically realized as [i] when the stem-initial consonant is a coronal obstruent, regardless of the quality of the following stem vowel. Consider the forms in (9).

(9)

a. Imperfective	Perfective	Gloss	b. Imperfective	Perfective	Gloss
yo+l?ot	la?at	'to hit'	yi+dħol	daħal	'to enter'
yo+?tol	?atel	'to kill'	yi+skot	siket	'to be silent'
yo+bsor	basar	'to predict'	yi+ǰbor	ǰabar	'to collect'
yo+ktor	kotor	'to predict'	yi+šrob	šorob	'to drink'

Identical to the verbs in (6), in the first three verbs in (9a) the stem vowel of the imperfective surfaces as [o] as the result of Imperfective Vowel Change. In the fourth verb [kotor], the stem vowel is /o/ in UR. In each of these verbs, the prefix vowel is identical to the following stem vowel as expected. Although similar to the verbs in (9a), it will be noticed that in the verbs in (9b) the prefix vowel is systematically realized as [i]. The crucial difference between these two sets of verbs lies in the fact that in (9b) the stem-initial consonant is a coronal obstruent. This was first observed, I believe, by Brame (1972). I have found that for all verbs beginning with a coronal obstruent the prefix vowel is [i][4]. Accounting for these apparent exceptions is the focus of the following sections.

2.2 Default Assignment

Perhaps the most obvious account of the forms in (9b) is to attribute the realization of the prefix vowel as [i] to default. This is particularly appealing since the quality of the prefix vowel in the forms in (9b) is identical to that of the language's default vowel. In vowel epenthesis, for example, it is the vowel [i] that surfaces (see Hume 1990b). Within standard SPE-based feature theory, the feature specification characterizing the high, front vowel is generally assumed to be [-back, +high]. We can posit then that the default feature value for vowel height in Maltese is [+high], and the value for frontness is [-back].

To account for the realization of the imperfective prefix vowel as [i] before coronal obstruents, we could thus formulate a rule such as that in (10).

(10) $V]_{\text{imperfective prefix}}$ -> [-back, +high] / __ [+coronal, -sonorant]

Informally, this states that the feature values [-back, +high] are assigned to the prefix vowel when followed by a coronal obstruent. I would suggest, however, that assigning these features to the vowel just in case the stem-initial consonant is a coronal obstruent treats this process as accidental. In other words, it would be equally natural for the high front vowel to occur only before, say, labial or velar consonants if we were to substitute the specification [+coronal] with the appropriate place feature characterizing these consonants.

Cross-linguistic evidence suggests, however, that the parallelism evidenced between [i] and coronal obstruents is not accidental. There is a substantial literature which points to the patterning of front vowels and coronal consonants as members of a natural class (e.g. Hyman 1973; Clements 1976, 1989; Vago 1976; Hume 1988, 1990a; Broselow & Niyondagara, to appear; E. Pulleyblank 1989; see also Jakobson, Fant & Halle 1952). One of the primary goals of a feature theory is to be able to refer to a natural class of sounds by a single set of feature specifications. Yet standard SPE-based feature theory fails to provide a means of referring to this natural class as such. There is no single feature which uniformly expresses the property of frontness on both consonants and vowels. For consonants, this property is characterized by the feature [coronal] whereas for vowels, frontness is expressed by the feature specification [-back]. As a result, accounting for processes which involve the interaction of front vowels and coronal consonants can lead to unnatural and complex formulations.

2.3 Coronal Vowel Assimilation

I would suggest that the patterning of the front vowel [i] and coronal obstruents in Maltese is a consequence of the fact that these sounds are members of a natural class and thus specified with a common feature. Building on the earlier proposal of Clements (1976), I follow Clements (1989) and Hume (1988) and specify this natural class by the articulator feature [+coronal], referring to sounds produced by raising the front of the tongue towards the hard palate. The realization of the prefix vowel as [+coronal] before coronal obstruents is thus an expected parallelism. In essence, we can attribute the place specification [+coronal] of the prefix vowel to a following coronal obstruent.

In current nonlinear formalism such parallelisms receive a straightforward account. Within the well-motivated view of assimilation as spreading, attributing some feature of a given segment to that of an adjacent segment essentially equates to saying that assimilation is involved. Thus by incorporating these two insights, first that front vowels and coronals are specified with a common feature, and secondly, that assimilation is accomplished by spreading, the forms in (9b) can be accounted for by the assimilation of the prefix vowel to the coronality of a following obstruent, i.e. the feature [+coronal] spreads from the consonant onto the vowel. Note that even if used within more current formalism, the rule based on SPE features in (10) would be unable to express the insight concerning the patterning of front vowels and coronals consonants as a natural class.

The enriched model of feature geometry proposed by Clements (1989) provides precisely the formalism needed to adequately express this rule in a nonlinear fashion. In the following section, I will outline relevant aspects of this model and then provide a nonlinear account of Coronal Vowel Assimilation.

2.3.1 The Nonlinear Representation of Coronal Consonants and Vowels

In the model of feature geometry proposed by Clements (1989), consonants and vowels are specified with the same set of articulator features. For reasons of simplicity, I will restrict this discussion to the feature [coronal].

(11) Feature Organization (based on Clements 1989):

e.g.

t
C-place
[+coronal]
[+anterior]

i
C-place
Vocalic
V-place Aperture
[+coronal] [+high]

As shown in (11), both [t] and [i], for example, are specified with the articulator feature [coronal]. For plain coronal consonants such as [t], this feature links directly to the C-(consonantal) place node while for the vowel, [coronal] is dominated by V-(vocalic) place. V-place is in turn linked to a Vocalic node which also dominates the vowel's height (or aperture) features (see Clements 1989 regarding motivation for each of these nodes). Thus, although both consonants and vowels are specified with the same feature, the feature is generally arrayed on different tiers. I should point out that in the unmarked case, consonantal place features are linked directly to C-place and place features for vowels are dominated by V-place; secondary articulations on consonants are characterized by features dominated by Vocalic. Following Clements (1976) and Hume (1988), I assume that front vowels are redundantly specified as [-anterior] as expressed by the redundancy rule in (12).

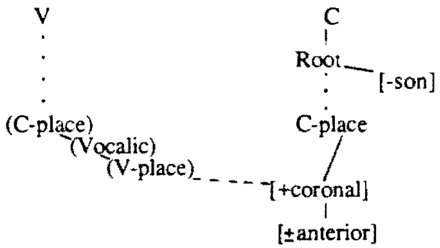
(12) Redundancy rule: V-place [+coronal] -> [-anterior]

With this as a basis, we are now in a position to provide a nonlinear representation of Coronal Vowel Assimilation.

2.3.2 The Nonlinear Representation of Coronal Vowel Assimilation

As illustrated in (13), I claim that Coronal Vowel Assimilation involves spreading the articulator feature value [+coronal] from the consonant to the preceding V-slot of the imperfective prefix (irrelevant tree structure is omitted). The nodes enclosed in parentheses are nodes which I assume are interpolated when [+coronal] spreads to the vowel (see, e.g. Node Generation in Archangeli & Pulleyblank 1986). Interpolation thus ensures that the output of the spreading rule results in a well-formed tree structure. Note also that if the consonantal trigger is a [+anterior] coronal, the redundancy rule in (12) will apply at some point in the derivation to change the specification of anteriority on the vowel.

(13) Coronal Vowel Assimilation (CVA):



As will be noticed, the output of (13) is a vowel specified as [+coronal] yet unspecified for height. Recall that the default value for vowel height in Maltese is [+high]. Consequently, it is (correctly) predicted that the height value assigned to the vowel is [+high]. I would suggest then that although the vowel's place is acquired by assimilation, the vowel's height is assigned by default. Thus, the output is correctly realized as the high front vowel [i].

If we are correct in assuming, following Kiparsky (1985), that the unmarked type of assimilation rule is feature-filling, treating CVA as such is to be preferred. Moreover, the simplest analysis would seem to be one in which CVA is considered a feature-filling rule, although I should point out that this assumption is not crucial. Consider the simplified derivation in (14) of [yišrob] 'she drinks', for example, in which CVA is treated as a feature-filling process. Recall that Vocalic Mapping is also feature-filling.

(14) yV+ š o r o b   cf. [šorob] 'he drank'

[] []

CVA   yV š o r o b

[] []

Syncope   yi š r o b

[o]'

Vocalic Mapping   n/a

Output   [yišrob]   'she drinks'

As illustrated in (14), CVA applies first to fill in the place specification of the empty V-slot of the prefix. Syncope then deletes the V-slot of the first stem vowel and its melody remains floating. Since the prefix vowel is already specified for features, the association of the floating melody to an empty V-slot, i.e. Vocalic Mapping, is inapplicable. Note that although not explicit in (14), I assume that the default rule assigning [+high] applies at some point in the derivation to provide the vowel with its height specification. By viewing CVA as a feature-filling process, the application of this rule is sufficient to account for the place specification of the prefix vowel. Vocalic Mapping need not (nor cannot) apply.

Conversely, treating CVA as a feature-changing process would seem to result in a more complex analysis. Within this approach, Syncope applies first and leaves the vocalic melody of the first stem vowel floating. By Vocalic Mapping, the floating melody ([o]') maps onto the empty V-slot of the prefix in a feature-filling manner. CVA then applies to change this feature specification to [i]. Although the place specification of the prefix vowel is realized correctly in this approach, it is necessary for both Vocalic Mapping and CVA to apply, as opposed to the analysis above in which only the application of CVA is required. At present, I have not found any independent evidence for choosing between these two analyses although based on simplicity and markedness, it would seem that viewing Coronal Vowel Assimilation as a feature-filling process is to be preferred.

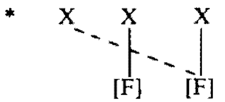
2.3.2.1 Summary

In accounting for the realization of the prefix vowel as [i] before coronal obstruents, I have proposed that only the vowel's height is attributed to default assignment; the vowel's place specification is acquired as the result of vowel-to-consonant assimilation. Accounting for the quality of the prefix vowel in this manner provides a natural and straightforward account which, unlike SPE feature-based accounts, does not treat this phenomenon as accidental. Rather, it views it as the expected consequence of the fact that these sounds are members of the same natural class.

2.4 An alternative account: the opacity of coronal obstruents

One of the basic assumptions maintained throughout this paper is that assimilation is achieved by spreading association lines. In Autosegmental Phonology, such processes are highly constrained by the well-formedness condition proposed by Goldsmith (1976) which prohibits crossing association lines (see (15)). Given this commonly accepted principle, it might be argued that the realization of the prefix vowel as [i] before coronal obstruents is a result of invoking the Line-Crossing Prohibition. In this section I will argue, however, that this account is not without problems.

(15) Line-Crossing Prohibition (following Goldsmith 1976)



F-tier (where F represents any feature or node)

In order to invoke the Line-Crossing Prohibition it must be assumed that coronal obstruents are specified for some value of the feature or node that spreads from the vocalic trigger and, moreover, that this feature or node is on the same tier for both consonants and vowels. In this way, spreading vowel features across an intervening coronal obstruent would result in crossed association lines and the rule would be blocked from applying. Given that the default vowel in Maltese is [i], it would be reasonable to posit that the prefix vowel is thus realized as [i] by default.

For concreteness, consider the verbs [yi+dlam] < /yV+dalam/ 'it grows dark' and [yi+šrob] < /yV+šorob/ 'he drinks'. In the first example, spreading the features from the vowel [a] would need to be blocked by the intervening coronal whereas in the second example, it is the features characterizing [o] that are relevant. Within the model of feature geometry proposed by Clements (1989), vowel features are dominated by the class node Vocalic. A unified account of vowel feature spreading can thus be defined on this class node with the Vocalic node spreading from the stem vowel to the preceding imperfective prefix vowel. Therefore, to ensure the opacity of coronal obstruents in this spreading rule, it must be assumed that these consonants, to the exclusion of all others, are specified with a Vocalic node. Yet, specifying a consonant with vocalic features characterizes a consonant produced with a secondary articulation. As Standard Maltese has only a single set of plain coronal consonants in the language, specifying these consonants for secondary (vocalic) features is unmotivated. I should point out that the problem is not associated with any particular model of feature geometry. Rather, imposing the Line-Crossing Prohibition is problematic as it would require specifying coronal obstruents, both anterior and non-anterior, for vocalic features, a specification which is otherwise unmotivated.

A second problem associated with this approach concerns the transparency of coronal sonorants. The imperfective prefix vowel is identical to the following vowel when the stem-initial consonant is a coronal sonorant, e.g. [rabat]/[yo+rbot] 'he tied/he ties'. Therefore, unlike coronal obstruents, coronal sonorants cannot be considered opaque to spreading features from the stem vowel. Yet, if coronal obstruents are specified in such as way as to block the spreading of vocalic features, we might also expect coronal sonorants to be opaque as well. This is under the assumption that coronal obstruents and sonorants share a common place feature. Note that underspecifying coronal sonorants for place is not a possible way around this. Due to Morpheme Structure Constraints in Maltese, I claim that coronal sonorants are specified for place of articulation in underlying representation (Hume 1990b). This is based on my observation that the distribution of consonants in verb roots in Maltese excludes adjacent homorganic consonants agreeing in their value for the feature [sonorant]. In particular, although coronal obstruents are frequently found adjacent to coronal sonorants, e.g. √srʔ 'steal', √tʃl 'interrupt', √kns 'sweep', coronal obstruents do not generally cooccur with each other, nor do coronal sonorants cooccur. Following McCarthy (1986a) (see also Steriade 1987, Yip 1988), I take this as evidence for the underlying specification of place features on root consonants and, crucial to the point here, on coronal obstruents and sonorants.

Therefore, invoking the Line-Crossing Prohibition to account for the cases in which the prefix vowel surfaces as [i] before coronal obstruents is problematic for a number of reasons. As a result, I would suggest that the simplest and most insightful account is one which treats these cases as the result of feature-filling vowel-to-consonant assimilation with the rule trigger defined as the class of [+coronal, -sonorant] consonants[5].

3. Consonant/Vowel Parallelisms

3.1 Coronal and Pharyngeal Consonants and Vowels

I have argued that by specifying front vowels and coronal obstruents with the feature value [+coronal] we are able to provide a natural account of their patterning together in Maltese. This is accounted for in a straightforward way within an enriched model of feature geometry in which consonants and vowels are specified for the same set of articulator features. One of the predictions made by this model of feature geometry is that we might then expect to see the interaction of other consonants and vowels as well.

Relevant in this respect is the rule of Guttural Assimilation discussed above in which guttural consonants and the vowel [a] function as members of a natural class. Following Herzallah (1990), this natural class can be characterized by the feature value [+pharyngeal] (cf. McCarthy 1989). Due to space limitations I will not discuss the process of Guttural Assimilation in detail. However, along the lines proposed for Coronal Vowel Assimilation, Guttural Assimilation can be characterized as vowel-to-consonant assimilation with the feature value [+pharyngeal] spreading from the consonant onto the adjacent vowel. Consequently, evidence for the patterning of consonants and vowels in phonological processes comes from both Guttural Assimilation and Coronal Vowel Assimilation.

3.2 Velar and Labial Consonants and Back, Rounded Vowels

This conspicuously leaves velar and labial consonants and back, rounded vowels. Given the parallelisms discussed above between other consonants and vowels in Maltese, we might also expect to see the patterning of velar and labial consonants with back, rounded vowels. However, this parallelism is absent: in the imperfective, for example, the prefix vowel is always realized as a straightforward copy of the stem vowel when the stem-initial consonant is labial or velar. In other words, labial and velar consonants do not seem to affect the realization of the prefix vowel.

As a final point, I would like to suggest somewhat speculatively a possible explanation for the lack of patterning between velar and labial consonants, and back, rounded vowels. Consider the place specification of segments given in (16), based on Clements (1989) and Herzallah (1990). The vowel inventory of Maltese appears on the left, and on the right, the place specification of representative labial, coronal, velar and guttural consonants[6]. Although the full specification of segments is given in (16), I assume that redundant feature values are absent underlyingly. The degree of underspecification assumed is not crucial to this discussion.

(16)

a.

V-place	i	e	a	o	u	C-place	p	t	k	ħ
labial	-	-	-	+	+		+	-	-	-
coronal	+	+	-	-	-		-	+	-	-
dorsal	-	-	-	+	+		-	-	+	-
pharyngeal	-	-	+	-	-		-	-	-	+

In (17), specific groupings of consonants and vowels are compared.

(17)

	i	t	a	ħ	cf.	o	p	k
labial	-	-	-	-		+	+	-
coronal	+	+	-	-		-	-	-
dorsal	-	-	-	-		+	-	+
pharyngeal	-	-	+	+		-	-	-

In (17) it will be noticed that the feature specification of the high front vowel [i] and the coronal consonant [t] are identical. The same is true for the pharyngeal vowel [a] and the pharyngeal consonant. On the other hand, the back rounded vowel differs in feature specification from both the labial and the velar consonant. Labial consonants are [+labial, -dorsal], and velar consonants are [+dorsal, -labial]. Conversely, back rounded vowels are both [+labial] and [+dorsal]. Consequently, there is no vowel which corresponds exactly to the feature specification of either a labial or a velar consonant.

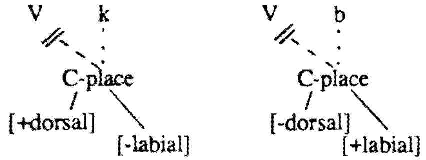
One means of expressing the redundancy between labiality and dorsality in Maltese vowels is by the marking condition in (18). This prohibits a vowel from having different values for the features [labial] and [dorsal].

(18)
$$* \begin{array}{c} V \\ | \\ \begin{bmatrix} \alpha \text{ labial} \\ -\alpha \text{ dorsal} \end{bmatrix} \end{array}$$

Kiparsky (1985) has proposed that one of the expected properties of a lexical rule is that if it were to violate a marking condition like that in (18) it is non-structure preserving and as a result, the rule would be blocked from applying. In other words, a lexical rule is not expected to introduce a segment that does not form part of the underlying inventory of the language.

Independent evidence suggests that both Guttural Assimilaton and Coronal Vowel Assimilation are lexical rules (see Hume 1990b). Based on this, we might then expect that a potential rule triggering labial or velar assimilation to the prefix vowel would also be lexical. Now, if it is assumed that labial and velar consonants are specified for both the features [labial] and [dorsal] when assimilation to the prefix vowel is triggered, spreading from these consonants would violate the marking condition in (18). (Specifying the redundant values of [labial] and [dorsal] on these consonants could be accomplished by an independent rule or by the Redundancy Rule Ordering Constraint of Archangeli & Pulleyblank (1986)). As shown in (19), it is then (correctly) predicted that assimilation from either a labial or velar would be blocked.

(19)



On the other hand, spreading from either a coronal or guttural consonant would be free to apply since no violation occurs and the output is a well-formed vowel.

Thus, based on the independent principle of Structure Preservation, the lack of parallelism in Maltese between velar and labial consonants and back, rounded vowels is to be expected. I would suggest that, all else being equal, languages which allow spreading from labial or velar consonants onto vowels would lack a marking condition like that in (18). Although speculative, this proposal provides a principled explanation for the lack of parallelism between labial and velar consonants and back rounded vowels on the one hand, and for the observed parallelism between coronal consonants and vowels, and the pharyngeal vowel and consonants on the other.

4. Conclusion

In this paper I have argued that consonant/vowel interaction in Maltese provides support for a feature theory which incorporates the view that consonants and vowels are specified for the same set of articulator features. In particular, I have shown that the most insightful account of the patterning of [i] and coronal obstruents is one which draws on the proposal that these segments form part of the natural class [+coronal]. Moreover, the parallelism evidenced between these sounds receives a natural explanation in nonlinear phonology by attributing the place specification of the imperfective prefix vowel to vowel-to-consonant assimilation.

Notes:

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1 Underlying /i/ surfaces as [e] in the context __C# , otherwise it surfaces as [i] (Puech 1978).

2 The rules of stress assignment in Maltese Arabic are similar to those of most Arabic dialects. Due to space limitations, I will not discuss stress assignment in detail but rather refer the reader to Brame (1972, 1973) for a detailed discussion. For the purposes of this paper, it will suffice to say that stress usually falls on a final superheavy syllable, e.g. CV:C, CVCC. If there isn't one, it falls on the penultimate if heavy, e.g. CV:, CVC, otherwise the antepenult is stressed.

3 In the representation in (5), I assume that consonantal and vocalic melodies are on the same plane (see Hume, to appear). Within the feature theory adopted in this paper, the spreading of vowel features across an intervening consonant is unproblematic since the place features of consonants and vowels are arrayed on different tiers (see discussion in section 2.3.1).

4 In Busuttil (1981), the imperfective of [tarat] 'he insisted' is given as both [yitrot] and [yotrot] 'he insists'. For my consultants, only the form [yitrot] is acceptable. One of my consultants does, however, give both [yitnos] and [yotnos] as possible forms of the verb 'he weeps'.
5 A comment is in order concerning the lack of assimilation to a stem-initial coronal sonorant. It is interesting to note in this respect that coronal obstruents, to the exclusion of coronal sonorants, are also triggers of another assimilation rule. In the realization of the imperfective prefix of the third person feminine and second person, the prefix consonant is generally realized as [t]. Before a stem-initial coronal obstruent, however, total assimilation occurs and the output is a geminate consonant identical in quality to the stem-initial consonant. In Hume (1990b), it is proposed that the imperfective prefix vowel and consonant are both targets of a single feature-filling assimilation process triggered by the class of coronal obstruents. In the absence of assimilation processes, they surface as [i] and [t]. They acquire their feature specification for place by the application of a single default rule which assigns the feature value [+coronal] to any segment, consonant or vowel, which remains unspecified for place at the end of the derivation.
6 Note that in the feature theory adopted in this work, place features are potentially binary-valued. This is in contrast with earlier proposals of, for example, Sagey (1986) who proposes that articulator features are privative, i.e. they are either present or absent. Following Clements (1989), it is argued that both values of a given feature are potentially available, although it is usually the positively marked feature which actively participates in spreading rules. See Herzallah (1990) for discussion of a rule similar to the one posited in (19) in which a class node dominating the negative value of [dorsal] participates in a spreading rule. Note, however, that although [-dorsal] spreads, it does so passively

References:

Archangeli, D. & D. Pulleyblank. 1986. The Content and Structure of Phonological Representations. monograph. University of Arizona and University of Southern California.

Aquilina, J. 1959. *The Structure of Maltese*. Malta: The Royal University of Malta.

Berrondonner, A. et al. 1983. *Principes de grammaire polylectale*. Lyon: Presses Universitaires de Lyon.

Borġ, A. 1973. The Segmental Phonemes of Maltese. *Linguistics* 109. 5-11.

Brame, M.K. 1972. On the abstractness of phonology: Maltese ʕ. In M. Brame (ed.), *Contributions to Generative Phonology*. Austin: University of Texas Press.

--------1973. On stress assignment in two Arabic dialects. In S.R. Anderson and P. Kiparsky (eds.), *A Festschrift for Morris Halle*. NY: Holt, Rinehart & Winston.14-25.

Broselow, E. & A. Niyondagara (to appear). Feature geometry of Kirundi palatalization. *Studies in the Linguistic Sciences* 20.

Bugeja, P. 1984. *Kelmet il-Malti*. Malta: Gulf Publishing.

Busuttil, E.D. 1981. *Kalepin Malti-Ingliz*. Malta: Union Press.

Butcher, M. 1938. Elements of Maltese. London: Oxford University Press.

Chomsky, N. & M. Halle. 1968. *The Sound Pattern of English*. New York: Harper & Row.

Clements, G.N. 1976. Palatalization: linking or assimilation? *CLS* 12. 96-109.

--------1989. A Unified Set of Features for Consonants and Vowels. ms. Cornell University.

Goldsmith, J. 1976. Autosegmental Phonology. Ph.D. dissertation. MIT.
Herzallah, R. 1990. Aspects of Palestinian Arabic Phonology: A Non-Linear Approach. Ph.D dissertation. Cornell University.
Hume, E. (to appear). Metathesis in Maltese: implications for the Strong Morphemic Plane Hypothesis. *Proceedings of NELS 21.*
--------1988. Palatalization in Polish: evidence for the underlying specification of redundant features. ms. Cornell University.
--------1990a. Front vowels, palatal consonants and the rule of umlaut in Korean. *Proceedings of NELS 20.* Published by GLSA, University of Massachusetts at Amherst.
--------1990b. Coronal Vowel and Consonant Assimilation: the case of the imperfective prefix in Maltese Arabic. ms. Cornell University.
Hyman, L. 1973. The feature [grave] in phonological theory. *Journal of Phonetics 1,* 329-337.
Jakobson, R., G. Fant & M. Halle. 1952. *Preliminaries to Speech Analysis.* Cambridge: MIT Press.
Kiparsky, P. 1982. Lexical Morphology and Phonology. *Linguistics in the Morning Calm.* Seoul: Hanshin. 3-91.
--------1985. Some Consequences of Lexical Phonology. *Phonology Yearbook 2.* 85-138.
McCarthy, J. 1979. Formal Problems in Semitic Phonology and Morphology. Ph.D. dissertation. MIT.
--------1981. A Prosodic Theory of Nonconcatenative Morphology. *Linguistic Inquiry 12.* 373-418.
--------1986a. Melodic Structure, Semitic Roots, and the OCP. ms. University of Massachusetts at Amherst.
--------1986b. OCP Effects: Gemination and Antigemination. *Linguistic Inquiry* 17. 207-263.
--------1989. Guttural Phonology. ms. University of Massachusetts at Amherst.
Puech, G. 1978. A cross-dialectal study of vowel harmony in Maltese. *CLS* 14.
--------1979. Les Parlers maltais. Ph.D. dissertation. Université Lyon II.
Pulleyblank, E. 1989. Articulator based features of vowels and consonants. ms. University of British Columbia.
Sagey, E. 1986. The Representation of Features and Relations in Non-linear Phonology. PhD dissertation. MIT.
Steriade, D. 1987. Redundant Values. *CLS* 23.
Sutcliffe, E. 1936. *A Grammar of the Maltese Language.* London. Oxford University Press.
Vago, R. 1976. More evidence for the feature [grave]. *Linguistic Inquiry* 7. 671-674.
Yip, M. 1988. Feature Geometry and Co-occurrence Restrictions. ms. Brandeis University.

The Status of Glottalized Glides in Gitksan

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1. Introduction

It is generally assumed in current phonological theory that prosodic structure is represented on a different tier from melodic structure. As has been pointed out frequently in the literature (Levin (1985), Selkirk (1984), Kaye and Lowenstamm (1984) i.a.), the feature [syllabic] is redundant in such a model, since all information about syllabicity should be represented structurally on the prosodic tier.

Abandoning the feature [syllabic] has important implications for the representation of vowels and glides, which have traditionally been distinguished by their value for this feature. The surface distinction between glides and vowels can be captured on the prosodic tier in terms of syllable position: [-consonantal] segments occurring in nucleus position are vowels and elsewhere are glides. However, without the feature [syllabic], glides and vowels will be identical at UR, before prosodic structure is erected.

As argued in detail in Levin (1985), strong support for this interpretation of glides and vowels comes from the many cases in which a single underlying segment is observed to alternate on the surface between a glide and a vowel, depending on its position in the syllable. This is illustrated in the following data from the Berber dialect of Ait Seghrouchen (data from Guerssel (1986)), in which the third person singular morpheme alternates between a realisation as [y] and [i]. If it precedes a consonant, as in (a), it is syllabified in nucleus position, and is realised as a vowel. If it precedes a vowel, as in (b), it is syllabified as a syllable onset, and realised as a glide.

(1.)

a.	zur	"be fat"	i-zur	"he is fat"
	fa	"yawn"	i-fa	"he yawned"
	bedd	"stand up"	i-bedd	"he stood up"
b.	ari	"write"	y-ari	"he writes"
	ass	"tie"	y-ass	"he ties"
	af	"find"	y-af	"he finds"

If glides and vowels are underlyingly identical, alternations of this type can be accounted for without positing any specific rule to change glides into vowels or vice versa. Rather, the alternations will fall out from the application of the syllabification algorithm.

While alternations of this type appear to support the view that glides and vowels are underlyingly identical, glides which fail to alternate with high vowels in the predicted environments clearly pose a problem. It is a case of exactly this type from Gitksan, a Tsimshianic language of British Columbia, which is examined in this paper.

In Gitksan, glottalized glides do not alternate with vowels in environments where we might expect them to. I claim, however, that these data do not force any revision of the representation of glides. Rather, I propose that the data can be accounted for under the well-motivated assumption that glottalization lowers the sonority of a glide and that this prevents it from forming a syllable nucleus.

2. The data

2.1 Gitksan Phonological Inventory and Prosodic Structure

The phonological inventory proposed for Gitksan in Rigsby (1986) is the following:

(2.)

a. Short vowels:[1] Long vowels:

i		u	i:		u:
	ə		e:		o:
	a			a:	

b. Consonants:

p	t	ts		k	kʷ	q	ʔ
p'	t'	ts'	tl'	k'	kʷ'	q'	
	s		ɬ	x	xʷ	X	h
m	n		l	y	w		
m'	n'		l'	y'	w'		

My analysis is couched in a moraic framework, in which the mora, or weight unit, is the smallest prosodic unit (Hyman (1985), Hayes (1989), Zec(1988)). A detailed discussion of how the segments of Gitksan are organized into moras and syllables is given in Walsh (1990). She demonstrates that, in Gitksan, [+sonorant] segments are "moraic" (able to license a mora) while the smaller class of [-consonantal] segments is "syllabic" (able to license a syllable). Syllabification applies from right to left, and the Strict Onset Principle (Ito 1989) is in operation, requiring that all syllables have onsets. Syllables are subject to the Sonority Sequencing Generalization, which requires that "in any syllable there is a segment constituting the sonority peak which is preceded and/or followed by a sequence of segments with progressively decreasing sonority values." (Selkirk, 1982:16)

I assume that moras are not present at underlying representation, but rather are assigned by algorithm. I adopt the following algorithm from Zec (1988).

(3.) Moraification Algorithm: (Zec 1988:102)

Given a sequence S of unlinked segments s_1, s_2, ... s_i, ... s_n, link S to μ iff

a. s_i is more sonorous than s_{i-1}
b. s_n is a member of the set of moraic segments
c. s_n is not immediately followed by a more sonorous segment.

2.2 Vowel Epenthesis

It has been noted by Rigsby (1986)[2] that Gitksan does not allow surface sequences consisting of a consonant followed by a sonorant at the end of a word or preceding another consonant. If such sequences arise, they are broken up by the vowel epenthesis rule, which can be informally stated as follows:

(4.) Vowel Epenthesis

$$\emptyset \longrightarrow V \ / \ C \ \_\_ \ \underset{[+\text{son}]}{C} \ \left\{ \begin{matrix} C \\ \# \end{matrix} \right\}$$

The effects of this rule can be seen with the attributive suffix, which has the underlying form /-m/. When it is added to a consonant-final stem, a vowel appears between the stem final consonant and the suffix, as illustrated. The quality of the vowel is determined by the adjacent consonants.

(5.)

a. kat-m qan "totem pole" [gadɪm Gan][3]
man -attr wood

b. ɬkuɬxʷ-m kat "son" [ɬguɬxwʊm gat]
small -attr man

In an approach consistent with Ito's (1989) view of epenthesis, Walsh (1990) proposes that this epenthesis process is prosodically motivated, applying as a side-effect of syllabification. Under this analysis, the syllabification of the form /kat + m/ proceeds as follows.

First, the word is assigned two moras by the moraification algorithm:

(6.)

```
 μ   μ
/|  /|
k a t m
```

Syllabification then applies right to left. Bimoraic syllables are licensed in Gitksan provided they do not violate sonority sequencing. If both moras in this word were grouped into a single syllable, sonority sequencing would be violated, since [m], which is more sonorous than [t], would be further from the sonority peak of the syllable. Thus, a single syllable must be erected over the final mora.

(7.)

```
     σ
     |
 μ   μ
/|  /|
k a t m
```

This syllable is, however, ill-formed, since it does not contain a "syllabic" segment. The structure is rectified by the epenthesis of a vowel to license the syllable.

(8.)

```
       σ
       |
 μ     μ
/|    /|\
k a  t _ m
       V
```

2.3 Epenthesis and glottalized glides

Post-consonantal sonorants thus motivate vowel epenthesis. Of interest in this paper is the behaviour of glottalized glides in such environments. Do they behave like sonorant consonants in motivating the application of epenthesis, or do they behave like other [-cons] segments in being able to license a syllable?

The relevant environments arise when the first person singular suffix /-y'/ is added to a consonant final stem, as in the following forms.

(9.) a. /kup + y'/ [gubiʔ^{i}][4]
eat + 1sg
b. /anuɬ + y'/ [anuɬiʔ^{i}]
drum + 1sg

In each case the phonetic realisation consists of the stem followed by the sequence [iʔ^{i}]. Such surface sequences do not immediately reveal whether epenthesis has applied or whether the glide has rather vocalized.

If epenthesis has occurred, then the [iʔ^{i}] sequence represents two phonological segments, the first the epenthetic vowel and the second the glottalized glide, phonetically realised as the sequence [ʔ^{i}]. Evidence which seems to support this analysis is that the normal realisation of a glottalized glide in postvocalic position is as a glottal stop with a vocalic release, as we see in the following examples:

(10.)	/titiy'/	[didiʔ^{i}]	"to look after"
	/k^{w}e:y'/	[g^{w}e:ʔ^{i}]	"poor"
	/haw'/	[haʔ^{u}]	"to go home"
	/xpa:w'/	[xba:ʔ^{u}]	"jaw"

It is also possible, however, that the [iʔ^{i}] sequence is in fact the realisation of a just a single segment - the vocalized version of the glottalized glide /y'/. In effect this segment would now be a glottalized vowel. The phonetic realisation of glottalized vowels is subject to some variation cross-linguistically. However, in some languages at least, the glottal constriction and the vowel are realised as [Vʔ^{V}] sequences such as we find here.[5]

In (11), the two possible derivations are illustrated for the form /kup-y'/. In the left hand derivation the glottalized glide has vocalized, licensing the final syllable, and in the right hand form the postconsonantal glide has motivated the application of epenthesis.

(11.) Moraification

```
        μ  μ                      μ  μ
        /|  /|                     /|  /|
        k u  p y'                  k u  p y'

Syllabification R -> L
i. vocalization                i. epenthesis
           σ                          σ
           |                          |
        μ  μ                      μ  μ
        /|  /|                     /|  /|\
        k u  p y'                  k u  p _ y'
                                        V
  ii.   σ  σ                 ii.   σ  σ
        |  |                       |  |
        μ  μ                      μ  μ
        /|  /|                     /|  /|\
        k u  p y'                  k u  pVy'
            (=i')
```

The surface form [gubi?^{i}] could result from either derivation. Not all forms are ambiguous in this way, however. Stems ending in uvular consonants show that the epenthesis not vocalization occurs in such cases.

Consider the following forms:

(12.) a. /se:laX + y'/ [se:laXa?^{i}]
needle + 1sg
b. /ts'aq + y'/ [ts'aGa?^{i}]
nose + 1sg

These surface forms differ crucially from the forms given in (9) in that the vowel which precedes the glottal closure is of a different quality from the vowel which follows. Such surface forms can only be derived if we assume that epenthesis has applied.

In Gitksan, epenthetic and other unstressed vowels are subject to colouring from adjacent consonants. Uvulars have a lowering effect on such vowels, as we see in the following data, where the epenthetic vowel occurring between a uvular consonant and the attributive suffix surfaces as the low vowel [a].

(13) a. /hat'aq + m/ [hat'aGam]
bad + attr
b. /haɬodoX + m/ [haɬodoXam]
boil + attr
c. /yɨmq + m/ [yɨmGam]
beard + attr

Given this process of vowel colouring, surface forms such as [se:laXaʔ^{i}] and [ts'aGaʔ^{i}] are consistent with an analysis in which epenthesis has applied, as illustrated in the following derivation.

(14.)	/se:laX + y'/
epenthesis	V
colouring	a
glottalized	ʔ^{i}
glide realisation	
	[se:laXaʔ^{i}]

The epenthetic vowel is adjacent to the uvular and is thus lowered to [a]. The glottalized glide, however, is unaffected by the lowering process since it is not adjacent to the uvular consonant.

Such surface forms would be unexpected, however, if vocalization rather than epenthesis had applied. Under a vocalization analysis, the [Vʔ^{V}] sequence is the realisation of a single set of features, so that the vowels preceding and following the glottal closure should always be of the same quality. Thus, if the preceding uvular fricative causes lowering, both vowels should be affected. As illustrated in the following derivation, the predicted outcome under this analysis would be the unattested form *[se:laXaʔ^{a}].

(15.)	/se:laX + y'/
vocalization	i'
colouring	a'
glottalized	aʔ^{a}
vowel realisation	
	*[se:laXaʔ^{a}]

3. Solution

The data presented in the previous section constitute evidence that in Gitksan a glottalized glide behaves like a sonorant consonant rather than like a vowel, in that it cannot license a syllable and instead motivates the application of vowel epenthesis when it occurs in post-consonantal position. This appears to pose a problem for the proposal that vowels and glides are underlyingly identical. How can the syllabification algorithm be prevented from treating the [-cons] segment /y'/ as a potential syllable nucleus?

One possibility is that in Gitksan glides must be underlyingly distinguished from vowels by some major class feature. However, this seems an undesirable move, given the cross-linguistic support for the claim that glides and vowels are underlyingly identical. I claim rather that it is the glottalization on the glide that is responsible for its failure to vocalize. Specifically, I claim that in Gitksan the class of segments able to license a syllable is not the whole [-consonantal] class, but rather the smaller class of [-consonantal, -CG] segments. This claim receives support from general phonetic and phonological principles.

It is necessary in any language to specify which segments can function as syllable nuclei, since this is subject to cross-linguistic variation. For instance, in English the class of potential syllable nuclei includes vowels, liquids and nasals, while in Kwakwala only vowels may function as syllable nuclei. However, the variation appears to be subject to tight constraints based on sonority. Zec (1988) claims that ".. syllabic.. segments occupy a continuous portion of the sonority scale, including its sonorous end. It is then a language-particular property how far the syllabic .. portion of the scale will extend towards the non-sonorous end." (Zec 1988:15)

Thus, if we claim that the feature [+CG] plays a role in determining whether a segment can license a syllable, we are in effect claiming that this feature can affect its position on the sonority scale. Specifically we are claiming that glottalization pushes a segment towards the non-sonorous end. There is in fact considerable evidence that glottal constriction may reduce the sonority of a segment.

Phonetic evidence supporting this conclusion is presented by Stevens and Keyser (1989) who claim that the feature [+CG] weakens the acoustic manifestation of [+sonorant] by reducing the amplitude of the fundamental frequency.

There is also phonological evidence that glottalized segments are less sonorous that their non-glottalized counterparts. For instance in Klamath (Levin 1985; 65), glottalized glides, unlike plain glides, act like obstruents for the rules of deglottalization and deaspiration, leading Levin to incorporate the feature [+CG] into the sonority hierarchy. Zec (1985) is led to the same conclusion by data from Kwakwala, in which plain sonorants are moraic, and glottalized sonorants are not.[6] (Like syllabicity, moraic status is associated with the sonorous end of the sonority scale.)

Our claim that glottalization prevents glottalized glides from vocalizing in Gitksan thus appears to be well-supported.

3.1 No glottalized vowels

A corollary of the claim that glottalized segments cannot license a syllable in Gitksan is that there should be no glottalized vowels in the language. Given this, a potential problem for the proposed analysis is the presence in Gitksan of phonetic [V?^{V}] sequences, illustrated in (16).[7] As was mentioned above, cross-linguistically such sequences are frequently the realisation of underlying glottalized vowels.

(16.)	[na?^{a}Xs]	"bracelet"
	[do?^{o}]	"cheek"
	[se?^{e}]	"leg"

However, two types of evidence suggest that the traditional analysis of these sequences as /V?/ sequences is the correct one. The first piece of evidence comes from their failure to trigger glide epenthesis and the second from their behaviour under reduplication.

Gitksan has a constraint against surface vowel sequences. If a vowel sequence is generated, an epenthetic glide [y] is inserted to break it up. This may be informally stated as in (17). However, I assume that it follows from the prosodic requirement that syllables have an onset.

(17.) Glide epenthesis

$\emptyset$ ----> y /V__V

The effects of this rule can be seen at morpheme boundaries, where a vowel-initial suffix or clitic is added to a vowel-final stem. This is illustrated in (18) with the ergative suffix /ə/ and in (19) with the interrogative clitic /a/.

(18.) ergative suffix

```
w'a - ə - s   John  n'i:y'          [w'ayɪs]
find-erg-cn  J       1sg
"John came to visit me"
```

(19.) interrogative clitic

```
kʷila    - a                         [gwilaya]
blanket  -interr
```

Interestingly, when the same suffixes are added to stems ending in [V?ᵛ] sequences, glide epenthesis does not occur, as illustrated in (20) and (21).

```
(20.)  k a?ᵃ - ə - t                  [gya?ᵃt]        *[gya?ᵃyat]
       see   -erg-3sg
       "He sees"

(21.)  sapa:ya?ᵃ    - a              [saba:ya?a:]   *[saba:ya?ᵃya]
       Dolly Varden -interr
       (type of fish)
```

If the [V?ᵛ] sequences were realisations of glottalized vowels, then the failure of glide epenthesis to occur here would be surprising since, with respect to syllabification, the stem would be vowel-final, as illustrated in (22 A). If, however, these stems actually end /V?/, then the environment for glide epenthesis is not be met, since the stem is consonant-final, as illustrated in (22 B).

```
(22.) A.  /V' + V/                  B.  /V? + V/

i. moraification
          μ   μ                          μ    μ
         /|   |                         /|   /|
        C V'  V                        C V  ? V
ii. syllabification
        * σ   σ                         σ    σ
          |   |                         |    |
          μ   μ                         μ    μ
         /|  /|                        /|   /|
        C V' _ V                       C V ? V
             y
```

Thus only the derivation in (22 B), where the /?/ is a separate segment and not part of a glottalized vowel, correctly predicts that glide epenthesis will not take place here.

Further evidence that these phonetic [V?^{v}] sequences should not be considered to be glottalized vowels comes from CVC reduplication. When a stem ending [V?^{v}] undergoes this type of reduplication, the CVC prefix is realised with a uvular fricative in C2 position.

(23.)	t'a?^{a}	daX-t'a?^{a}	"to clap"
	w'a:?^{a}-tx^{w}	waX-w'a:?^{a}-tx^{w}	"to scream"

It is difficult to account for these data if [V?^{v}] sequences are assumed to be underlying glottalized vowels. Under such an analysis, stems of the form [CV?^{v}] would be prosodically CV stems. CVC reduplication, however, applies only to stems which are minimally CVC and so the analysis would make it problematic to account for the existence of the reduplicated forms in (23). If, however, we claim that these are in fact CV? stems, the data fall out naturally. Since the stem is a CVC stem, it is no longer surprising that CVC reduplication should apply to it.[5]

To summarize this section, the phonological processes epenthesis and reduplication both behave as though [V?^{v}] sequences represent underlying /VC/ sequences. This supports an analysis of these sequences as /V?/ sequences rather than one which treats them as underlying glottalized vowels.[8]

4. Conclusion.

The failure of glottalized glides in Gitksan to vocalize appeared to pose a serious problem for the claim that glides and vowels are underlyingly identical. However, I have shown that it is possible to account for the Gitksan facts without introducing any underlying distinction between glides and vowels. Specifically I have proposed that glottalization lowers the sonority of a glide and thus prevents it from functioning as a syllable nucleus.

Footnotes

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1. Rigsby does not actually include the schwa in his inventory. However, he does use it in his phonological representations as the default vowel which is subject to colouring from adjacent consonants. Note also that in this traditional inventory, where vowels and consonants are separately represented, both the high vowels /i/ and /u/ and the glides /y/ and /w/ are represented. Under the assumption that vowels and glides are identical segments, they would not be represented separately.

2. Tarpent (1987) and Livingston (1987) observe the same phenomenon in the neighbouring dialect Nisgha.

3. The voiced stops are derived by a rule of prevocalic voicing. The effects of certain other allophonic rules are not indicated in the phonetic forms given , except where relevant.

4. I use the raised [i] to indicate the brief vocalic release following the opening of the glottis.

5. Amuesha (Fast 1953) is one such case. In Dakota (Shaw 1989) a similar surface sequence is derived when a floating glottal feature links to a vowel.

6. It may also be the case in Gitksan that glottalized glides are not moraic. The evidence is contradictory. See Walsh (1990) for discussion.
7. Mulder (1988) refers to such sequences in Coast Tsimshian as glottalized vowels. Note that it is impossible to analyse these sequences as the realisation of a vowel followed by a glottalized glide, since the vowels before and after the glottal closure need not be [+high] and are always of the same quality.
8. The presence of the uvular fricative in C2 position can be accounted for by a general process of spirantization of [-anterior] consonants in C2 position. The fact that [X] rather than [h] surfaces is attributable to a general constraint against [h] surfacing in coda position.
9. Presumably under this analysis the echo vowel results from spreading of the vowel features onto the glottal stop which lacks supralaryngeal features.

References

Fast, P. W. (1953) Amuesha (Arawak) Phonemes. *IJAL* 19.3: 191-94
Guerssel, M. (1986) Glides in Berber and Syllabicity. *Linguistic Inquiry* 17.1: 1-12.
Hayes, B. (1989) Compensatory Lengthening in Moraic Phonology. *Linguistic Inquiry* 20.2: 253-306
Hyman, L. M. (1985) *A Theory of Phonological Weight*. Foris, Dordrecht.
Ito, J. (1989) A Prosodic Theory of Epenthesis. *Natural Language and Linguistic Theory* 7: 217- 259
Kaye, J. and J. Lowenstamm (1984) De la Syllabicite. In F. Dell, D. Hirst and J-R. Vergnaud eds. *Forme Sonore du Langage*. Paris: Hermann.
Levin, J. (1985) *A Metrical Theory of Syllabicity*. Ph.D Dissertation, MIT.
Livingston, E. (1987) Pronominal Suffixes in Nisgha. Paper presented at the 22nd International Conference on Salish and Neighbouring Languages.
Mulder, J. (1988) *Ergativity in Coast Tsimshian*. PhD Dissertation, UCLA.
Rigsby, B. (1986) *Gitksan Grammar* Ms. prepared for the Linguistics Division, British Columbia Provincial Museum.
Selkirk, E. (1982) The Syllable. In H. van der Hulst and N. Smith eds. *The Structure of Phonological Representations* (Part II), 337-383. Foris, Dordrecht.
(1984) "On the major class features and syllable theory" in M. Aronoff and R. Oehrle eds. *Language sound structure*, MIT Press, Cambridge.
Shaw, P. (1989) The Complex Status of Complex Segments. In D.Gerdts and K. Michelson eds. *Native American Languages in Theoretical Perspective*. New York, SUNY Press.
Stevens, K. and S. J. Keyser (1989) Primary Features and their Enhancement in Consonants. *Language* 65;1 81-106
Tarpent, M-L. (1987) *A Grammar of the Nisgha Language*. Ph.D. Dissertation, University of Victoria, Victoria.
Walsh, L. (1990) Syllable Structure in Interior Tsimshianic: A Preliminary Report. ms. University of British Columbia, Vancouver.
Zec, D. (1988) *Sonority Constraints on Prosodic Structure*. Ph.D. Dissertation, Stanford University.

New Technology for Neurolinguistics: The Possibilities and the Limitations of Positron Emission Tomography and Topographical Mapping of Electroencephalography

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Technological developments over the last few years in such areas as positron emission tomography and electroencephalographic brain mapping have provided a window through which to view or visualize the actual workings of the human brain. This technology has prompted advanced scientific exploration into the connections between linguistic experience and neurological functioning.

A variety of theoretical positions have been taken in the study of language and brain, and miscellaneous hardware has been used to explore the brain's processing of language, including magnetic resonance imaging (MRI) and computerized tomography (CT) scanning. However, most work could be categorized as following either cognitive models or neurological models, and studies requiring hardware have generally used either EEG technology (measuring electrical activity of the brain's neurons) or PET technology (utilizing radioactive tracers of brain blood flow and metabolism) to provide concrete data. The diversity of this research is notable. For example, Fox et al. (1986) have used positron emission tomography (PET) to map human visual cortex, while Mazziotta et al. (1982) have used PET imaging to map auditory stimulation. Petersen et al. (1988), in their study of single-word processing, "favor the idea of separate brain areas involved in separate visual and auditory coding of words, each with independent access to supramodel articulatory and semantic systems," and thus support the cognitive rather than the neurological model of language processing. Posner et al. (1988) make the same assertion following their PET studies, emphasizing that specific brain regions serve specific functions but work interactively with other regions rather than in isolation.

In the past, valuable information about brain and language derived from studies of individuals with aphasia, acquired dyslexia, or other neurological impairments, and significant case studies of such subjects continue to be reported and to be instructive. Caplan presents an extensive account of this type of work in his 1987 Neurolinguistics and Linguistic Aphasiology, but a sound argument could be constructed that some lingering questions remain when general conclusions about brain function are based on research with impaired individuals. Obviously, though, some types of research, by their very nature, must continue to rely on subjects who have or might have abnormalities or anomalies affecting their language.

However, much current research, thanks to the advances in noninvasive techniques such as EEG and PET, can be based on normal volunteers. The advantages and the potential difficulties associated with PET imaging have been discussed in every study relying on it. The safety of PET has been much touted and has been reiterated in public discussions of current research (e.g., Fox, 1990), but the procedure involves using radioactive tracers, and simply stating and explaining the term "radioactive" can raise a psychological barrier for some volunteers. Topographical mapping of EEG data offers an alternative to PET imaging for studying language processing noninvasively and, of course, does not necessitate injecting any substances into the body.

Electroencephalography is an interdisciplinary enterprise that draws on physics, chemistry, engineering, electronics, and neurology. After the pioneering efforts in the 1920s and 1930s by Hans Berger, the first person to record the electrical activity of the human brain, "the EEG has become a routine clinical procedure of considerable diagnostic value as well as a powerful research tool in the neurosciences" (Duffy, Iyer, and Surwillo, 1989: 2). Duffy, Burchfiel, and Lombroso (1979) have proposed "that brain electrical activity presents not too little but too much information to be easily grasped and assimilated by visual inspection alone" (309). In order to manage EEG data, devices have been developed since the 1950s to represent the spatial, temporal, and statistical information topographically, using computerized analysis to map frequency distributions (Petsche, 1976). Current maps of brain electrical activity, in which color ranges represent parameters of electrical functions, are similar to the daily weather maps printed in newspapers, in which color ranges represent temperature differences. With the passage of time, the devices producing these topographical maps have become increasingly affordable, manageable, and sophisticated. This technology has, until now, been used exclusively in research relating to clinical practice, aiding in the diagnosis of tumors, seizure disorders, dyslexia and other neurological conditions.

Working with my co-researcher and husband, Daniel L. Hurst, who is a neurologist at the Texas Tech University Health Sciences Center, I recently designed an interdisciplinary study to test the use of electroencephalographic maps in the analysis of complex language processing.[1] A major goal of the study was to assess the advantages and limitations of this technology in non-diagnostic situations. We sought to determine whether a "normal response" to language and poetry could be identified in "normal subjects." We wanted to see whether EEG maps could identify patterns of electrical activity specifically related to the processing of poetic language, and we wanted to see whether the brain responds differently to poetry than it does to other types of language. Though we hoped to find clear similarities among the brain maps in our study, we were also interested in establishing hypotheses to account for any different topographical maps from individuals exposed to the same set of linguistic stimuli under the same set of circumstances.

Ten volunteers were selected for this project; five participants were honors students and five were English professors. All were interested in literature and some had written poetry themselves. Of the students, three were female and two were male. All of the professors were male. The students were all eighteen or nineteen years old. The professors ranged in age from mid-thirties to late forties. All subjects were native speakers of English.

Each volunteer was conducted into the neurology laboratory at a pre-appointed time. The subjects, who reclined on an EEG table with their eyes closed, were connected to a 16 channel EEG system using the standard international system of electrode placement. EEGs were recorded for a one-hour period. A tape recorder was turned on and a female voice explained that the tape would later play fifteen minutes of an instructional tape and thirty minutes of poetry, but that for the first fifteen minutes, the volunteers would not hear any language but should just relax and lie quietly for a baseline EEG recording. The first fifteen minutes were then recorded in silence. Next, the tape played fifteen minutes of excerpts from a professional tape on time management; the voice during this portion was female. Then, for the final thirty minutes, the tape played excerpts from two professional recordings of poetry by Edgar Allan Poe. The taped selections reflect a standard range of Poe's shorter poems such as "The Raven," "Tamerlane," "Lenore," "Annabel Lee," "Ulalume," "To Helen," "Israfel," and "Eldorado." The poems were recited in slightly different styles by two readers, both of whom were male.[2]

Each subject's set of EEG data was collected and stored using the Dantech Neuroscope system. Spectral analysis was performed using two-minute, artifact-free recording segments. These segments were topographically displayed on a color scale. Colored topographical maps were then printed in the four basic frequency ranges: delta, theta, alpha, and beta. At the conclusion of the one-hour taping sessions, the volunteers were asked to write one-page accounts of their feelings and sensations during the experiment.

The students' written responses reflect exuberance at being involved in the project and demonstrate that the student participants were trying to cooperate, though some were more successful than others. For example, one male student wrote, "I was really trying to listen," while another male student reported, "Towards the end of the poetry I had to go to the bathroom and I was ready for the experiment to be over. I still tried to concentrate on the poetry." One female student admitted, "When lying down with your eyes closed for extensive periods of time, the natural biological tendency is to sleep." But another female student wrote, "I had to learn 'Annabel Lee' when I was younger so hearing it was rather enjoyable as I tried to quote in my mind with the tape." A third female student commented, "The talk on organizational skills was really quite interesting. I felt more emotional during the poetry readings and am familiar with some of Poe's works, so that was pleasant."

The professors' written responses were, in general comparison to the students' responses, filled with more critical reactions to the poetry itself. Three professors expressed a range of negative attitudes toward the poetry, but their very responses show engagement with the material. One man explained, ". . . as I listened I kept thinking how noisy and emptily rhetorical Poe's poetry is. I was aware of words as words and I even had trouble focusing on content. The second time through "The Raven" and "Helen" I noticed that I began to get more visual imagery accompanying the poems. The first time through it was all verbal; the second time it was visual. But, alas, Poe being Poe, I didn't feel much involved." Another man wrote, "And, of course, as I listened I kept thinking of how I much prefer to <u>read</u> a poem rather than <u>listen</u> to it." Yet another person declared, "I know Poe's poetry fairly well and have taught the poems -- so they weren't new to me, and I had preconceived responses. . . I found my own thoughts and images more interesting than the poems."

But two professors had positive reactions toward the poetry. One person stated, "The experience of listening to Poe read aloud was unsettling, for I found myself responding positively to poems that I had long ago dismissed as trite. . . . I was surprised that the metrical patterns which have annoyed me as reader emerged so melodic and natural when trained readers delivered the lines. . . . I was surprised at how convincingly the poems wake a strain of melancholy as much through their cadences as through their words." Another professor expressed a high degree of emotional and critical engagement, saying, "I have not read 'The Raven' in some time but referred to it in a recent writing. . . . I verified this [my recent argument about the poem] in listening to the lines toward the end of the poem (bird or devil!). . . . I think 'Annabel Lee' a pretty poem and remember smiling at its sweet adolescent sentimentality. . . . In the second reading of "The Raven" I paid close attention to the imagery -- not in an analytical way -- rather I saw the speaker's chamber, the raven's shadow."

The topographical maps in some ways correspond to the volunteers' written reports of their experiences, although the written comments cannot be correlated with all aspects of the maps. In fact, the findings in these ten subjects do not suggest an obviously significant or totally consistent pattern for the delta, theta, or beta maps.

The alpha maps, however, reveal distinctive differences which seem to follow definable patterns. During the at-rest portion of the experiment, all of the topographical maps showed the normal resting EEG pattern of posterior dominant alpha rhythms. The alpha maps during the poetry sections showed three identifiable patterns of responses. (These patterns are illustrated in the Appendix.) First, five subjects (Group A) showed no significant changes; all five of these subjects (three male professors and two male students) reported daydreaming or not concentrating during some or all of the poetry sections. One male professor in Group A showed decreased frontal alpha activity during the first poetry segment, but during the second poetry segment his alpha activity was very similar to his prepoetry state. Second (Group B), four subjects (one male professor and three female students) showed decreased frontotemporal alpha activity during the poetry sections; these four test subjects reported concentrating during the poetry. All three female subjects showed more pronounced changes in the second poetry segment as compared to the first poetry segment. Posterior alpha activity which comes from the occipital lobe (i.e., the primary visual cortex) decreases with eye opening; decreased alpha activity can thus be considered to represent regional utilization. Therefore, this second pattern accurately represents frontotemporal brain activity in the test subjects who concentrated during the poetry readings. Third (Group C), one subject (a male professor) showed a generalized increase in alpha activity during the poetry sections; this subject reported an intense emotional response (enjoyment) while listening to the poetry.

During the instructional tape, the subjects' alpha maps were different from each other, but some comparisons can be made based on the categories which emerged during the later poetry segments. Maps from four of the five subjects from Group A did not show significant differences between the resting state, the instructional section, and the poetry section. One Group A subject, a male professor, showed a generalized alpha decrease during the instructional tape; this subject reported in his written comments that he found the instructional tape more interesting than the poetry. Group B responses were more variable. Two Group B subjects (one male professor and one female student) showed generalized decreased alpha activity during the instructional segment. One Group B subject (a female student) showed no changes between the at-rest and the instructional portions of the experiment. Another Group B subject (a female student) showed decreased frontotemporal alpha. The Group B subjects did not make specific comments in their written responses about the instructional tape that would permit correlation of their topographical maps with their perception of the instructional portion of the experiment. The male professor whose distinctive brain map during the poetry section was described above as Group C showed a marked increase in posterior alpha activity during the instructional tape, although his changes during the instructional segment were less prominent and more generalized than were his changes during the poetry segments.

It seems reasonable to hypothesize that both points of similarity and points of difference would emerge between the processing of language which is used to give instructions and the processing of language which is used to express poetic sensibilities. In the present study, we hoped to find some hard evidence about whether individuals process language in poems differently from language used in a technical or instructional context. Unfortunately, this study did not find easily-explained differences between the subjects' topographical maps during the poetry sections compared to their maps during the instructional section. We can conclude, however, that, at least in the ten subjects in this study, the processing of poetry did not seem to lateralize to one side or localize to a single discrete brain region. However, one subject (a male professor from Group A) who reported a keen interest in the instructional tape showed a generalized decrease in alpha activity during the instructional segment. A similar but less marked response was seen in two other subjects (one female student and one male professor from Group B) during the instructional tape. These responses of <u>generalized decreased alpha activity</u> during the instructional tape can be contrasted with the Group B response of <u>decreased frontotemporal alpha activity</u> during the poetry segments.

Some of the participants mentioned in their written comments that they responded to the musicality of Poe's poetry. Some observed that they began to visualize the images in the poems, particularly on second hearing or toward the end of the taping session. The processing of visual stimuli seems to be different from auditory stimuli (Mazziotta et al., 1982), and the processing of musical stimuli seems to be different from the processing of verbal stimuli (McKee, Humphrey, and McAdam, 1973). However, if the verbal input has musical qualities, does it become music for purposes of neurolinguistic processing? If the auditory input is translated into visual imagery, does it become visual for purposes of neurolinguistic processing? Our study raises these questions in a new way, even though its limited yet complex evidence cannot provide the answers.

Previous EEG research has noted asymmetries during both linguistic and musical tasks. Also, a study of dyslexia by Duffy, Burchfiel, and Lombroso (1979) used topographical EEG maps with a computerized subtraction process to identify differences between the dyslexic subjects and the control subjects in the test population, finding variations in the specific regions of the brain. Furthermore, PET studies done at UCLA (Mazziotta et al., 1982) have shown regional metabolic differences during auditory processing. These past studies gave us hope of mapping regional brain asymmetry during the auditory processing of poetry. In fact, however,[3] our study did not find significant asymmetries.

The most notable finding of our study was the documentation of decreased frontotemporal alpha activity during the poetry segments in four individuals (three female students and one male professor) who reported strict concentration on the poetry. This finding is similar to the results of the PET study (Mazziotta et al., 1982) in which subjects listened to a Sherlock Holmes story. Our results thus support the idea that complex auditory and mental processes correlate with diffuse activation of frontotemporal brain areas. Furthermore, since three out of four members of this group in our study included all of the female students, the results raise the possibility of a gender-specific, age-specific, or training-specific response. Of course, the present study was designed to be a preliminary investigation, and the necessarily limited number of subjects in such a preliminary project prohibit me from drawing broad conclusions from our data.

No previous studies have related poetry or poetic language to brain mapping. My co-researcher and I hope that our findings will attract further research interest into the neurolinguistic processing of poetry and will have significance for others studying how and where the brain processes literature and language. Resolution of brain mapping for localizing changes is still low; however, CT scans in the 1970s were of similarly low resolution and gave very hazy pictures compared to the MRI scans of the 1990s. With a higher resolution capacity, brain mapping could become a powerful, safe, and relatively economical way of defining both normal and abnormal brain functions and of tracing dynamic brain processes. Too, if strict correlations with PET research are established, topographical EEG mapping could become a major research tool for measuring normal language functions and normal cognitive processing. Results of such studies would be of use in clinical evaluations of individuals gifted in poetry and language, of individuals with language disorders or learning disabilities, and of language-learners acquiring skills in reading and listening. This type of interdisciplinary study, therefore, holds promise for linguists, educators, neurologists, and others in related professions.

Notes

[1] This research project was supported by a grant from the Witter Bynner Foundation and was carried out through the cooperation of the Dantech Corporation, the English Department at Texas Tech University, and the Neurology Department at Texas Tech University Health Sciences Center.

[2] The poetry of Edgar Allan Poe was selected for this project for a variety of reasons. First, Poe himself was interested in the interplay between science and poetry, as we know from his "Sonnet--To Science." Second, Poe was fascinated by the psychological aspects of poetry and by the connections between sounds, meanings, feelings, and words. Poe was also attracted to the study of hypnosis, which at the time was called "mesmerism" or "animal magnetism." In the nineteenth century, references to hypnosis signalled pseudo-scientific work and fakery as much as they did genuine human responses. As Tatar (1978) points out, "Poe refused to entertain fanciful psychological or spiritual interpretations of mesmerist views. He wished to report 'authentic' case histories documenting the power of animal magnetism to provide moments of cosmic insight" (198). Though most studies of Poe and hypnosis focus on his fiction, Poe's efforts to incorporate hypnotic techniques in his poetry are notable; he wrote many poems with the the full hope, it seems, of producing specific and spectacular results in his readers. As Daniel Hoffman (1985) has shown, Poe's unceasing emphasis on the primacy of the imagination, on musical rhymes and rhythms, and on repetition is evident throughout his poetry, and Richard Wilbur (1984) has described Poe's literary theory as giving "supremacy to the short, trance-inducing and earth-forsaking poem" (24). And, as a final reason for choosing Poe's poems in this study, Poe's work is familiar to technically untrained readers while it is also the subject of scrutiny by literary scholars, so his poetry ought to provide a good balance between accessibility and depth.

The instructional portion of the experiment consisted of an excerpt from a professional tape about time management. This tape was chosen because the topic would be appealing to the volunteers, busy honors students and university professors, and could, therefore, be expected keep the volunteers' attention focused on what they were hearing. The time management tape would not seem to require any imaginative or emotional response from the listeners, and this was intended to be one major point of contrast between the technical instructions and poetry sections. Also, this selection of tape did not include any unusual lexical items, any plays on words, or any special uses of language, in great contrast to the tapes of Poe's poetry. The time management tape would not be considered poetic or even literary material; it was interesting rather than dull, but it was not especially exciting, deep, or thought-provoking.

[3] The one person (a male professor) reporting an intense emotional response to the poetry in this study showed a generalized increase in alpha activity which might be interpreted as an enhanced state of relaxation. This individual's topographical maps can be contrasted in particular with the maps of the two individuals (both male students) who reported some boredom during the experiment. These two students' maps showed few changes during the one-hour experimental period; the individuals were perhaps so relaxed as to be near the point of sleep.

Selected Bibliography

Alexander, M. P., Benson, D. F., and Stuss, D. T. 1989. Frontal lobes and language. *Brain and Language*, 37, 656-691.

Caplan, D. 1987. *Neurolinguistics and linguistic aphasiology: an introduction*. Cambridge: Cambridge University Press.

Duffy, F. H., Burchfiel, J. L., and Lombroso, C. T. 1979. Brain electrical activity mapping (BEAM): a method for extending the clinical utility of EEG and evoked potential data. *Annals of Neurology*, 5, 309-321.

Duffy, F. H., Iyer, V. G., and Surwillo, W. J. W. 1989. *Clinical electroencephalography and topographic brain mapping: technology and practice*. New York: Springer-Verlag.

Fox, P. T. 1990. Mapping language with positron emission tomography. *Innovations in Epilepsy*, 2 and 6.

Fox, P. T., Mintun, M. A., Raichle, M. E., Miezin, F. M., Allman, J. M., and Van Essen, D. C. 1986. Mapping human visual cortex with positron emission tomography. *Nature*, 323, 806-809.

Hoffman, D. 1985. *Poe Poe Poe Poe Poe Poe Poe*. New York: Vintage.

Mazziotta, J. C., Phelps, M. E., Carson, R., and Kuhl, D. E. 1982. Tomographic mapping of human cerebral metabolism: auditory stimulation. Neurology, 32, 921-937.

McKee, G., Humphrey B., and McAdam, D.W. 1973. Scaled lateralization of alpha activity during linguistic and musical tasks. Psychophysiology, 10, 441-443.

Miller, G. A. 1990. Linguists, psychologists, and the cognitive sciences. Language, 66, 317-322.

Petsche, H. 1976. Topography of the EEG: survey and prospects. Clinical Neurology and Neurosurgery, 79, 15-28.

Petersen, S.E., Fox, P. T., Posner, M. I., Mintun, M., and Raichle, M. E. 1988. Positron emission tomographic studies of the cortical anatomy of single-word processing. Nature, 331, 585-589.

Posner, M. I., Petersen, S. E., Fox, P. T., and Raichle, M. E. 1988. Localization of cognitive operations in the human brain. Science, 240, 1627-1631.

Reiman, E. M., Fusselman, M. J., Fox, P. T, and Raichle, M. E. 1989. Neuroanatomical correlates of anticipatory anxiety. Science, 243, 1071-1074.

Tatar, M. M. 1978. Spellbound: studies on mesmerism and literature. Princeton: Princeton University Press.

Wilbur, R. 1984. Review of Edgar Allan Poe: essays and reviews. New York Times Book Review, September 9, 1984, 3 and 24.

Appendix

Topographical Alpha Maps (Converted to Grey Scale)

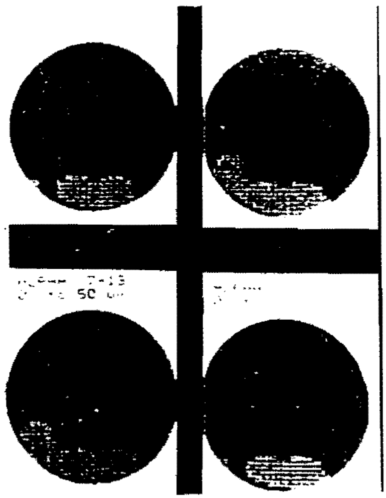
Pattern of Figures:

at rest alpha	poetry 1 alpha
instruction alpha	poetry 2 alpha

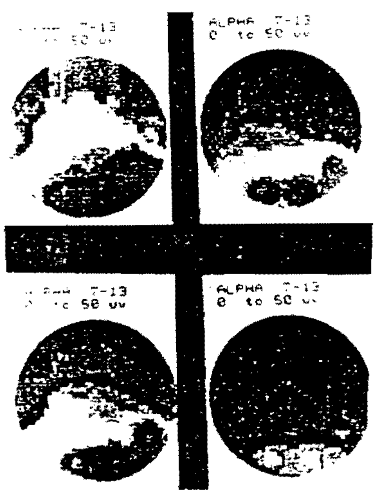
Sample Group A Response (upper right): no significant changes; subject reported lapses in concentration.

Sample Group B Response (lower left): decreased frontotemporal alpha during poetry; subject reported concentrating.

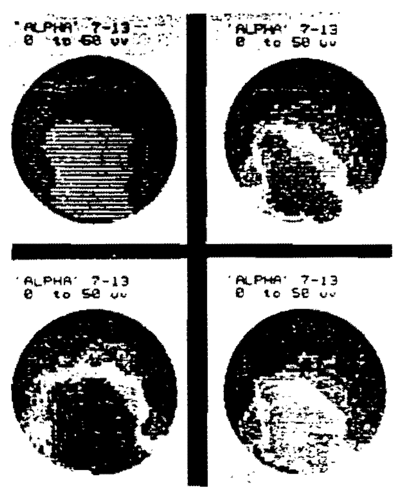
Sample Group C Response (lower right): generalized increase in alpha; subject reported emotional response during poetry.



A



B



C

Adjunction to Nonarguments*

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0. Introduction

This paper is concerned with some empirical consequences of adjunction to nonarguments w.r.t. the formulation of Subjacency and ECP. According to Chomsky (1986b), Subjacency is a syntactic principle that rules out antecedent-trace relations involving more than one barrier, and the ECP is an LF principle which rules in only the relation between an empty category and its antecedent involving no barrier, assuming a G-marking algorithm, originally proposed by Lasnik and Saito (1984).

One of the leading ideas in Chomsky's theory is that every maximal projection could be a potential barrier for government and a bounding node for movement. A maximal projection can be a real barrier for government and movement unless it is lexically subcategorized for, or the intended antecedent is adjoined to that maximal projection. Thus Chomsky assumes that adjunction is possible only to a nonargumental, maximal projection, which may be derived from the theta-theory. However, contrary to this original, optimally simple assumption, his analysis of unbounded dependency constructions shows that except for adjunction to VP, adjunction to other nonarguments is generally prohibited for Subjacency or ECP purposes. In this paper, I will argue that UG should be constructed in such a way that it, in principle, allows all kinds of nonarguments to be adjunction sites, but this adjunction process is parameterized across languages during the construction of particular core grammars. Descriptively adequate accounts for a certain set of extraction phenomena in some constructions in some languages require not only adjunction to VP but adjunction to other nonarguments to be incorporated into the grammatical system of those languages. This is necessary in order not to make otherwise necessary stipulations. Developing the parameterized adjunction-to-nonargument analysis, I will show that defining ECP in disjunctive terms whose components consist of theta-government and antecedent government provides more descriptively adequate accounts for a wide range of extraction phenomena than previous attempts. Typologically, the world's languages are categorized into subclasses, according to which different types of adjunctions are permitted. This result indirectly supports our view of the relativized process of adjunction.

1. Chomsky's (1986b) Unified Theory of Government and Bounding

In order to see how Chomsky's barriers theory works, let us consider the contrast between sentences (1b) and (1c) below:

(1) a. John knew [CP[IP to [VP[V' fix which car]] how]]
b. [which car]i [IP did John[VP ti'' [VP know[CP [how]j [IP to [VP ti' [VP [V' fix ti]]] tj]]]]]
c. *[how]i [IP did John [IP ti'[IP know [CP [which car]j [IP to [VP tj' [VP [V' fix tj]]] ti]]]]]

In barriers theory, the above contrast is accounted for by the notion of subjacency degree, roughly stated as in (2):

(2) a is n-subjacent to b iff there are fewer than n+1 barriers for a that exclude b.[1]

In (1b), tj is 0-subjacent to how. The relation between the trace ti", adjoined to the matrix VP, and the trace ti', attached to the lower VP, involves one barrier; hence 1-subjacency results. This is due to the fact that the embedded CP inherits barrierhood from its IP, which is a Blocking Category. Then, we can interpret Subjacency as in (3):

(3) Every link of a well-formed chain must be of 0- or 1-subjacency.

As for Subjacency, the grammaticality of (1c) must be the same as that of (1b), since every link of the chain except (ti, ti') is of 0-subjacency. The embedded CP between ti' and ti acts as a barrier, and thus ti' is 1-subjacent to ti. What principle, then, is responsible for the contrast of grammaticality between (1b) and (1c)? This asymmetry is explained by the ECP. (1b) satisfies the ECP, since the trace ti is theta-governed by fix, while the trace tj is antecedent-governed by how. The other traces are deleted by Lasnik and Saito's (1984), Affect a at LF. In contrast, (1c) is an ECP violation. The original trace of which car is theta-governed by fix, but antecedent-government fails to hold between tj and tj', since the embedded CP inherits barrierhood from its IP. Assuming a G-marking algorithm, the relation of these two traces is not of 0-subjacency; hence an ECP violation results.

However this account crucially relies on the following stipulation:

(4) Adjunction to IP should be prohibited.

Suppose that IP-adjunction is allowed. Then there is no way to capture the argument/adjunct asymmetry w.r.t extraction from wh-islands. Adjunction to IP plays havoc with barriers formed in the sentences in (1). Thus it would incorrectly predict that all the sentences in (1) are perfectly grammatical. Chomsky and others suggested that the difference between IP and VP may be traced to some principles of grammar.

2. A Conceptual Problem in Licensing only Adjunction to VP

In this section, I will point out one conceptual problem that will result by an attempt to rule out IP-adjunction but not VP-adjunction.

As mentioned before, Chomsky assumes that adjunction is possible only to a maximal projection that is a nonargument. Under this assumption, VP must be nonargumental if VP-adjunction is always possible. However, contrary to this prediction, there are some cases in which VPs seem to behave like an argument. Let us consider sentence (5) below:

(5) Fix the car, John would ask whether he will t

The configuration of (5) does not allow for antecedent-government between the extracted VP and its trace. For ECP purposes, the trace of VP should be theta-governed. In order to deal with such sentences, Chomsky suggested that INFL elements, more specifically modal verbs, may optionally theta-mark their complement VP. Only modal verbs allow their complement to be extracted. They seem to have properties of main verbs and those of other INFL elements simultaneously. Like main verbs, they optionally assign a theta-role to their complement VP, however abstract theta-role it is. Given this, the extraction of VP in (5) satisfies the ECP, since the VP-trace is theta-governed. From the assumption underlying this account, it follows that VP may be a nonargument or an argument. On the other hand, there are no cases in which IP is extracted. Even if it is a complement to ECM verbs like consider, believe, etc., it cannot be extracted from VP. This fact strongly suggests that IP is always nonargumental. These two observations demonstrate that IP is more nonargumental than VP. If so, IP is the category that is most compatible with the original assumption that adjunction is possible only to a non-maximal projection. On this view, an attempt to rule out IP-adjunction is quite undesirable. In the following section, I will present the reasons why we need to allow for adjunction to non-VP arguments.

3. Why Adjunction to Nonarguments?

3.1 English Topicalization

As noted by Baltin (1982), Lasnik and Saito (1989) and others, English topicalization in an embedded clause provides evidence for the hypothesis that IP-adjunction is a possible option for an IP-internal, moved element. Let us consider the following sentence:

(6) They believe [$_{CP}$ that [$_{A}$ John [$_{B}$ Bill saw t]]]

If the embedded topic construction of (6) involves movement, then we may have just two options regarding the categorial identity of the embedded constituents, A and B. On the first view, A could be identified with CP, and B, with IP. On the second, A and B may be viewed as an instantiation of IP. Without further discussion, I will adopt the latter view.[2] A step further, I will argue that IP-adjunction is possible, even in the case of an unbounded topic construction. Let us consider the sentence in (7):

(7) John, [$_{IP}$ I believe [$_{CP}$ [$_{IP}$ [$_{IP}$ Sally [$_{VP}$ said [$_{CP}$ [$_{IP}$ [$_{IP}$ Sue saw t]]]]]]]]

The original trace of John is theta-governed by saw, and thus satisfies the ECP. Since every link of the chain headed by John is of 0-subjacency, sentence (7) is perfectly compatible with Subjacency.

English topicalization is not only island-sensitive but also island-creative.[3] Consider the following ungrammatical sentence and its labelled bracketing structure:

(8) a. ?*to whom do you think that, these records, I gave
b. to whom do you t_j think [$_{CP}$ t_j that [$_{IP}$ these records$_i$ [$_{IP}$ I [$_{VP}$$t_j$ [$_{VP}$$t_i$ [$_{VP}$ gave t_i t_j]]]]]]

Since (8a) satisfies the ECP by means of theta-government, it must be a weak violation of Subjacency. This means that there is a link of chain that contains one barrier. However, according to Chomsky's definition of barrier, there is no barrier intervening between the traces in (8b). To account for this, I assume that English may not allow multiple VP adjunction. Given this assumption, (8a) can be derived in either of the following ways:

(9) to whom do you [$_{VP}$ t_j" [$_{VP}$ think [$_{CP}$ t_j' that [$_{IP}$ these records$_i$ [$_{IP}$ I [$_{VP}$ t_i' [$_{VP}$ gave t_i t_j]]]]]

(10) to whom do you [$_{VP}$ t_j'" [$_{VP}$ think [$_{CP}$ t_j" that [$_{IP}$ these records$_i$ [$_{IP}$ I [$_{VP}$ t_j' [$_{VP}$ gave t_i t_j]]]]]

The representation in (9) shows a strong Subjacency violation. The trace of <u>to whom</u>, t_j' in the specifier position of the embedded clause is 2-subjacent to its original trace t_j, because of the two barriers, i.e., VP and IP. VP is a blocking category, since it is not L-marked and dominates the original trace, and by definition can be a barrier. IP can also be a barrier by inheritance. In contrast, (10) is a weak violation of Subjacency, since there is one barrier between the topicalized NP, <u>these records</u> and its initial trace t_i. Given that a multi-set of segments counts as one barrier, VP can be a barrier because it is not L-marked and dominates the trace t_i. There is no barrier between the trace of <u>to whom</u>, t_j" in the specifier position of the embedded clause and the VP-adjoined trace t_j': VP is not L-marked but it does not dominate t_j', and hence it is not a BC. IP is a BC, since it is not L-marked and dominates that trace. However, by the second clause of the definition of 'barrier', it cannot be a barrier. Therefore, (8a) will be marginally accepted under the derivation shown in (10).

3.2 Hebrew Topicalization

Reinhart (1981) shows that parameterization of the bounding node, e.g., S for English and S' for Italian, of the sort proposed by Rizzi (1978) does not hold for Hebrew. Unlike Italian, Hebrew allows for structures which are not compatible with S'-Subjacency. Let us first consider the sentence in (11) and its skeletal structure:

(11) a. et habeaya hazo$_1$ haiti roce ladaat kama peamin od$_2$
[$_{S'1}$ This problem$_1$ I would like to know [$_{S'2}$ how many more times$_2$ I will
ectarex lehasbir lexa t_2 eix$_3$ liftor/ ha-more patar t_1 t_3
have to explain to you t_2 [$_{S'3}$ how$_3$ to solve/the teacher solved t_1 t_3]]]
b. [$_{S'1}$ wh$_1$ [$_S$ ... [$_{S'2}$ wh$_2$ [$_S$ ... t_2 ... [$_{S'3}$ wh$_3$ [$_S$ ... t_3...t_1...]]]]]]

According to the S'-Subjacency analysis, (11a) should be ruled out as ungrammatical, since <u>et habeaya hazo</u> crosses two S' nodes, as shown in (11b). However, sentences like (11a) are grammatical in Hebrew.

What we need to account for the grammaticality of such sentences is to allow <u>et habeaya hazo</u> to cross two occurrences of a S' boundary in a successive cyclic manner. This is easily accommodated into the theory of barriers. Suppose that Hebrew allows multiple VP-adjunctions as well as a single IP-adjunction. Under this language-specific condition on adjunction, the S-structure representation of (11a) would be as (12) (for expository purposes, the English translation is used here):

(12) [$_{IP}$ [$_{NP}$ This problem] [$_{IP}$ I would like to [$_{VP}$ t_5 [$_{VP}$ know [$_{CP}$ how many
more times [$_{IP}$ t_4 [$_{IP}$ I will have to [$_{VP}$ t''_1 [$_{VP}$ t_3 [$_{VP}$ explain to you t'' [$_{CP}$ how
[$_{IP}$ t_2 [$_{IP}$ (the teacher) to [$_{VP}$ t'_1 [$_{VP}$ t_1[$_{VP}$ solve/(solved) t t']]]

In (12), three chains are formed: (this problem, t_5, t_4, t_3, t_2, t_1, t), (how, t'_1, t') and (how many more times, t''_1, t''). Each of these chains is well-formed and satisfies Subjacency, since every link of the chain is of 0-subjacency.

The derivation shown in (12) strongly supports the IP-adjunction analysis of Hebrew topicalization. If topicalization did not involve adjunction to IP but substitution for [SPEC, CP], sentences like (11a) would be incorrectly predicted to be ungrammatical. Since no element can substitute for a wh-phrase or its trace in the SPEC position of CP, it has to cross that CP directly. If the IP-adjunction strategy is not available, this ought to cross two barriers, IP and its immediately dominating node, CP; hence a violation of Subjacency occurs.

Unlike its English counterpart, Hebrew topicalization does not form an island, as shown in the following paradigm:

(13) a. mi-mi$_j$ omrim [$_{CP}$ she-[$_{IP}$ et hamexonit hazo$_i$ [$_{IP}$ rosa kibla t_i t_j]]]
from whom$_j$ do people say that acc this car$_i$, Rosa got t_i t_j
b. ?[$_{NP}$ ha-sefer [$_{CP}$ she-atah carix ladaat [$_{CP}$ le-mi$_j$ ani xoshev
the-book that-you ought to-know to-whom$_j$ I think
[$_{CP*}$ she-oto$_i$ dan natan t_i t_j]]]
that-it$_i$ Dan wrote t_i t_j
c. *hine [$_{NP}$ ha-shir [$_{CP}$ she-[$_{NP}$ ha-isha [$_{CP}$ she-aleiha$_i$ xoshvim
here is the-poem that-the-woman that-about-her$_i$ they think
[$_{CP*}$ she-oto$_j$ dan katav t_j t_i]]] hitabda]]
that-it$_j$ Dan wrote t_j t_i committed suicide

The degree of grammaticality shown in (13) indicates that it is easier to extract an interrogative over a topicalized NP than over a relative resumptive pronoun. Given that IP-adjunction is allowed in Hebrew, there is no violation of Subjacency in (13a). Nothing prevents mi-mi from being moved successive cyclically through [SPEC, CP] of the lower clause. On the other hand, in (13b) and (13c), the lowering of the extracted relative pronoun to a position immediately adjoined to IP makes [SPEC, CP*] unavailable for a landing site for an interrogative or another relative pronoun, given that multiple adjunction to IP is not allowed.[4]

In sum, Hebrew topicalization can be best analyzed as adjunction to IP, and characterized as island-transparent, since Hebrew allows for multiple VP-adjunction. On the other hand, given a single IP-adjunction, the lowering of a relative pronoun to IP forms an island because of the trace left behind in the specifier position of a relative clause. At a descriptive level, it seems reasonable to regard IP-adjunction as well as multiple VP-adjunction as parameters whose value must be fixed at some point of language acquisition. From the viewpoint of Wexler and Manzini (1988), Hebrew can be viewed as more marked than English w.r.t. extraction from wh-islands.

3.3 Cebuano Wh-Questions and Topicalizations

We have so far discussed how Hebrew topicalization is analyzed in terms of a single IP-adjunction and multiple VP-adjunction. In this section we will consider another language whose wh-questions and topicalizations seem to involve syntactic IP-adjunction.

Let us first consider the following sentences:

(14) a. Nangutana si Jose kung sa tindahan gipalit ni Maria ang libro.
asked CM comp CM store bought CM CM book
'Jose asked whether Maria bought a book in the store'
b. Nangutana si Jose kung kinsa nipalit ug libro sa tindahan.
asked CM comp who bought CM book CM store
'Jose asked who bought a book in the store'
c. Gisulti ni Carlos na si Mariya, gitu'u ni Jose na nagluto ug saging.
says CM comp CM thinks CM comp cooked CM banana
'Carlos says that Maria, Jose thinks cooked banana'

As shown in (14a-b), when subcategorized for by a verb such as nangutana 'ask', indirect wh-questions are always introduced by the [+wh] complementizer kung. The complementizer kung is then followed by a wh-phrase, if any. (14c) is a typical example of long-distance topicalization. Note that I choose this example to show that it is not derived by unbounded scrambling but by successive cyclic movement. Here, the topicalized phrase si Mariya immediately follows the [-wh] complementizer na. What the examples in (14) show is that there is a structural parellism between wh-questions and topicalizations, since topicalized elements occur in the same position as extracted wh-phrases. There may be differences between embedded question and topicalization in that the latter is more often constrained for pragmatic reasons. It is worth noting that both topicalization and wh-questions create an island as well, as illustrated in (15) and (16):

(15) *Sa tindahan$_i$ nangutana si Jose kung unsa$_j$ gipalit e_j ni Maria e_i.
CM store asked CM comp what bought CM
'In the store, Jose asked what Maria bought'
(16) *Kinsa$_i$ gisulti ni Carlos na si Mariaya$_j$, nitu'u e_i na e_j ang nagluto ug saging.
Who say CM comp CM think comp CM cooked CM ban.
'Who does Carlos say that Maria, thinks is the one who cooked banana'

When a wh-question is embedded, it is headed by the [+wh] complementizer kung, and naturally forms a wh-island. Since topicalized sentences are usually embedded in the form of a declarative, we may have to assume that the configuration generated by topicalization forms an island. Cross-linguistically, they are not particularly marked. English topicalization, which we examined before, generates the same configuration and has the same properties. Without giving a detailed analysis, I assume that syntactic IP-adjunction is responsible for them.[5]

3.4 Extractions out of Adjuncts in Korean

Finally, I will argue that some LF extraction facts in Korean support the view that adjunction should be parameterized. Chomsky (1986b) pointed out that sentence (17b) below is fairly acceptable, whereas sentence (17a) is not:[6]

(17) a. He is the person to whom [IP they left [before speaking t]]
     b. He is the person [IP they left [before speaking to t]]

He attributed the relative acceptability of (17b) to the possible option of adjoining the NP empty operator to the adjunct <u>before</u>-phrase, and suggested that in English, this option may be limited only to NP's. By virtue of this restriction, extraction of an adjunct from an adjunct phrase results in an ECP violation, as illustrated in (18):

(18) a. *How did you leave [before fixing the car t]
     b. *Who left [before fixing the car how]

In the above sentences, the <u>before</u>-phrase is a BC, and thus a barrier for the trace in situ, which protects it from government by the fronted wh-word.

Unlike English, Korean may be thought of as a language in which the option of adjunction to PP, and also probably to other adjuncts, is more available. Let us consider the following sentences:

(19) a. ne-nun [IP[PP[CP nwuka chacaoki] cene], hakkyo-ey kassni]
     you-top who-sm came-to-visit before school-to went-Q
     'who is the person x such that John went to school before x came to visit'
     b. $John_i$-un [IP[PP[CP pro_i nwuku-rul mannan] hwuey], hakkyo-ey kassni]
     -top who-om meet after school-to went-Q
     'who is the person x such that John went to school after he met x'

On the view that the wh-in-situ move to an appropriate landing site at LF for scopal purposes, the sentences in (19) are construed as the wh-phrases, <u>nwuka</u> and <u>nwuku-rul</u> having wide scope over their respective matrix sentences. Huang (1982) argued that when a wh-in-situ moves at LF, its LF-movement is subject only to ECP. He further argued that certain languages, in particular, those languages without overt wh-movements, do not show a subject/object asymmetry, but rather a complement/adjunct asymmetry. Let us consider the following contrast between (20) and (21):

(20) ni xiang-zhidao [shei mai-le sheme]
     you wonder who buy-asp what
     a. 'what is the thing x such that you wonder who bought x'
     b. 'who is the person x such that you wonder what x bought'
(21) ni xiang-zhidao [shei weisheme mai-le shu]
     you wonder who why buy-asp books
     'who is the person x such that you wonder why x bought books'

In (20), either of the wh-in-situ can move to the spec position of the matrix clause at LF, and thus result in the ambiguity indicated in (20a) and (20b). On the other hand, in (21) only the wh-phrase, shei occupies that position; no ambiguity arises. This is because the LF wh-traces in the argument position are always properly governed, but the trace of the wh-adverbial, weisheme is never properly governed.

Given that Korean is on par with Chinese regarding LF-movement of syntactically unmoved wh-phrases, LF-movement in sentences (19a) and (19b) yields no ECP violation, since the LF wh-phrases occupy a position properly governed at S-structure.[7] On the other hand, LF-movement of wh-adverbials, corresponding to 'why' and 'how', from adjunct phrases results in ungrammatical sentences, as in (22) and (23) below:

(22) *John$_i$-un [$_{IP}$[$_{PP}$[$_{CP}$ pro$_i$ Mary-rul way mannan] hwuey], hakkyo-ey kassni]
why meet after school-to went-Q
'what is the reason x such that John went to school after he met Mary for x'

(23) *J-nun [$_{IP}$[$_{PP}$[$_{CP}$Sue-ka M-ul ettehkey mannan] koseyse], Bill-ul mannassni]
how meet place-at met-Q
'what is the manner x such that John met Bill at the place Sue met Mary in x'

Wh-adverbials like way and ettehkey are supposed to occur outside V', and thus their LF traces cannot be theta-governed. As assumed so far, there is another option in which the ECP is satisfied. It can be satisfied by means of antecedent-government. Therefore, given the ungrammaticality of (22) and (23), we have to ensure that there is no appropriate LF representation assigned to them in which antecedent-government does not fail.

If we assume that as in English, adjunction of adverbials to PP is also prohibited in Korean, the ungrammaticality of the sentences in (22) and (23) falls out from an ECP violation. The initial trace of the wh-adverbials are antecedent-governed by the intermediate trace in the spec of the complement clause of P like hwuey, and koseyse, etc. However, the intermediate trace is protected from government from outside PP, since this PP is not L-marked and dominates it. Therefore, under the assumption that there is no PP-adjunction available, we can account for the ungrammaticality of (22) and (23) in terms of the ECP.

However, there are some cases where this account runs into a problem. Let us consider the following sentences:

(24) John$_i$-un [$_{IP}$[$_{PP}$[$_{CP}$ pro$_i$ Mary-rul eti-eyse mannan] hwuey], hakkyo-ey kassni]
where meet after school-to went-Q
'where is the place x such that John went to school after he met Mary at x'

(25) J-nun [$_{IP}$[$_{PP}$[$_{CP}$Sue-ka M-ul ence mannan] koseyse], Bill-ul mannassni]
when meet place-at met-Q
'when is the time x such that John met Bill at the place Sue met Mary at x'

As seen above, the wh-adverbials corresponding to 'where' and 'when' exhibit quite different behavior w.r.t. LF-movement. Contrary to the prediction that will be made by the above analysis, LF-extraction from an adjunct PP does not result in the ungrammaticality of the sentences in question. Theta-government fails to work in (24) and (25) just because the verb, mannata is not subcategorized for by an adverbial phrase. The failure of theta-government leaves us one option, i.e., antecedent-government. Under the definition of government adopted in this paper, the only LF-representation possible where antecedent-government is obtained is produced by adjoining the wh-adverbials to the adjunct PP. Adjunction to any maximal projection deprives it of its potential barrierhood. In order to rule in the above sentences, it should be allowed to adjoin any maximal projection to the adjunct PP, whether it is an argument or not.

This seems to contrast with Huang (1982). He treated the wh-adverbials in the Chinese sentences corresponding to (24) and (25) as nominal for ECP purposes, while our analysis allows for the possibility that any adjunct can be adjoined to the adverbial PP. Huang observes that the Chinese equivalents to 'where' and 'when' behave like the wh-arguments, rather than like the wh-adverbials. To account for this fact, Huang assumed that Chinese 'where' and 'when' are dominated by NP in the position [$_{PP}$ P [$_{NP}$ __]], where the P may or may not be phonetically realized. On this assumption, they are complements of prepositions, and are on a par with 'who' and 'what'. Note, however, that Huang's account implies that in Chinese, prepositions are a proper governor when they are present, and thus are somewhat freely stranded-- which is dubious.

It cannot be applied to the analysis of their Korean counterparts. As a head final language, Korean has only postpositions, and the wh-adverbials may be optionally headed by postpositions. Korean does not allow for postposition-stranding, like other postpositional languages. In the absence of any evidence that complements of a postposition are freely moved at LF, we can conclude that the wh-adverbials of 'where' or 'when' moves being contained in a postpositional phrase. In light of this, consider the following sentences:

(26) ?B-nun [$_{PP}$[$_{NP}$[$_{CP}$ J-i nwuku-lul mannassta-nun] sasil]-ttæmuney] koyrewehani
who met-comp fact-because-of (is) distressed-Q
'who is the person x such that Bill is distressed because of the fact that John met x'

(27) ?*B-nun [$_{PP}$[$_{NP}$[$_{CP}$ J-i eti-eyse/encey/way/ettehkey Mary-lul mannassta-nun]
where/when/why met-comp
sasil]-ttæmune] koyrewehani
fact-because-of be distressed-Q
'where/when/why is Bill distressed because of the fact that John t met Mary'

As expected from our analysis, there is a clear contrast in grammaticality between (26) and (27). Sentence (26) doesn't seem fully natural, but can be interpreted as a direct question asking the value of 'who'.[8] In (26), the wh-phrase, nwuku-lul is in the object position, and thus its LF-trace satisfies the ECP, in whatever manner it moves to the spec of the matrix sentence. In contrast, sentence (27) shows that wh-adverbials in situ cannot be extracted from the complex NP which is in turn a complement to ttæmuney 'because of', and that 'where' and 'when' are on a par with 'how' and 'why' at this point. This is because sentence (27) cannot be assigned an LF-representation where antecedent-government obtains. The complex NP serves as a barrier which blocks the trace in the spec of the complex NP-internal CP from being governed from outside. Unlike our analysis, Huang's analysis would incorrectly predict that sentence (27) is perfect when 'where' and 'when' are extracted.

What is to be explained in our analysis is why sentences like (24) and (25) are grammatical, but sentences like (22) and (23) are ungrammatical. Before giving a solution to this, let us consider the sentences in (28):

(28) a. [NP[CP nwuka ssu-n] chæk-i] cæmiissni
who wrote-comp book-sb (is) nteresting-Q
b. [NP[CP John-i etieyse ssu-n] chæk-i] cæmiissni
where wrote-comp book-sb (is) interesting-Q
c. [NP[CP John-i musun iyuro ssu-n] chæk-i] cæmiissni
what reason-for wrote-comp book-sb (is) interesting-Q
d. *[NP[CP John-i way ssu-n] chæk-i] cæmiissni
why wrote-comp book-sb (is) interesting-Q
e. *[NP[CP John-i ettehkey ssu-n] chæk-i] cæmiissni
how wrote-comp book-sb (is) interesting-Q

(28c) is a paraphrase of (28d), and is significantly better than (28d). The same fact observed in Chinese forces Huang to posit that it be on par with (28a) and (28b) w.r.t. LF-extraction. However, there is a difference between (28a) and (28b) on the one hand and (28c) on the other. Questions like (28a) and (28b) can be answered either by identifying the referent of a wh-word or by spelling out the whole NP in which the relevant information for identifying the wh-word is contained. In contrast, questions like (28c) can hardly be answered in the former way; the whole NP must be repeated. This pattern of answering leads to the conjecture that unlike 'who', 'what', 'where', and 'when', 'why' and 'how' cannot be extracted from the embedded subject NP. It is also true for the case of extraction from an adjunct PP. This fact suggests that the best solution to the problem consists in the precise classification of various wh-adverbials. Following Aoun and Li (1989), I will treat <u>where</u> and <u>when</u> as referential adjuncts, and <u>how</u> and <u>why</u> as nonreferential adjuncts, and propose that only referential expressions (arguments or adjuncts) are adjoinable to nonarguments. This accounts for the contrast between (22) and (23) on the one hand and (24) and (24) on the other.

4. Concluding Remarks

We have seen that the more descriptively adequate accounts for a certain set of extraction phenomena in some languages necessitates adjunction to other nonargument phrases, in addition to VP-adjunction. Since languages differ in allowing such adjunction possibilities, it is not unreasonable to consider the possible choices of adjunction sites as the parameters of UG whose values are to be fixed by language learners on the basis of positive data. On such a view, the world's languages may be schematically classified in the following way:

(29)	English-type	Hebrew-type	Cebuano-type-lgs	Korean-type
IP-adjunction	??	yes	yes	yes
Multiple IP-adjunction	no	no	no (?)	yes
VP-adjunction	yes	yes	yes	yes
Multiple VP-adjunction	no	yes	no	yes
LF PP-adjunction	no (?)	no	no	yes

The proposed account may not be conclusive and explanatorily adequate in many respects. However, language-specific parameterization of adjunction seems to be necessary to handle the island effects in natural languages.

NOTES

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1Chomsky (1986b) defines barrier as follows:

(i) g is a barrier for b iff (ia) or (ib)

  a. g immediately dominates d, d a BC for b;

  b. g is a BC for b, g ≠ IP

Then, the relation of dominance is redefined as follows:

(ii) a is dominated by b only if it is dominated by every segment of b.

Blocking Category (BC) is defined as follows:

(i) g is a BC for b iff g is not L-marked and g dominates b.

Roughly, we construe 'L-marking' as follows:

(ii) a L-marks b iff a is a lexical category that theta-governs b.

2Advocating the IP-adjunction approach to topic sentences, Lasnik and Saito (1989) observes the following contrast:

(i) a. ?Whoi did Mary wonder [CP [NP which picture of ti]j [IP Tom hated tj]]

  b. *?Whoi did Mary say [CP ti' that [IP [NP a picture of ti]j, [IP Tom hated tj]]]

However degraded sentence (ia) may be, it does not involve any violation of ECP or Subjacency. The initial trace of <u>who</u> is theta-governed by the preposition <u>of</u>, and hence satisfies the ECP. Since the NP in SPEC of the embedded CP is L-marked, and thus is not a BC. Neither is CP a barrier, since it is also L-marked by the matrix verb. So the trace adjoined to the matrix VP is 0-subjacent to the initial trace, ti. Therefore, it satisfies Subjacency perfectly. On the other hand, sentence (ib) is a weak Subjacency violation. Since the topicalized NP, <u>a picture of who</u> is not L-marked and dominates the initial trace, ti, of <u>who</u>, it is a BC. Thus it is a barrier that protects ti from government from the intermediate trace ti' in SPEC of the embedded CP. So sentence (ib) is marginally acceptable, since every link of the chain headed by <u>who</u> involves at most 1-subjacency.

3Chomsky (1977) shows that English topicalization leaving a gap is unbounded movement sensitive to Subjacency.

4I assume here that lowering the fronted pronoun to IP must leave its trace in [SPEC, CP]. The trace left behind thus blocks this position from being used as a landing site for another extracted element. For more detailed discussion of the lowering of extracted relative pronoun or null operator in Hebrew, see Lee (1987).

5Lee (1990) deals with unbounded dependency constructions in Cebuano, whose correct analysis seems to pose some problems for current theories of movement.

6Examples (17) and (18) below are taken from Chomsky (1986b, 66).

7That the subject NP is theta-governed in Korean may be derived either by assuming that in this language, INFL is a proper governor, or by adopting the VP-internal Subject hypothesis that it originates in the specifier position of VP which is theta-governed by V. I will take the first option in this paper, since it is not clear to me whether the VP-internal subject should move to the spec of IP and how this process is carried out, if it should do so. Whichever option we take, we have to be able to explain not only that extraction from the subject NP is possible but also that the NIC effects lack in Korean, as shown in (i):

(i) John-i [CP caki-ka kaketta-ko] malhætta
  sb self-sb would go-that said
  'John said that self would go'

On the view that some aspects of the anaphor-antecedent relation are attributed to the trace-antecedent relation, as in Chomsky (1986a), the trace left by LF-raising caki in (i) must be properly governed. The grammaticality of (i) gives evidence in favor of the view that the subject position is properly governed in this language.

[8]The unnaturalness of sentence (26) might be due to the Subjacency effects. Whether Subjacency holds at LF is too controversial to deal with in such a short paper. Even if it regulates LF-movements in Korean, it does not affect the main point of this paper, and thus I refer the reader to Lee (1982), Choe (1987), Pesetsky, D. (1987) for more discussion about the issue.

REFERENCES

Aoun, J. and A. Li (1989). Syntax of Scope. USC, ms.

Baltin, (1982). "A landing site theory of movement rules." LI 13:1, 1-38.

Borer, H. (1984). "Restrictive relatives in Hebrew." NLLT 2, 219-260.

Choe, J.-W. (1987). "LF-movement and Pied Ping." LI 18:2.

Chomsky, N. (1981). Lectures on Government and Binding. Dordrecht: Foris.

Chomsky, N. (1986a). Knowledge of Language: Its Nature, Origin and Use. New York: Praeger.

Chomsky, N. (1986b). Barriers: Linguistic Inquiry Monograph 13. MIT Press.

Gad, Ben-Horin (1976). "Aspects of syntactic preposing in spoken Hebrew." In S.C. Dik and J.G. Kooij, eds., Studies in Modern Hebrew Syntax and Semantics. Amsterdam: North Holland Publishing Company.

Lasnik, H., and M. Saito (1984). "On the nature of proper govenment." LI 15, 235-289.

Lasnik, H., and M. Saito (1989). Move Alpha. Ch 1-4, ms.

Lee, Hyo-Sang (1982) "Asymmetries in island constraints in Korean." UCLA, ms.

Lee, Hyunoo (1987). "The internal structure of COMP and WH-movement in Hebrew". UCLA, ms.

Lee, Hyunoo (1990). "Cebuano constituent questions and theory of movement". UCLA, ms.

Pesetsky, D. (1987). "Wh-in-situ: movement and unselective binding." In Reuland, Eric J. and Alice G. B. ter Meulen, eds., The Representation of (In)definiteness. Cambridge, MA: MIT Press.

Reinhart, T. (1981). "A second COMP position." In A Belleti, L. Brandi, and L. Rizzi, eds., Theory of Markedness in Generative Grammar. (Proceedings of the 1979 GLOW conference.) Scuola Normale Superiore, Pisa.

Rizzi, L. (1978). "Violations of the Wh-Island Constraint in Italian and the Subjacency Condition." In C. Dubuisson, D. Lightfoot, and Y. C. Morin, eds., Montreal Working Papers in Linguistics 11.

Rizzi, L. (1987). Relativized Minimality. Universite de Geneve, ms.

Shlonsky, U. (1988). "Complementizer-cliticization in Hebrew and the Empty Category Principle." Natural Language & Linguistic Theory 6:2.

Wexler, K. and M. R. Manzini (forthcoming). "Parameters and learnability in Binding Theory." in Roeper, T. and E. Williams, eds., Parameter Setting. Reidel, Dordrecht.

The Effect of Person Hierarchy on the Blocking of the Long-distance Binding of the Chinese Reflexive Pronoun ZIJI[1]

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0. Introduction

Chinese reflexives have been given considerable attention by Government and Binding theoreticians in recent years. This is because the properties of the Chinese reflexive *ziji* are very important to current proposals about binding theory within the Government and Binding framework. It has been well-documented that the standard binding theory (Chomsky 1981) can not adequately account for the Chinese reflexive *ziji* in several respects. For instance, the theory imposes locality requirements that are too strong to account for the long-distance effects of *ziji*, and at the same time it allows too much freedom in the choice of antecedent to account for the subject orientation of *ziji* (Tang, 1989). A number of attempts have been made to resolve these problems. Progress has been made, but none of the solutions offered so far is satisfactory.

In this short paper, I will discuss the long-distance effects of the Chinese reflexive *ziji* focusing on its blocking effects. In section one, I will present the problem of long-distance binding and the blocking effects of the Chinese reflexive *ziji*. In section two and section three, I will discuss two different approaches dealing with the issues in question proposed by C.-C. Jane Tang (1989) and Peter Cole and Li-May Sung (1990). In section four, I will attempt to critique the two approaches and offer my own highly tentative explanation as to what is really going on in the distribution of the Chinese reflexive *ziji* with respect to its long-distance binding and blocking effects.

1. The Issue

The classic example to illustrate the long-distance binding of *ziji* in Chinese is as follows (taken from Cole and Sung (1990)).

(1) Zhangsan$_i$ renwei Lisi$_j$ zhidao Wangwu xihuan ziji$_{i/j/k}$
Zhangsan thinks Lisi knows Wangwu likes self
'Zhangsan$_i$ thinks that Lisi$_j$ knows that Wangwu$_k$ likes himself$_{i/j/k}$.'

In (1) the reflexive *ziji* can refer to any of three potential antecedents: the subject of the most deeply embedded clause, Wangwu, the intermediate subject, Lisi, or the matrix subject, Zhangsan. In fact, it has been noted that, in Chinese, the reflexive *ziji* can be bound with an antecedent far away from it outside its local clause, hence the term long-distance binding. Needless to say, such a phenomenon poses a problem for the binding theory that requires a local antecedent for an anaphoric element such as a reflexive.

Another property of the long-distance effects of the Chinese reflexive *ziji* is that, other things being equal, long-distance binding of *ziji* is not possible in all cases. The cases where long-distance binding is blocked are referred to as the blocking effects of *ziji*. Huang (1984) points out that long-distance binding of *ziji* is subject to the following four restrictions (summarized in Tang (1989)).

(2) a. Non-third person (i.e. 1st and 2nd) NPs can not serve as long-distance binders.

e.g. Wo/Ni$_i$ juede [Lisi$_j$ dui ziji$_{*i/j}$ mei xinxin]
I/You think Lisi to self no confidence
'I/You thought that Lisi had no confidence in *myself/*yourself/himself.'

b. Intervening non-third person NPs block long-distance binding of *ziji*.

e.g. Zhangsan$_i$ juede [wo/ni$_j$ dui ziji$_{*i/j}$ mei xinxin]
Zhangsan think I/you to self no confidence
'Zhangsan thought that I/you had no confidence in*himself/myself/yourself.'

c. Compound reflexives (i.e. phrasal reflexives) like ta-ziji 'himself/herself' can not be long-distance bound.

e.g. Zhangsan$_i$ juede [Lisi$_j$ dui ta-ziji$_{*i/j}$ mei xinxin].
Zhangsan think Lisi to he-self no confidence
'Zhangsan$_i$ thought that Lisi$_j$ had no confidence in himself$_{*i/j}$.

d. Only the remotest, not intervening, third person NPs can act as long-distance binders.

e.g. Zhangsan$_i$ zhidao [Lisi$_j$ juede [Wangwu$_k$ dui ziji$_{i/*j/k}$ mei xinxin]].
Zhangsan know Lisi think Wangwu to self no confidence
'Zhangsan$_i$ knew that Lisi$_j$ thought that Wangwu$_k$ had no confidence in himself$_{i/*j/k}$.

Confronted with the problematic data of the Chinese reflexive *ziji*, one has to decide whether to drastically reshape the binding theory, or to modify it, or to keep it intact but add a couple of language specific rules to accommodate the data.

2. C. C. Jane Tang's Approach

Tang (1989) maintains that the possibility of long-distance binding of the Chinese reflexive *ziji* and its blocking effects, although problematic for binding theory, should not lead one to abandon or drastically reformulate the theory itself, but can be accounted for using special language-specific rules. She proposes two language-specific rules to deal with the issue.

(3) a. Feature-copying Rule (optional)
The pro in a pro-*ziji* anaphoric reflexive may transfer its features (such as person, number, gender) to *-ziji* after the application of binding theory, thus turning *ziji* into a long-distance reflexive.

b. Reindexing Rule (iterative and obligatory)
Reindex the long-distance reflexive (that is one to which binding theory has applied) with the potential NP of the next higher governing category.

To justify the optional feature-copying rule (i.e. (3)a.), Tang argues that since *ziji* is like self in English which does not have inherent features of number, person and gender, it gets them from the pronouns or pro's with which it is prefixed. The reindexing rule (i.e. (3)b.) which is triggered by the application of (3)a., is meant to account for long-distance binding because Tang claims that it cancels the locally bound condition of the binding theory. Its iterative and obligatory nature is needed to make (3)a. work in explaining away the blocking effects. and the assumed fact that when long-distance binding occurs, only the remotest antecedent can be coindexed with the reflexive.

Now let us see how Tang's approach works. The following examples are taken from Tang (1989).

(4) a. Zhangsan$_i$ renwei [Lisi$_j$ zhidao [pro-ziji$_{i/j}$ de taitai shi yige da hao ren]]
Zhangsan think Lisi know pro-self GEN wife is one-CL big good person
'Zhangsan$_i$ thought that Lisi$_j$ knew that his own$_{i/j}$ wife was a very good person.'

b. Zhangsan$_i$ renwei [Lisi$_j$ zhidao [ta-ziji$_{*i/j}$ de taitai shi yige da hao ren]]
Zhangsan think Lisi know he self GEN wife is one-CL big good person
'Zhangsan$_i$ thought that Lisi$_j$ knew that his own$_{*i/j}$ wife was a very good person.'

(5) a. Zhangsan$_i$ juede [Lisi$_j$ dui pro-ziji$_{i/j}$ mei xinxin]
Zhangsan think Lisi to pro-self no confidence
'Zhangsan$_i$ thought that Lisi$_j$ had no confidence in himself$_{i/j}$.'

b. Zhangsan$_i$ juede [Lisi$_j$ dui ta-ziji$_{*i/j}$ mei xinxin]
Zhangsan think Lisi to he-self no confidence
'Zhangsan$_i$ thought that Lisi$_j$ had no confidence in himself$_{*i/j}$.'

Tang contends that the pronoun-*ziji*, i.e. *ta-ziji*, is local reflexive in both (4)b. and (5)b. This is because the pronoun prefix is not empty and therefore the feature copying rule does not apply. Consequently, the reflexive must be bound to the local c-commanding NP as is predicted by binding theory. However, (4)a. and (5)a. are open to two possible interpretations. If the optional feature copying rule does not apply, *ziji* remains a locally bound reflexive which gives us the j reading in both sentences. If the feature-copying rule applies, it will trigger the iterative obligatory reindexing rule that requires a long-distance reflexive to be reindexed with the next minimal subject until no such subject remains, which will give us the i reading in (4)a. and (5)a. This will take care of (2)c., the restriction that compound reflexives like *ta-ziji* 'himself' can not be long-distance bound.

Example (6) below illustrates that long-distance binding is blocked by intervening non-third person NPs.

(6) Ni$_i$ renwei [wo$_j$ zhidao [pro-ziji$_{*i/j}$ de taitai shi yige da hao ren]].
you think I know pro-self GEN wife be one-CL big good person
'You thought that I knew that *your/my wife is a very good person.'

The application of the feature-copying rule and the reindexing rule can handle such cases. Since the reindexing rule must be applied iteratively (i.e. cyclically) and *ziji* is to be reindexed in each step up the tree, long-distance binding is impossible if the feature-matching requirement between the long-distance antecedent and the reindexed reflexive is not met. As is stated in the rule, the features of *-ziji* are fixed after pro-*ziji* is locally bound. In this particular example, long-distance binding is ruled out because the second person long-distance antecedent does not agree in features with the first person pro prefix. This explains (2)a. and (2)b. In fact, Tang's prediction goes a little beyond what Huang (1984) indicates, in that her theory predicts that non-third person is a possible long-distance binder, which is true according to my intuition. I will come back to this point later in the last section of this paper.

To show how her theory can deal with the fourth restriction, i.e. (2)d. above, Tang gives the example in (7) below.

(7) Zhangsan$_i$ zhidao [Lisi$_j$ juede [Wangwu$_k$ dui pro-ziji$_{i/*j/k}$ mei xinxin]].
Zhangsan know Lisi think Wangwu to pro-self no confidence
'Zhangsan$_i$ knew that Lisi$_j$ thought that Wangwu$_k$ had no confidence in himself$_{i/*j/k}$.'

Tang explains that since the reindexing rule applies iteratively up to the last cycle, the resulting coreference in (7) is that of the matrix Zhangsan with *ziji*, but not that of the intermediate Lisi with *ziji*. Tang's analysis of this example contradicts Cole and Sung's analysis of the same sentence. To Cole and Sung, all three readings, i.e. i, j, and k, are grammatical. Cole and Sung seem to be correct. Otherwise, we would have trouble accounting for the classic example in (1) that I cited at the beginning of this paper.This means that the obligatoriness of the reindexing rule is questionable. This will be discussed in the last section of this paper.

Tang claims that to account for long-distance *ziji*, no further modification of binding theory is needed. She concludes that long-distance binding of *ziji* results from the language-specific rules of feature-copying and reindexing.

3. Peter Cole and Li-May Sung's Approach

Peter Cole and Li-May Sung (1990) (henceforth Cole & Sung (1990)) adopted the Movement-to-Inflection theory advanced by Edwin Battistella in 1987. Battistella's paper that gives an account of this theory was published in 1989. Since Cole & Sung (1990) supercedes Battistella (1989), I have chosen to discuss the more recent version of this theory. To keep within the topic of this paper, I will again concentrate on the part of their theory that deals with the long-distance effects of the Chinese reflexive *ziji*, the same as what I did with Tang's theory discussed in section two above.

Cole & Sung have revised their theory several times. The version to be discussed here is based on their paper entitled the Effect of Morphology on Long-Distance Reflexives, to be published in the Proceedings of NECCL (1990). Cole & Sung argue that the fundamental mechanism permitting long-distance reflexives is head movement. Whether long-distance reflexives occur at all will depend on whether the language in question has X^o reflexives (i.e. lexical reflexives) like the invariant noun *ziji* in Chinese or only X^{max} reflexives (i.e. phrasal reflexives) like himself in English. In languages that possess both types, the X^o reflexives will undergo successive cyclic head movement and will thereby take long-distance antecedents, while the X^{max} reflexives will be strictly local. The movement of reflexives up the tree in the case of long-distance reflexives takes the form of INFL-to-COMP-to-INFL.

To account for the blocking effects exemplified by the example in (10) below, in which case, according to Cole & Sung, only the k reading is possible, they impose the agreement phenomenon on Chinese. They assume that *ziji* is generated with phi features (person and number). Since Chinese does not have overt morphological agreement, Cole & Sung assume that INFL is base-generated with agreement. They give (10) the underlying structure in (11), (taken from Cole & Sung (1990)).

(10) Zhangsan$_i$ renwei wo$_j$ zhidao Wangwu$_k$ xihuan ziji$_{*i/*j/k}$
Zhangsan think I know Wangwu like self
'Zhangsan$_i$ thinks that I$_j$ know that Wangwu$_k$ likes*myself/himself$_{*i/k}$
(11) Zhangsan$_i$ [$_{INFL}$ renwei [$_{COMP}$ wo$_j$ [$_{INFL}$ zhidao [$_{COMP}$ Wangwu$_k$
[$_{INFL}$ xihuan ziji $_{*i/*j/k}$]]]]]

As was explained in Cole & Sung (1990), in (11), *ziji* is marked as third person singular and the INFL of the lowest clause is base-generated without any agreement marking. *Ziji* moves to the INFL of its own clause. In the absence of base-generated phi-features on the head INFL, the phi-features of the adjoined element percolate up to INFL, and INFL is marked third person. A universal agreement rule checks whether the features in INFL are distinct from those of the subject. So in (11) in the case of the lowest clause, there is no conflict of features between INFL and the subject since both *ziji* and the subject of the lowest clause are third person singular. But the agreement checking will rule out (11) if *ziji* is moved up to the intermediate clause because there is a conflict of phi-features between INFL (3rd person) and the subject (1st person). Since *ziji* will pass up its phi-features to INFL, long-distance binding is thus blocked.

Although both Cole & Sung and Tang make use of agreement to explain the blocking effect, they differ in an important respect. Cole & Sung link the agreement with verb to make it conform to general principles of agreement. They stipulate that the phi-features of subject and INFL must be non-distinct. They believe that agreement is affected by the morphological properties of the language. In a language without overt agreement (i.e. without base-generated phi-features on INFL), INFL will take on the phi-features of the moved reflexive, and blocking effects will be found. This is saying that blocking effects will be present in languages without verb agreement, and absent in languages with verb agreement.

4. Comment

The use of agreement of person, number and gender features to explain the blocking effect of long-distance *ziji* is quite problematic in both approaches. It seems to me that they are looking for explanation in the wrong places. It is highly doubtful whether agreement can be considered as a useful device to account for the blocking effect of *ziji*. Cole has already abandoned the number and gender features.[2] Battistella (1989) states in a footnote that grammatical number seems to be irrelevant to blocking in Chinese. In fact, it has already been demonstrated with the following convincing example that grammatical number is indeed irrelevant to blocking in Chinese.[3]

(14) Dangshi xueshengmen$_i$ zhidao laoshi$_j$ dui ziji$_{i/j}$ mei xinxin.
then student-PL know teacher to self no confidence
'The students knew that the teacher had no confidence in themselves/himself at that time.'

Needless to say, the number feature is no longer useful in explaining blocking since both the i reading and the j reading in (14) are perfectly grammatical. However, I am under the impression that people still want to hold on to person as a valid agreement feature to be used to deal with the blocking effect of *ziji*. In the rest of this paper, I would like to argue that the person agreement feature is also irrelevant to blocking in Chinese.

Let us start with some examples given in Tang (1989) and Battistella (1989). Tang (1989) illustrates the person feature agreement effect with examples (47), (48) and (49), repeated here as (15), (16) and (17) respectively.

(15) Ni$_i$ renwei wo$_j$ zhidao ziji$_{*i/j}$ de taitai shi yige da hao ren.
you think I know self GEN wife be one-CL big good person
'You thought I knew that *your/my wife was a good person.'

(16) Wo$_i$ juede ni$_j$ dui ziji$_{*i/j}$ mei xinxin.
I think you to self no confidence
'I thought that you had no confidence in *myself/yourself.'

(17) Wo/Ni$_i$ juede Lisi$_j$ dui ziji$_{*i/j}$ mei xinxin.
I/You think Lisi to self no confidence
'I/You thought that Lisi had no confidence in *myself/*yourself/himself.'

Tang's interpretation of (15) is quite correct. The first person *wo* 'I' does block *ziji* from being coindexed with the long-distance subject *ni* 'you'. However, in (16) and (17) both the i reading and the j reading are possible, although the i reading in each case would be more natural if we add a past time adverbial to indicate that the sentence expresses reflective thinking in retrospection. Examples (16) and (17) are repeated below as (18) and (19) with the past time adverbial *dangshi* 'at that time' added to them.

(18) Wo$_i$ dangshi juede ni$_j$ dui ziji$_{i/j}$ mei xinxin.
I then think you to self no confidence
'I, at that time, thought that you had no confidence in myself/yourself.'

(19) Wo/Ni$_i$ dangshi juede Lisi$_j$ dui ziji$_{i/j}$ mei xinxin.
I/You then think Lisi to self no confidence
'I/You, at that time, thought Lisi had no confidence in myself/yourself/himself.'

These examples show that first person blocks second person as in (15), but second person does not block first person as in (18), and third person does not block first or second person as in (19). This observation holds in cases where there are intervening clauses with first or second person subjects. The examples given in Battistella (1989) to illustrate the blocking effect of agreement features can be borrowed to demonstrate the point here. The two relevant examples are repeated as (20) and (21) below.

(20) Zhangsan$_i$ juede wo/ni$_j$ dui ziji$_{*i/j}$ mei xinxin.
Zhangsan think I/you to self no confidence
'Zhangsan thought that I/you had no confidence in *himself/myself/yourself.'

(21) Zhangsan$_i$ zhidao wo/ni$_j$ juede Lisi$_k$ dui ziji$_{*i/*j/k}$ mei xinxin.
Zhangsan know I/you think Lisi to self no confidence
'Zhangsan knew that I/you thought Lisi had no confidence in himself$_{*i/k}$/*myself/*yourself.'

There is no doubt about the interpretation of (20). But the j reading in (21) is perfectly acceptable if a past time adverbial is added to the sentence.

(22) Zhangsan$_i$ zhidao wo/ni$_j$ dangshi juede Lisi$_k$ dui ziji$_{*i/j/k}$ mei xinxin.
Zhangsan know I/you then think Lisi to self no confidence
'Zhangsan$_i$ knew that I/you$_j$, at that time, thought Lisi$_k$ had no confidence in himself$_{*i/k}$/myself/yourself .'

(22) shows that first and second person block third person, but third person does not block first or second person. Assuming that this observation is valid, which I believe it is, we can test the full range of interaction between first, second and third persons in terms of their blocking effects. We can also incorporate number in this test.

Given the first, second and third persons, we need nine sentences, each of which contains a matrix clause and an embedded clause, to test the blocking effect between all the different persons. Adding the plural and singular numbers to the test, we need to multiply the nine sentences by four to get all the possible number combinations, which will give us thirty-six sentences altogether. The persons of the subjects of the clauses in each sentence will be indicated using Arabic numerals at the end of the sentence. And if the subject of the embedded clause blocks *ziji* from being coindexed with the subject of the matrix clause, I will underline the numeral. Set A will have singular subjects in both the matrix clause and the embedded clause. Set B will be for plural subjects in both clauses. Set C will have singular subject in the matrix clause and plural subject in the embedded clause. Set D will have plural subject in the matrix clause and singular subject in the embedded clause.

Set A: Sg Sg

(1)Ta$_i$ dangshi zhidao ta$_{i/j}$ dui ziji$_{i/j}$ mei xinxin 3 3
he then know he to self no confidence
'He$_i$ knew that he$_{i/j}$ had no confidence in himself$_{i/j}$ at that time.'
(2)Ta$_i$ dangshi zhidao ni$_j$ dui ziji$_{*i/j}$ mei xinxin 3 $\underline{2}$
he then know you to self no confidence
'He knew that you had no confidence in *himself/yourself at that time.'
(3)Ta$_i$ dangshi zhidao wo$_j$ dui ziji$_{*i/j}$ mei xinxin 3 $\underline{1}$
he then know I to self no confidence
'He knew that I had no confidence in *himself/myself at that time.'
(4)Ni$_i$ dangshi zhidao ta$_j$ dui ziji$_{i/j}$ mei xinxin. 2 3
you then know he to self no confidence
'You knew that he had no confidence in himself/yourself at that time.'
(5)Ni$_i$ dangshi zhidao ni$_i$ dui ziji$_i$ mei xinxin 2 2
you then know you to self no confidence
'You$_i$ knew that you$_i$ had no confidence in yourself$_i$ at that time.'
(6)Ni$_i$ dangshi zhidao wo$_j$ dui ziji$_{*i/j}$ mei xinxin 2 $\underline{1}$
you then know I to self no confidence
'You knew that I had no confidence in *yourself/myself at that time.'
(7)Wo$_i$ dangshi zhidao ta$_j$ dui ziji$_{i/j}$ mei xinxin 1 3
I then know he to self no confidence
'I knew that he had no confidence in myself/himself at that time.'
(8)Wo$_i$ dangshi zhidao ni$_j$ dui ziji$_{i/j}$ mei xinxin 1 2
I then know you to self no confidence
'I knew that you had no confidence in myself/yourself at that time.'

(9)Wo$_i$ dangshi zhidao wo$_i$ dui ziji$_i$ mei xinxin 1 1
I then know I to self no confidence
'I knew that I had no confidence in myself at that time.'

Set B: Pl Pl

(1)Tamen$_i$ dangshi zhidao tamen$_{i/j}$ dui ziji$_{i/j}$ mei xinxin 3 3
they then know they to self no confidence
'They$_i$ knew that they$_{i/j}$ had no confidence in themselves$_{i/j}$ at that time.'
(2)Tamen$_i$ dangshi zhidao nimen$_j$ dui ziji$_{*i/j}$ mei xinxin 3 2
they then know you to self no confidence
'They knew that you had no confidence in *themselves/yourselves at that time.'
(3)Tamen$_i$ dangshi zhidao women$_j$ dui ziji$_{*i/j}$ mei xinxin 3 1
they then know we to self no confidence
'They knew that we had no confidence in *themselves/ourselves at that time.'
(4)Nimen$_i$ dangshi zhidao tamen$_j$ dui ziji$_{i/j}$ mei xinxin. 2 3
you then know they to self no confidence
'You knew that they had no confidence in themselves/yourselves at that time.'
(5)Nimen$_i$ dangshi zhidao nimen$_i$ dui ziji$_i$ mei xinxin 2 2
you then know you to self no confidence
'You$_i$ knew that you$_i$ had no confidence in yourselves$_i$ at that time.'
(6)Nimen$_i$ dangshi zhidao women$_j$ dui ziji$_{*i/j}$ mei xinxin 2 1
you then know we to self no confidence
'You knew that we had no confidence in *yourselves/ourselves at that time.'
(7)Women$_i$ dangshi zhidao tamen$_j$ dui ziji$_{i/j}$ mei xinxin 1 3
we then know they to self no confidence
'We knew that they had no confidence in ourselves/themselves at that time.'
(8)Women$_i$ dangshi zhidao nimen$_j$ dui ziji$_{i/j}$ mei xinxin 1 2
we then know you to self no confidence
'We knew that you had no confidence in ourselves/yourselves at that time.'
(9)Women$_i$ dangshi zhidao women$_i$ dui ziji$_i$ mei xinxin 1 1
we then know we to self no confidence
'We knew that we had no confidence in ourselves at that time.'

Set C: Sg Pl

(1)Ta$_i$ dangshi zhidao tamen$_{i/j}$ dui ziji$_{i/j}$ mei xinxin 3 3
he then know they to self no confidence
'He knew that they had no confidence in himself/themselves at that time.'
(2)Ta$_i$ dangshi zhidao nimen$_j$ dui ziji$_{*i/j}$ mei xinxin 3 2
he then know you to self no confidence
'He knew that you had no confidence in *himself/yourselves at that time.'
(3)Ta$_i$ dangshi zhidao women$_j$ dui ziji$_{*i/j}$ mei xinxin 3 1
he then know we to self no confidence
'He knew that we had no confidence in *himself/ourselves at that time.'
(4)Ni$_i$ dangshi zhidao ta$_j$ dui ziji$_{i/j}$ mei xinxin. 2 3
you then know he to self no confidence
'You knew that he had no confidence in himself/yourself at that time.'

(5)Ni$_i$ dangshi zhidao nimen$_j$ dui ziji$_{*i/j}$ mei xinxin 2 2
you then know you to self no confidence
'You knew that you had no confidence in *yourself/yourselves at that time.'

(6)Ni$_i$ dangshi zhidao women$_j$ dui ziji$_{*i/j}$ mei xinxin 2 1
you then know we to self no confidence
'You knew that we had no confidence in *yourself/ourselves at that time.'

(7)Wo$_i$ dangshi zhidao tamen$_j$ dui ziji$_{i/j}$ mei xinxin 1 3
I then know they to self no confidence
'I knew that they had no confidence in myself/themselves at that time.'

(8)Wo$_i$ dangshi zhidao nimen$_j$ dui ziji$_{i/j}$ mei xinxin 1 2
I then know you to self no confidence
'I knew that you had no confidence in myself/yourselves at that time.'

(9)Wo$_i$ dangshi zhidao women$_j$ dui ziji$_{*i/j}$ mei xinxin 1 1
I then know we to self no confidence
'I knew that we had no confidence in *myself/ourselves at that time.'

Set D: **Pl Sg**

(1)Tamen$_i$ dangshi zhidao ta$_j$ dui ziji$_{*i/j}$ mei xinxin 3 3
they then know he to self no confidence
'They knew that he had no confidence in *themselves/himself at that time.'

(2)Tamen$_i$ dangshi zhidao ni$_j$ dui ziji$_{*i/j}$ mei xinxin 3 2
they then know you to self no confidence
'They knew that you had no confidence in *themselves/yourself at that time.'

(3)Tamen$_i$ dangshi zhidao wo$_j$ dui ziji$_{*i/j}$ mei xinxin 3 1
they then know I to self no confidence
'They knew that I had no confidence in *themselves/myself at that time.'

(4)Nimen$_i$ dangshi zhidao ta$_j$ dui ziji$_{i/j}$ mei xinxin. 2 3
you then know he to self no confidence
'You knew that he had no confidence in yourselves/himself at that time.'

(5)?Nimen$_i$ dangshi zhidao ni$_j$ dui ziji$_{*i/j}$ mei xinxin 2 2
you then know you to self no confidence
'You knew that you had no confidence in *yourselves/yourself at that time.'

(6)Nimen$_i$ dangshi zhidao wo$_j$ dui ziji$_{*i/j}$ mei xinxin 2 1
you then know I to self no confidence
'You knew that I had no confidence in *yourselves/myself at that time.'

(7)Women$_i$ dangshi zhidao ta$_j$ dui ziji$_{i/j}$ mei xinxin 1 3
we then know he to self no confidence
'We knew that he had no confidence in ourselves/himself at that time.'

(8)Women$_i$ dangshi zhidao ni$_j$ dui ziji$_{i/j}$ mei xinxin 1 2
we then know you to self no confidence
'We knew that you had no confidence in ourselves/yourself at that time.'

(9)?Women$_i$ dangshi zhidao wo$_j$ dui ziji$_{*i/j}$ mei xinxin 1 1
we then know I to self no confidence
'We knew that I had no confidence in *ourselves/myself at that time.'

The four sets of data can be summarized in the following chart. The Arabic numerals across the top of the box represent the occurrences of pronouns in the subject position of the embedded clauses, and the Arabic numerals on the side of the box represent the occurrences of the pronouns in the subject position of the matrix clauses.The singular and plural number of those pronouns are indicated with Sg for singular and Pl for plural by the side of the numerals. Within the box, each cell stands for a combination of two pronouns that occur in the same sentence as subjects of the matrix and embedded clauses. Each cell contains one letter, either F or B. F stands for free, which means that the subject of the embedded clause does not block *ziji* from being coindexed with the subject of the matrix clause. B stands for block, which means that the subject of the embedded clause blocks *ziji* from being coindexed with the subject of the matrix clause (see figure 1 below).

	1Sg	1Pl	2Sg	2Pl	3Sg	3Pl
1Sg	F	B	F	F	F	F
1Pl	B	F	F	F	F	F
2Sg	B	B	F	B	F	F
2Pl	B	B	B	F	F	F
3Sg	B	B	B	B	F	F
3Pl	B	B	B	B	B	F

Figure 1

Such data are undoubtedly problematic for any approach that uses agreement of person and number features to account for the blocking effect of the Chinese reflexive *ziji*. The pattern emerged from the four sets of data is quite clear. The third person, both singular and plural, shows no blocking effect at all with respect to first and second persons. The second person blocks the third person, but does not block the first person. The first person blocks all the second and third person forms. However, first person singular and first person plural block each other. The same is true with second person. In the case of the third person, its plural form does not block its singular form, but its singular form blocks its plural form. If we take out all the cells that represent the occurrences of those pronouns that are of the same person within the same sentence, a remarkably clear pattern obtains, as is shown in figure 2 below.

	1Sg	1Pl	2Sg	2Pl	3Sg	3Pl
1Sg			F	F	F	F
1Pl			F	F	F	F
2Sg	B	B			F	F
2Pl	B	B			F	F
3Sg	B	B	B	B		
3Pl	B	B	B	B		

Figure 2

This pattern seems to point to the fact that maybe some kind of hierarchical ranking among the persons is at work. The first person is higher than the second person and the second person is higher than the third (1st>2nd>3rd). When coindexing the reflexive pronoun *ziji* with pronouns, one can only go down the hierarchy. This explains why first person blocks both second and third, second person blocks the third but not the first, and the third does not block the first or the second. If this is true, we would not expect pronouns of the same person to block each other since they have the same rank on the hierarchy. In fact the instances of blocking between pronouns of the same person in the data presented above seem to have a reason of a different nature. In all of the cases in question, there seems to be some kind of pragmatic inconsistency present. In Set C(5) and Set D(5) it is an inconsistency of the addressee, whereas in Set C(9) and Set D(9) it is an inconsistency of the speaker. In his discussion on raising, Postal (1974) pointed out that certain pairs of NPs are not permitted to overlap in stipulated coreference. Consequently, sentences such as 'I like us: We like me: He$_i$ praised them$_{i/j}$; and They$_{i/j}$ criticized him$_i$' are not acceptable. He refers to such restrictions as the Inclusion Constraint. This is probably an even more important reason why 1st person singular and plural and 2nd person singular and plural block each other in the examples given above. The fact that we get both a free and a blocking reading of the examples that contain 3rd person pronouns as subjects is because the 3rd person pronoun 'he' can be either a subset of the 3rd person pronoun 'they' or not a subset of it.

The idea that persons are ranked with respect to their syntactic functions and their conbinatorial ability with other elements in a sentence is not new. For example, Halkomelem, a Salish language spoken in southwestern British Columbia, makes use of a person/animacy/nominal type hierarchy in its clausal organization (Gerdts, 1988). So motivating a person hierarchy to account for the blocking effect of the Chinese reflexive *ziji* is probably not totally irrational. This view is consistent with Zubin et al.'s claim that underlying the uses of reflexives in Mandarin Chinese is an abstract indexical system in some ways analogous to the 1st-2nd-3rd person system of interactional discourse (Zubin et al., 1990). They contend that it is easier for *ziji* 'self' to be identified pragmatically with 1st or 2nd person than 3rd person. If we adopt the person hierarchy approach in explaining the cases in which long-distance binding of the reflexive pronoun *ziji* in Chinese is blocked, we do not need to artificially impose the supposedly covert agreement features. And if we take a second look at the four restrictions recognized by Huang (1984), it becomes clear that the only claim that still holds is (2)c. (2)a and (2)d are not valid. (2)b is only partially correct because intervening second person does not block first person. Whether the subject of an intermediate clause has a blocking effect or not depends on the ranking of the subject of the higher clause on the person hierarchy . If it is ranked lower than that of the subject of the intermediate clause, then blocking would occur. Otherwise, no blocking effect would be found. In comparison with the other approaches, this person hierarchy hypothesis is quite intriguing. Some details of the hypothesis need to be worked out. It remains to be further tested to determine how much it can do in accounting for the blocking effect of *ziji*. It would be interesting to find out if animacy can be incorporated in this hierarchy since animacy also has a role to play in blocking the occurrence of long-distance reflexives in Chinese.

NOTES

1.I am indebted to Donna B. Gerdts for her encouragement, support and guidance in this project. She drew my attention to the importance of the behavior of the Chinese reflexives, helped me to find access to references and showed me how to

collect and analyze the data. I am also grateful to Karin Michelson, Matthew Dryer, Naicong Li and Luo-zhu Cen for their valuable suggestions and comments. However, I am alone responsible for any mistakes and inadequacy in the paper.
2. Peter Cole was no longer sure if he could still keep the person feature when questioned after he gave his talk on long-distance reflexives at SUNY at Buffalo in the Spring of 1990.
3. This example is due to T. S. Sun from U.C. Berkeley.

BIBLIOGRAPHY

Battistella, Edwin. (1989) Chinese relexivization: a movement to INFL approach. Linguistics 27:987-1012.
----.(1985) On the Distribution of Pro in Chinese. NLLT, pp 317-340.
Chen, Ping. (1987) A Discourse Analysis of Zero Anaphora in Chinese. Zhongguo Yuwen, pp 363-378.
Chomsky, N. (1981) Lectures on Government and Binding, Foris, Dordrecht.
Cole,Peter, Gabriella Hermon, Li-May Sung. (1990) Principles and Parameters of Long-Distance Reflexives. Linguistic Inquiry, Vol. 21, No. 1, pp 1-22.
Cole, Peter, Li-May Sung. (1990) The Effect of Morphology on Long-Distance Reflexives. (To appear in Proceedings of NECCL).
Gerdts, Donna B. (1988) A Nominal Hierarchy in Halkomelem Clausal Organization. Anthropological Linguistics,Vol. 30,No. 1, pp 20-36.
Huang, C.-T. James. (1984) On the Distribution and Reference of Empty Pronouns. Linguistic Inquiry, Vol. 15, Number 4, pp 531-574.
----.(1987) Remarks on Empty Categories in Chinese. Linguistic Inquiry, Vol. 18, No. 2, pp 321-337.
Postal, Paul Martin. (1974) On Raising: One Rule of English Grammar and Its Theorectical Implications. Cambridge, Mass., M.I.T. Press.
Sells, Peter. Logophoricity. (1987) Linguistic Inquiry, Vol. 18, No. 3.
Tang, Chih-Chen Jane. (1989) Chinese Reflexives. NLLT, 7, pp 93-121.
Xu, Liejiong. (1986) Free Empty Category. Linguistic Inquiry, Vol. 17, No. 1, pp 75-93.
Xue, Ping. (1990) Feature Matching and Chinese Reflexive Binding. CLS.
Zubin, David, Soon Ae Chun and Naicong Li. (1990) Misbehaving Reflexives in Korean and Mandarin (To appear in BLS).

ACCENTUAL PHRASING IN JAPANESE

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1. INTRODUCTION

It is commonly recognized that in Japanese there are different types of prosodic units above the level of word: utterance (sentence), intermediate (major) phrase, and accentual (minor) phrase (McCawley 1968; Poser 1984; Pierrehumbert and Beckman 1989).

Acoustically, the utterance is characterized as the domain of declination which is about 10 Hz per second (Poser 1984). The intermediate phrase is the domain of catathesis or iterative application of pitch compression caused by an accent (Pierrehumbert and Beckman 1989). The accentual phrase is, then, the domain of an initial rise and the possible occurrence of an accent, which is an acute pitch shift from H tone to L tone.

The pitch contour in Figure 1 demonstrates these prosodic units. The whole contour is that of the utterance which consists of two intermediate phrases; *ao'i yama-ma'de* 'to the blue mountain' and *ooi'sogi-de ikima'suka* 'do you quickly go?'; of these two, the initial intermediate phrase is a good example showing that it further consists of (two) accentual phrases, the second of which is catathesized due to the accent in the preceding accentual phrase, ao'i 'blue'.

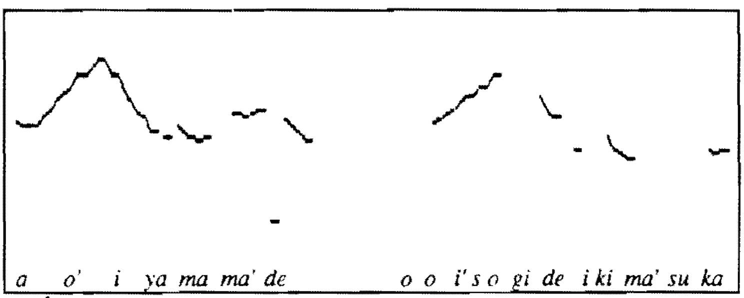

Figure 1

As part of designing a prosodic phrasing model which assists a speech-synthesis program to create natural pitch contours in Japanese (Miyamoto 1989), an acoustic experiment is conducted to investigate the conditioning factor for accentual phrasing. Our basic assumption is that, unlike intermediate phrasing, which is the complex interaction of syntactic, semantic, and extra-linguistic factors (cf. Nespor & Vogel 1986), accentual phrasing is conditioned either by the syntactic configuration or the phonological configuration of a given intermediate phrase.

Two interesting facts are found in our acoustic experiment. First, the conditioning factor for accentual phrasing is found to be the *underlying* accentual configuration of the phrase rather than the syntactic or surface accentual structure. Second, speakers are sensitive to some sort of a look-ahead mechanism in accentual phrasing.

2. ACCENTUAL BEHAVIOUR OF JAPANESE POSTPOSITIONS

Prior to reporting on the experiment on accentual phrasing, the accentual behaviour of Japanese postpositions is discussed because they play roles in accentual phrasing. In combinations of postpositions and their host nouns, many of the postpositions exhibit peculiarities in accentual behaviour. These accentual behaviour of postpositions are well documented (e.g., Hirayama 1960; NHK 1966; McCawley 1968, 1977; Higurashi 1983; Poser 1984). Table 1 provides a convenient, though not exhaustive, summary of accounts on the accentual behaviour of non-monomoraic postpositions.

Table 1
Accentual types of non-monomoraic postpositions shown in the forms with the accented host, *i'noti* "life" and the unaccented host, *miyako* "capital".

(1) *ma'de* -type [+Left-winning]: an unmarked type which obeys the left-win rule; e.g. *de'su* "copula", *yo'ri* "from", *ba'kari* "only".

i'noti + ma'de → *i'noti-made*

miyako + ma'de → *miyako-ma'de*

(2) *kara* -type [+Anonymity]: an unaccented counterpart of the type (1); all the monomoraic postpositions should also be included in this type.

i'noti + kara → *i'noti-kara*

miyako + kara → *miyako-kara*

(3) (a) *gu'rai* -type [+Deaccenting]: a marked type.

i'noti + gu'rai → *inoti-gu'rai*

miyako + gu'rai → *miyako-gu'rai*

(b) *jyuu* -type [+Deaccenting]; an unaccented counterpart of the *gu'rai* type postpositions.

i'noti + jyuu → *inoti-jyuu*

miyako + jyuu → *miyako-jyuu*

(4) *'sika* - type [+Preaccenting (partial)]: a marked type of postposition.

i'noti + 'sika → *i'noti- sika* (obeying the left-win rule)

miyako + 'sika → *miyako'-sika*

As listed in Table 1, postpositions may be categorized into four major types; (1) [+Left-winning] postpositions; (2) [+Anonymity] postpositions; (3) [+Deaccenting] postpositions; and (4) [+Preaccenting] postpositions. The first type, [+Left-winning] postposition is an unmarked case. Some of the non-monomoraic postpositions, such as *ma'de* "to", *de'su* "copula", or *ba'kari* "only" are classified in this type. If a [+Left-winning] postposition has any accent-conflict, i.e., when both the host and the postposition are accented, it is the host's accent which is realized, and the accented postposition loses its accent, as in *i'noti + ma'de* --> *i'noti-made*. If there is no accent-conflict, an available accent is realized as the accent of the unit (noun + postposition), as in *miyako + ma'de* --> *miyako-ma'de*.

The second type of postposition marked by [+Anonymity] is the unaccented counterpart of [+Left-winning] postpositions, and being a part of a host noun, they are never independent in accentuation and never cause any accent-conflicts. All the monomoraic postpositions, such as *o* "accusative", *ni* "dative", or *wa* "topic marker" should also be included in this type.

The third type of postposition is marked by the feature [+Deaccenting] and postpositions, such as, *gu'rai* "as much as", *da'ke* "only", or *jyuu* "throughout" are classified in this type. In the case of a [+Deaccenting] postposition, the accent of the host will not be realized because of the predominant power associated with the [+Deaccenting] postposition which deaccents the accent on its left, as in *i'noti* + *gu'rai* --> *inoti-gu'rai*. The unaccented [+Deaccenting] postpositions, *jyuu* and *dake* , create an unaccented accentual phrase regardless of the accentuation of the host, as in *i'noti* + *jyuu* --> *inoti-jyuu* ; *miyako* + *jyuu* --> *miyako-jyuu*.

The fourth type of postposition is marked by the feature [+Preaccenting] because the postposition of this type places an accent on the last syllable of the preceding host if the host does not have an accent (i.e., unaccented) as in *miyako* + *'sika* --> *miyako'-sika* . If the host is accented, however, *'sika* obeys the left-win rule as in *i'noti* + *'sika* --> *i'noti-sika*.

3. EXPERIMENT ON ACCENTUAL PHRASING

3.1. Aim of Experiment

As mentioned in Introduction, the main aim in conducting an acoustic experiment is to obtain a generalization about accentual phrasing. More precisely, we would like to know whether it is a syntactic configuration or an accentual configuration which determines how an intermediate (major) phrase is parsed into accentual (minor) phrases. For example, given the phrase, *ao'i* + *oma'me* + *ma'de* , 'to the blue beans', is it possible to predict how many accentual phrases are created from the phrase? Although unlikely, will the phrase be uttered with two interphrasal boundaries, creating three accentual phrases in the phrase because there are three underlying accents? Or, more likely, will the phrase be uttered with just one interphrasal boundary (L%) which is inserted before the noun, creating only two accentual phrases, as *ao'i* L% *oma'me-made* because there are two surface accents? Or, will the whole phrase be realized as just one accentual phrase, having a culminative accent at the leftmost unit, *ao'i* ? Or, will it be that accentual phrasing is not conditioned by the accentual configuration, but by the syntactic configuration: modifier + noun + postposition? Of course, there ought to be variations in phrasing but also there ought to be a general trend in accentual phrasing which ought to be determined either by a phonological or syntactic condition. It is the trend and the condition of the accentual phrasing which are what we would like to elicit from the experiment

3.2. Procedure.

Table 2 is the list and the possible combinations (4 • 2 • 4 = 32) of lexical items used as stimuli in the experiments. The phrases made of the possible combinations of these lexical items are set in a carrier sentence; "····· *te-ga todokima'su* ," (I can reach out my hand for ·····) except for the possible combinations with *gu'rai*. The phrases with *gu'rai* are placed in a carrier sentence, "····· Aj- N *wa arima'sen* " as "*ao'i omame-gu'rai ao'i oma'me-wa arima'sen* ," (there are no beans which are as blue as the blue beans). It is the meaning of *gu'rai* which demands the different carrier sentence.

Table 2
A list of stimuli used in the experiments examining accentual phrasing

Modifier		Noun		Postposition	
ao'i	"blue"			*ma'de*	"to"
omoi	"heavy"	*oma'me*	"beans"	*gu'rai*	"as much as"
a'ni -no	"brother's"	*nimame*	"cooked beans"	*jyuu*	"all over"
ane -no	"sister's"			*ni*	"to"

Pierrehumbert and Beckman (1989) have found that a focused item attracts an intermediate phrase boundary immediately before the focused item. Warkentyne (1978) reports that in Japanese focus is generally placed on the "argument " which immediately precedes a (sentence final) verb. The combination of these two individual claims assures us that all the stimuli will be realized as an intermediate phrase, having an intermediate phrase boundary between the end of a stimulus phrase and the beginning of a carrier sentence which consists of an NP argument and a verb.

The stimuli are organized in the following manner. In the noun slot, there are two pairs of modifiers, each of which constrasts an accented modifier with an unaccented modifier, having similar phonemic configurations. The same with the noun slot: the accented noun, *oma'me* , is contrasted with the unaccented noun, *nimame* , in that both nouns have the same number of morae as well as similar phonemic configurations. In the postposition slot, *ma'de* represents [+Left-winning] postpositions: *gu'rai* is an accented postposition marked by the feature [+Deaccenting]; and the postposition, *jyuu* , is an unaccented [+Deaccenting] postposition. The [+Preaccenting] postposition, *'sika* , is not included in the list because its segments, /s/, devoiced /i/, and /k/ are all invisible in F_0 analysis. *Ni* represents monomoraic postpositions.

These stimuli embedded in the carrier sentences were written, in random order, on sheets of paper in Japanese. Each sentence was paired with its echo question. The data for analyses were taken only from the answers because, being old information, none of the items in the phrases in the answers should have received any narrow-focus. The total of 160 $(((4 * 2 * 4 *) * 5) = 160)$ utterances were recorded by five female subjects who were the speakers of Standard Tokyo Japanese. The subjects were requested to utter the stimuli in a well articulated manner.

Measurements were taken using MSL (Micro Speech Lab) and MSLPITCH which were IBM-PC-compatible speech analysis programs developed at the Centre for Speech Technology Research, Victoria, Canada. The recorded items were analyzed with a 10 bit, 10k/sec sampling rate.

4. RESULTS

The results of the experiment are summarized as Table 3 and Table 4. Table 3 is a summary of the phrasing of all the possible combinations with the accented noun, *oma'me* and Table 4 is a summary of the phrasing of those with the unaccented word, *nimame* . In both sets, i.e., *oma'me*-set and *nimame*-set, all the cases are divided into two groups, unmarked phrasing and marked phrasing. The markedness and unmarkedness are determined by the frequency of occurrences. In each table, there are four rows of phrase groups which differ in the modifier they take. In a group, each phrase is specified with its ending postposition. The + and - signs specify whether items in a phrase are accented (+) or unaccented (-). The reason why there are two series of + and - specifications in the unmarked phrasing case in the *oma'me*-set is that one on the left specifies a surface accentuation of a phrase and one on the right in a parenthesis specifies underlying (original) accentuation of the phrase, i.e., the accentuation prior to an application of a [+Feature] of a postposition. The *nimame*-set does not have two types of accentual specifications because surface and underlying accentual specifications are the same in a phrase in the set. A slash between symbols indicates the presence of an accentual boundary. If a phrase is realized as a single phrase without an accentual boundary, such a phrase is marked by [ ]. If there are no symbols inside [ ], it shows that a phrase is realized without a boundary and with the same accentuation as its unmarked phrasing. If a subscript is attached to the bracket, it identifies the subject who uttered the instance. The symbol Ø indicates the absence of an instance. Finally, the numeral in each case indicates the schematic F_0 contour of the phrase presented in the last section of the paper so that the reader can have visual understanding of the phrase in question.

Table 3
The results of accentual phrasing of the phrases whose head is the accented noun, *oma'me* 'beans'.

	OMA'ME - Set					
	Unmarked Phrasing				Marked Phrasing	
ao'i						
A11	+/ + -	(*ma'de*)	(+ + +)	(2)	[+ - -] h/s	(9)
A 12	+/ - +	(*gu'rai*)	(+ + +)	(3)	[ ] h	(10)
A13	+/ - -	(*jyuu*)	(+ + -)	(4)	Ø	
A14	+/ + -	(*ni*)	(+ + -)	(2)	[+ - -] s	(9)
omoi						
A21	-/ + -	(*ma'de*)	(- + +)	(5)	Ø	
A22	-/ - +	(*gu'rai*)	(- + +)	(5)	Ø	
A23	-/ - -	(*jyuu*)	(- + -)	(7)	Ø	
A24	-/ + -	(*ni*)	(- + -)	(5)	[ ] h/s	(9)
a'ni -no						
A31	+/ + -	(*ma'de*)	(+ + +)	(2)	[+ - -] h	(9)
A32	+/ - +	(*gu'rai*)	(+ + +)	(3)	[+ - -] h	(9)
A33	+/ - -	(*jyuu*)	(+ + -)	(4)	Ø	
A34	+/ + -	(*ni*)	(+ + -)	(2)	[+ - -] h	(9)
ane -no						
A41	-/ + -	(*ma'de*)	(- + +)	(5)	[ ] h	(6)
A42	-/ - +	(*gu'rai*)	(- + +)	(5)	[ ] h/s	(6)
A43	-/ - -	(*jyuu*)	(- + -)	(7)	[ ] s	(8)
A44	-/ + -	(*ni*)	(- + -)	(8)	[ ] h/s	(6)

Table 4
The results of accentual phrasing of the phrases whose head is the unaccented noun, nimame 'cooked beans'.

Nimame - Set

	Unmarked Phrasing			Marked Phrasing	
ao'i					
B11	+/ - +	(*ma'de*)	(3)	[ ] h/s	(10)
B 12	+/ - +	(*gu'rai*)	(3)	[ ] s/t	(10)
B13	+/- -	(*jyuu*)	(4)	[ ] h (9);	+/-/- k
B14	+/ - -	(*ni*)	(4)	[ ] s/h	(9)
omoi					
B21	[- - +]	(*ma'de*)	(6)	Ø	
B22	[- - +]	(*gu'rai*)	(6)	Ø	
B23	[- - -]	(*jyuu*)	(8)	-/-/-k	
B24	[- - -]	(*ni*)	(8)	Ø	
a'ni -no					
B31	+/ - +	(*ma'de*)	(3)	Ø	
B32	+/ - +	(*gu'rai*)	(3)	[+ - -] h	(9)
B33	+/ - -	(*jyuu*)	(4)	Ø	
B34	+/ - -	(*ni*)	(4)	[ ] h	(9)
ane -no					
B41	[- - +]	(*ma'de*)	(6)	Ø	
B42	[- - +]	(*gu'rai*)	(6)	-/ - +k	(5)
B43	[- - -]	(*jyuu*)	(7)	-/ - - k	(7)
B44	[- - -]	(*ni*)	(8)	Ø	

For example, a part of the first, *ao'i*-group in the *oma'me*-set which is reproduced below can be read as follows:

OMA'ME - Set

	Unmarked Phrasing				Marked Phrasing	
ao'i						
A11	+/ + -	(*ma'de*)	(+ + +)	(2)	[+ - -] h/s	(9)
A13	+/ - -	(*jyuu*)	(+ + -)	(4)	Ø	

The case, A11, *ao'i* + *oma'me* + *ma'de* (+ + +) was realized, in the case of unmarked phrasing, as +/ + - , i.e., *ao'i* L% *oma'me-made* with the insertion of an accentual boundary. The schematic F0 contour of the phrase is (2) (which is listed in Figure 2). The subjects H and S, however, uttered the same phrase as [+ - -], i.e., *ao'i-omame-made* with no insertion of L% and with just one culminative accent on the left-most item, *ao'i* . The utterance is regarded as marked phrasing, and its schematic F0 contour is shown in Figure 9. Another case, A13, *ao'i* + *oma'me* + *jyuu* whose underlying accentuation is (+ + -) was realized as +/ - -; *ao'i* L% *omame-jyuu* , i.e., an intermediate phrase consisting of two accentual phrases. The schematic F0 contour of the phrase is presented in Figure 4. All five subjects showed the same phrasing pattern because its marked case has Ø, a null-sign.

Now, let us look at unmarked phrasing in the *oma'me*-set.[1] The phrases in the set have a consistent pattern of phrasing, i.e., the insertion of an interphrasal boundary between the modifier and the noun. The accentuation of the phrases seems to have no impact on the phrasing because there are the differences of all the possible combinations in accentuations. That is, if the accentuation of the postpositions are excluded from consideration, there are following accentual variations across the interphrasal boundary:

+/ + (*ao'i* L% *oma'me-* ; *a'ni -no* L% *oma'me-*)
+/ - (*ao'i* L% *omame-* ; *a'ni -no* L% *omame-*)
-/ + (*omoi* L% *oma'me-* ; *ane -no* L% *oma'me-*)
-/ - (*omoi* L% *omame-* ; *ane -no* L% *omame-*)

The above facts seem to suggest that a syntactic configuration rather than an accentual configuration determines accentual phrasing. That is, as unmarked phrasing, a phrase of "modifier + noun + postposition" is uttered as an intermediate phrase consisting of two accentual phrases with L% inserted after the modifier. So, to account for the accentual phrasing, we can posit a very simple working hypothesis; i.e., if a phrase has a syntactic configuration of modifier + noun + postposition, insert an interphrasal accentual boundary after a modifier.

Next, let us look at unmarked phrasing in the *nimame*-set in Table 4 , and test whether the above hypothesis can account for all the phrasings. In the *nimame*-set, the working hypothesis based on syntactic configuration is obviously denied because in *omoi* - and *ane -no* groups, there is no instance which has an interphrasal L%. All these phrases were realized without an accentual phrase boundary. This discounts the syntax-based hypothesis. The question is, then, how to account for the fact that it is only the phrases in the unaccented modifier (*omoi* and *ane-no*) groups in the *nimame*-set that do not have an interphrasal L%. It looks as if the accentual configurations of the phrases, too, fail to condition accentual phrasing because in the *oma'me*-set, there are the cases where L% is inserted between an unaccented modifier (-) and an unaccented noun (-), i.e.. "-/ - " (cases: A22, A23, A42, and A43). On the other hand, in the *nimame*-set, there is no insertion of L% in the phrases which have exactly the same accentual configuration, i.e., [- -] (cases: all the phrases in *omoi*- and *ane-no* groups). So, denying the previous syntax-based working hypothesis, it seems that accentual phrasing is arbitrary; i.e., the insertion of the interphrasal L% cannot be predicted either by a syntactic configuration or by an accentual configuration.

Importantly, however, it becomes possible to obtain a generalization on accentual phrasing once the underlying (original) accentual configuration rather than the surface pattern is taken into account. That is, in all the *underlying* accentual forms (i.e., the accentuations of the phrases prior to the applications of the postpositional features) in the *oma'me*-set, there is at least one + either in the modifier slot or in the noun slot. It is, then, always the case that an interphrasal L% is inserted after a noun. Now, in the *nimame* -set, all the phrases in the *ao'i*- and *a'ni-no* groups have + specification in the modifier slot, and they all have an interphrasal L%. In the same *nimame*-set, however, all the phrases in the *omoi*- and *ane-no* groups which do not show any interphrasal L% have no + specification either in the modifier slot or in the noun slot. Thus, from these facts, we can deduce the following generalization: in the case of unmarked phrasing, a phrase of "modifier + noun + postposition" has an interphrasal accentual boundary after the modifier if either the modifier or the noun is underlyingly (originally) accented. This generalization accounts for the unmarked phrasing exhibited in all the data.[2]

5. PSYCOLINGUISTIC IMPLICATION

One psycholinguistic implication which comes to mind based on the results on the accentual phrasing is that there must be some sort of look-ahead mechanism in accentuation and phrasing. More precisely, there must be a look-ahead-one-item mechanism in accentuation and phrasing. Such a mechanism can be represented by a two-item-sized window cursor which moves from left to right one item at a time.[3] It is only in a (current) window cursor, that any accent-conflict between two items is resolved. Also, in the (current) window cursor, a phrasing decision is made; i.e., an accentual phrase boundary will be inserted if, in the cursor, there are two words and at least one of them is underlyingly accented (+).

What are the reasons for postulating a look-ahead-one-item mechanism for accentuation and phrasing? First, if there were no look-ahead mechanism at all, how would it be possible to account for the resolution of an accent-conflict triggered, for example, by the feature, [+Deaccenting]; e.g., (A13) *ao'i + oma'me + jyuu* → *ao'i-omame -jyuu*? To deaccent correctly *oma'me* as *omame* in the phrase, the speaker has to see the feature [+Deaccenting] before the speaker reaches the second mora of the noun, or more reasonably before the speaker starts to utter the noun. Thus, there must be some sort of look-ahead mechanism in accentuation. If, however, the speaker were able to look ahead at the accentual configurations of items up to the end of the phrase, in other words, if there were a *phrase-sized* window cursor, it would not be possible to account for the phrasing difference between, for example, (A23) *omoi -omame -jyuu* ; (- + -), -/ - - and (B23) *omoi - nimame -jyuu* ; (- - -), [- - -]. If the speaker were able to see the feature [+Deaccenting] prior to uttering the phrases, both phrases would have the same phrasing, i.e., [- - -]. That is, A23 should not have the interphrasal L% because the speaker would be able to see the feature [+Deaccenting] of the postposition prior to uttering the initial word and, thus, would treat the accentuation of the whole phrase as $\boxed{-\ -\ -}$. If this were the case, (A23) *omoi -omame -jyuu* $\boxed{-\ -\ -}$ and (B23) *omoi -nimame -jyuu* $\boxed{-\ -\ -}$ should have had the same phrasing, i.e., [- - -], according to the earlier generalization which inhibits the insertion of an interphrasal L% between two unaccented (-) words. However, the fact that A23 was realized as -/ - - whereas B23 was realized as [- - -] denies the existence of the phrase-sized window cursor; i.e., the speaker cannot look ahead to all the accentual configurations of a phrase before starting to utter it.

A look-ahead-one-item mechanism or an implementation of a two-item-sized window cursor will explain things nicely. Because there is a two-item-sized window-cursor, an interphrasal L% is inserted after the modifier in A23 but not in B23 due to the generalization that a phrase will have L% between two words if at least one of them is (underlyingly) accented:

A23	B23
$\boxed{\textit{omoi (-)oma'me (+)}}$ *jyuu* [+Deac]	$\boxed{\textit{omoi (-)nimame (-)}}$ *jyuu* [+Deac]
‖	‖
omoi L% *oma'me*	*omoi nimame*

The next movement of the cursor enables the speaker to see the feature [+Deaccenting] and to deaccent the noun, *oma'me* , in A23:

omoi / $\boxed{\textit{oma'me jyuu}\ [\text{+Deac}]}$[4] *omoi* $\boxed{\textit{nimame -jyuu}\ [\text{+Deac}]}$

$\quad\quad\quad ||\quad\quad\quad\quad\quad\quad\quad\quad\quad\quad ||$

omame -jyuu *nimame -jyuu*

The results, *omoi* L% *omame jyuu* and *omoi nimame jyuu* are exactly what we want as the unmarked phrasing for the phrases. The same argument applies to the phrasing difference exhibited between A42 and B42; and this argument is compatible with all the accentual phrasings and the realization of postpositional features shown in Table 3 and 4. We would thus like to claim that, at least in well-articulated speech involving no narrow focusing, a speaker possesses a look-ahead-one-item mechanism in accentual phrasing and in realizing the accentual feature of a postposition.

6. CONCLUSION

Based on the acoustic evidence, we have shown that (i) the conditioning factor for accentual (minor) phrasing is the underlying accentual configuration of a given intermediate (major) phrase; (ii) an accentual phrase boundary is inserted between two words if at least one of them is underlyingly accented; and that (iii) there is a look-ahead-one-item mechanism in accentual phrasing and in realizing the accentual features of postpositions. We believe that these claims hold not only in the cases where the intermediate phrase consists of just three items, "modifier + noun + postposition", but also in the case of intermediate phrases consisting of more than a few items.

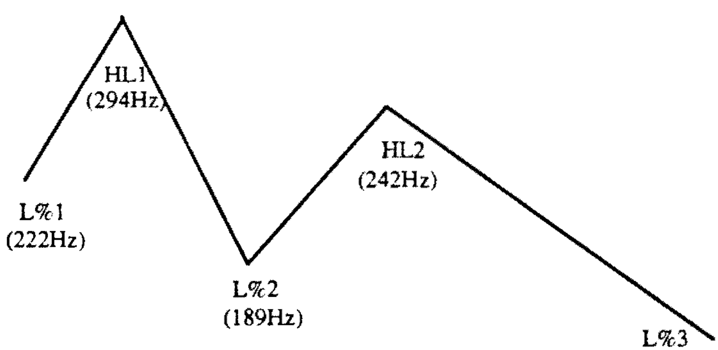

Figure 2. A schematic pitch contour of (2), +/ + - : L% HL L% HL L%. (F0 values are means of 15 tokens.)

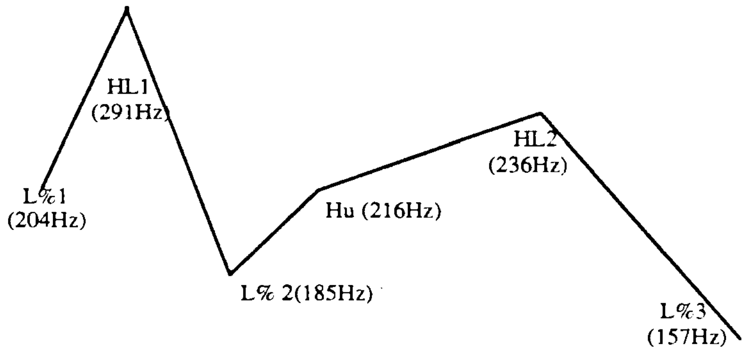

Figure 3. A schematic pitch contour of (3), +/ - + : L% HL L% H HL L%. (F0 values are means of 22 tokens.)

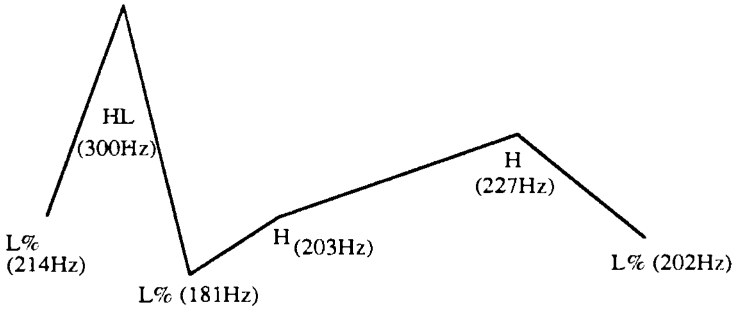

Figure 4. A schematic pitch contour of (4), +/ - - : L% HL L% H H L%. (F0 values are means of 14 tokens.)

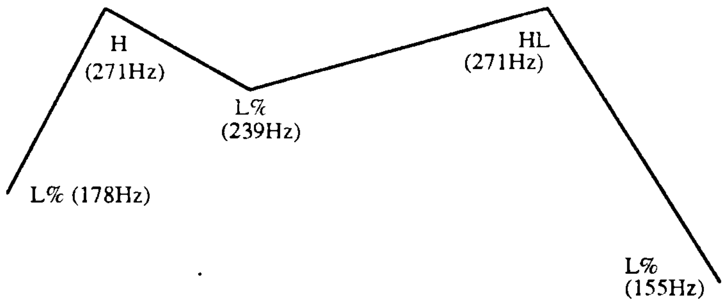

Figure 5. A schematic pitch contour of (5), -/ + - ; -/ - + : L% H L% HL L%. (F0 values are means of 23 tokens.)

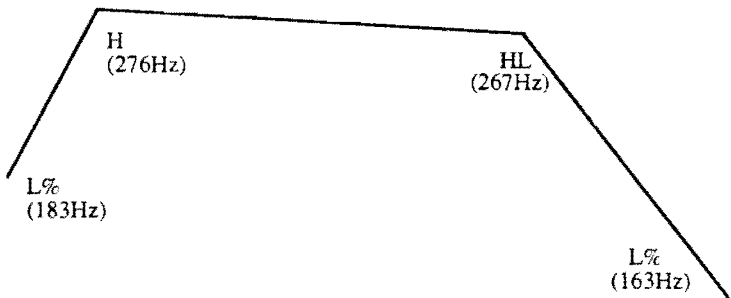

Figure 6. A schematic pitch contour of (6), [- - +] : L% H HL L%. (F0 values are means of 19 tokens.)

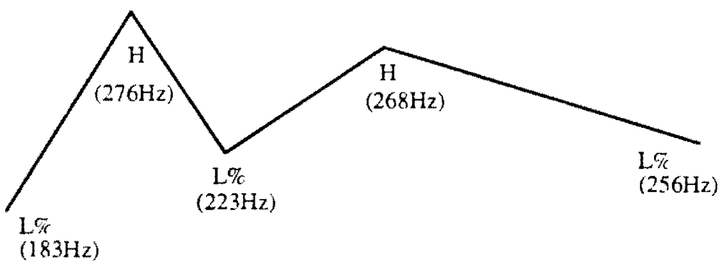

Figure 7. A schematic pitch contour of (7), -/ - - : L% H L% H L%. (F0 values are means of 3 tokens.)

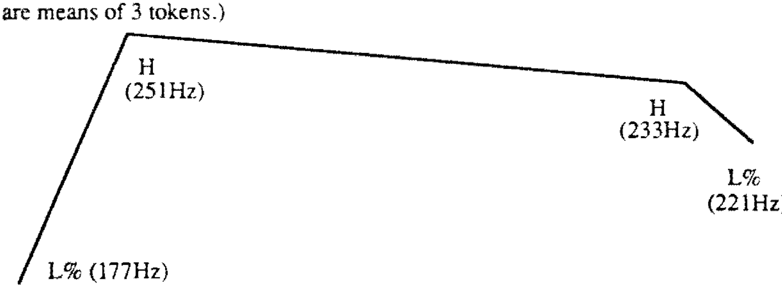

Figure 8. A schematic pitch contour of (8), [- - -] : L% H H L%. (F0 values are means of 12 tokens.)

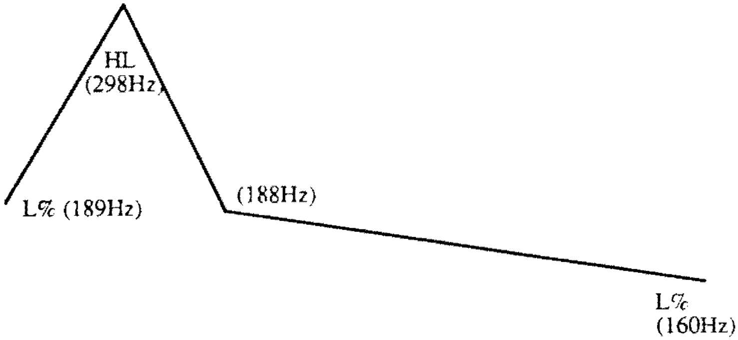

Figure 9. A schematic pitch contour of (9, marked phrasing), [+ - -] : L% HL L%. (F0 values are means of 10 tokens.)

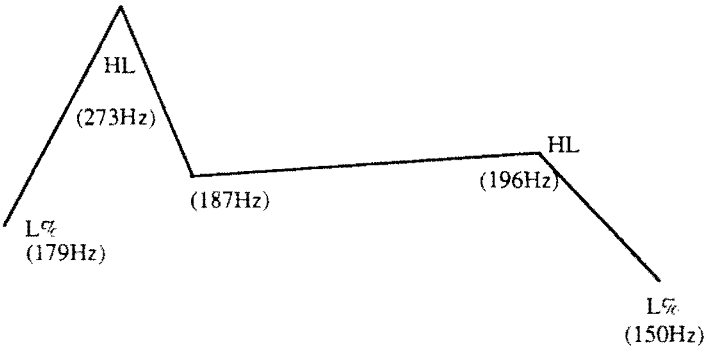

Figure 10. A schematic pitch contour of (10, marked phrasing), [+ - +]: L% HL HL L%. (F0 values are means of 4 tokens.)

NOTES

1. In this paper, we are not reporting on marked phrasing. However, roughly speaking, there are two types of marked phrasing; one caused by "culminative accentuation" and the other caused by "enunciative accentuation". Two of the subjects, S and, especially, H, constantly show the first type of marked phrasing, creating a single phrase with only one accent, whereas the subject K shows, once in a while, the second, opposite type of phrasing, inserting L% at every possible location. Typical examples of the marked phrasing caused by culminative accentuation are found in the following cases: A11, A14, A31, A32, and A34. The unmarked phrasing in these cases has either +/ + - or +/ - +, whereas the marked phrasing shows only [+ - -] which is characterized by (i) having just one

culminative accent in the leftmost item and by (ii) having no interphrasal L%, realizing the whole phrase as a single accentual phrase. We performed an additional experiment (on narrow focusing) and confirmed that this type of marked phrasing was caused by a narrow focus placed on the left-most item which deaccents any accents to its right (cf. Miyamoto 1989).

2. The maximal generalization we can obtain from the experiment may be that an accentual phrase boundary is inserted between phonological words if at least one of the phonological words is underlyingly accented, where phonological word is defined as a word coupled with or without a postposition. This generalization should be able to account for the accentual phrasing not merely of "modifier + noun + postposition" but of longer strings of words in any part of speech classifications.

3. "Item" is used as a cover term for word and postposition.

4. Because the second item in the cursor is not a word but a postposition, an accentual phrase boundary is not inserted between these two items, conforming to our generalization that an accentual phrase boundary is inserted between two *words* if one of them is underlyingly accented.

REFERENCES

Higurashi, Yoshiko (1983). *The Accent of Extended Word Structures in Tokyo Japanese*. Tokyo: EDUCA.

Hirayama, Teruo (1960) *Zenkoku Akusento Jiten* (All Japan Accent Dictionary). Tokyo: Tookyoodoo.

McCawley, James D. (1968). *The Phonological Component of a Grammar of Japanese*. The Hague: Mouton.

McCawley, James D. (1977). "Accent in Japanese". In L. Hyman, ed., *Studies in Stress and Accent*. 261-302. (Southern California Occasional Papers in Linguistics 4.) Department of Linguistics, University of Southern California, Los Angeles.

Miyamoto, Tadao. (1989). *Modelling Tone and Intonation in Japanese*. M.A.Thesis, University of Victoria.

Nespor, M., and I. Vogel (1986). *Prosodic Phonology*. Dordrecht: Foris.

NHK (1966). *Nihongo Hatsuon Akusento Ziten* (Dictionary of Japanese Pronunciation and Accent). Tokyo: Nippon Hoosoo Kyookai Shuppan.

Pierrehumbert, J.B., and M. E. Beckman (1989). *Japanese Tone Structure*. Cambridge, Massachusetts: The MIT Press.

Poser, William J. (1984). *The Phonetic and Phonology of Tone and Intonation in Japanese*. Doctoral Dissertation, MIT.

Warkentyne. Henry J. (1978). "Information Focus and Primary Accent." *Onsei no Kenkyuu* 18, 217-222.

On Parasitic Velars

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0. Introduction.

Parasite effects at the end of linguistic constituents abound in natural languages: fillers at the end of sentences, paragogic vowels at the end of words and phrases etc... At the level of the syllable, it is not unusual to encounter consonants which function as allophones of glides. The phonetic effect is to cut short the trailing off of the glide, as in the familiar yep and nope of American English. That may be a misleading example, however, since, universally, such parasites are overwhelmingly velar rather than labial. We will have occasion later to discuss the fact that velar is indeed the unmarked articulation of codas. Better examples may be the ones in (1) and (2).

(1) Salvadoran Spanish (Canfield 1981)
[degda] 'deuda'
[aktomóβil] 'automóvil'

(2) Atlas Ling. de la France Gilliéron (1902): map # 915 Etymon NODU
Island Norman (Pt. 398) [nœ:k]
Low Norman Calvados (Pt. 376) [nuk]
Vendée (all points) [nu:k]
Belgian Ardennes (around Pt. 194) [nok]
Switzerland (Pt. 988) [nuks]

Very often, these are just phonetic effects, of a sporadic nature, which may not have any phonological import[1]. This paper looks at a number of parasitic phenomena which are not merely phonetic and which do affect the phonology of some varieties of Franco-Provençal and Raeto-Romance. So-called "parasitic velars", i.e. [k], [g] and [ŋ], develop as excrescences of (usually stressed) syllables, yielding forms like Surmiran [lukʃ] 'wolf', [durmekr] 'to sleep', Engadinese [ugrə] 'hour', [štygvə] 'room', Valaisan [dugra] 'hard. f.', [kraŋma] 'cream', etc...; compare to French cognates loup, dormir, heure, étuve, dure, crème. In Indo-European philology, this is commonly referred to as the "Verschärfung" effect[2].

In the first part of this paper, I will discuss and illustrate the behavior of excrescent velars in Franco-Provençal, from the data provided by Krier (1985). Because the Franco-Provençal data have never been analyzed in terms of modern phonological theory, it will be appropriate to compare them, in a second section, to the Raeto-Romansch Surmiran data which have been the object of a thorough treatment by Kamprath (1985, 1987). In a third section, I will propose my views on the phonology of excrescent velars in Franco-Provençal and draw some conclusions which are antithetic to the ones reached by Kamprath for Surmiran. Specifically, I will argue that excrescent velars have, in many areas, undergone a change of phonological status. I will discuss this change within the larger context of the historical, areal and sociolinguistic deterioration of the hardening phenomenon, thus justifying the title appellation of 'parasites'.

1. Parasitic velars in Franco-Provençal

Parasitic velars (PV's) are characteristic of Eastern Franco-Provençal (EFPr) and particularly the Valais area of Western Switzerland. Krier (1985) offers narrow transcriptions of the speech of several Valaisan villages, notably Sierre, Saint-Luc and Chandolin, and in Text #1, PV's are frequent[3]. Some examples where they surface as [k] are given in (3). In (4), they undergo voice-assimilation and surface as [g]; in (5), they undergo total assimilation[4].

(3) Krier's data, Text from Sierre, Valais (111 lines)

Ref	Text	French Gloss
2	i:o wɨk te palla	je veux te parler
12	de pa lasje morɨk le bla	de ne pas laisser mourir le blé
15	è petɨkte zevelle	en petites gerbes
29	no sen awuk aleva	nous avons été élevés
41	laje de duk	il y avait du dur
67,106	lɨk ten	ce temps-là
103	ajon poʃuk	ils avaient pu
(4)		
4,27	li via le ši:re dugra	la vie elle était dure
4	po vɨgvre	pour vivre
39	por nurɨg le vacce	pour nourrir les vaches
88	po enɨg le solprender	pour venir le surprendre
(5)		
4	suk	en haut
88	ʃup pe la rwatetta	en haut par la ruelle
38	prok de fen	assez de foin
77	prɔp po to lo zor	assez pour tous les jours

In Sierre EFPr, excrescent velars close the syllable. They are never followed by a tautosyllabic consonant. Furthermore, Krier (1985:79) states that a parasitic element " alterne toujours avec la présence de diphtongues", and she illustrates the statement by comparing words with PV's from the village of Saint-Luc to the same words with diphthongs from Miège and Chermignon; see (6)[5].

(6) Saint-Luc	Miège/Chermignon	
wɛk	wej	'aujourd'hui'
wɨgdo	wejdo	'vide'

However, there is no example of actual alternations (morphophonemic or otherwise) in the speech of the same village. This means that, in the phonology of the village of Saint-Luc, there is no way of construing excrescent velars as hardened glides on the basis of synchronic phonology alone. Only historical and comparative data show the relationship with glides. Furthermore, in the Krier corpus, there is no instance of coda glides[6].

PV's usually occur after high vowels, as shown in (3-5). But sporadically they will show up after mid vowels as well. Some examples from the Krier corpus are given in (7). In Text #1, there are 63 PV's after high vowels, 10 after mid vowels and none after low vowels.

(7) PV's after mid vowels

11	okton	automne
13,25	lanɛk	la neige
25	prɔk de pɔmɛtte	assez de pommes de terre
38	prok de fen	assez de foin
73,86	wɛk	aujourd'hui

Almost invariably, the high V which is followed by a PV is lax. Out of 63, there are only 5 occurrences of PV's after tense vowels. They are given in (8).

(8) PV's after high tense vowels

13	me vikto	plus vite
24	le vine:von mahugre	elles devenaient mûres
32	nen prɔk awuk	nous avons assez eu
45	buɣλo	beurre
49,50,51	bugro	beurre

There are (out of 73) only 5 occurrences of PV's after an unstressed vowel. They are given in (9).

(9) unstressed PV's

11	okton	automne
15,78,80	aw un fʊksille	avec une faucille
39	laje repʊksa	elle avait repoussé
94	dʊksemen	doucement
107	fʊksiλe	faucher

Finally, for the sake of completeness, we note the fact that the Krier corpus contains a certain number of nasal parasites. The complete list is given under (10). Nasal parasites in EFPr are not subject to the same restrictions as oral parasites. They are more sporadic, and can occur after any short vowel (including low vowels). Although their study should fall within the scope of this paper, little will be said about them, due to the insufficience of solid data[7].

(10) <u>Nasal parasites</u>

5,6,11	seŋ k e	ce que
5,74,79	priŋma si:la	petit seigle
14	de boŋn ora	de bonne heure
37	peŋniblo	pénible
41	le sɨŋn e	les soupers
45, 46	kraŋm a	crème
54	boŋna cosa	bonne chose
88	ʃe treŋn a	se traîner
92	una mareŋn a	une femme (=une marraine)

After this preliminary look at the data, it would be tempting to conclude that such velar excrescences are merely parasites riding the feature [-tense]. This will prove incorrect. In order to understand their phonological role, we must know a few facts about length and stress in EFPr:

-1. length never occurs outside of stress

-2. stress falls either on the penult (the unmarked site) or on the last syllable (the marked site). Word-final stressed syllables can be either short or long. Penultimate stressed vowels have to be long if the syllable is open; in other words, stressed penultimate rimes are heavy

-3. aside from interferences[8], there are no instances of stressed vowels in closed syllables getting lengthened.

These three distributional statements make it clear that the language operates under an Italian-style Bimoraicity Condition.

Given these generalizations on length, how are we to interpret the fact that lax vowels before parasites never lengthen? One might expect [dugra] from /dura/ to syllabify into [du.gra], and in that case to display at least some instances of lengthening: *[du:gra]. That never occurs.

Lax vowels occur both in and out of stress, in closed or open syllables, and they are rarely long. But they can be long, as in [llɐ lu:je dɔ rɐhɐ] 'sur le balcon du racard' (line 15 of Krier's text). So there is no restriction on the properties of a particular set of phonemes, and the grammar contains no filter ruling out bimoraic [-tense] segments. One plausible hypothesis is that resyllabification never takes place, so [ug] in [dugra] remains tautosyllabic throughout the derivation and thus will fail to lengthen, because the Bimoraicity Condition is already satisfied. This is of extreme interest because such blocking of resyllabification, although common at word boundaries in Romance, occurs very rarely inside the word. Thus the phonetics ([k] as an obstruent) and the phonology ([k] as a glide) are at odds. While a hypothetical form [dugra] with a "regular" [k] would syllabify as [du.gra], the word [dugra] with a parasitic [k] would syllabify as [dug.ra]

2. Hardened Glides in Surmiran

Surmiran parasites are "hardened glides"[9] and have long been recognized as such by traditional scholarship[10]. There are two main reasons for that unusual appellation:

1. They alternate with glides, morphophonemically. See (11). The inventory of V + hardened glide and V + regular glide is co-extensive[11].
2. No hardened glide occurs before a nasal consonant; no regular glide occurs before a non-nasal consonant.

(11) Hardened glide / Regular glide alternation in Surmiran

/krɛj+a/ [krɛja] '(he) believes' Fr. 'croit' (alternates with)

/krɛj+r/ [krɛkr] 'to believe' Fr. 'croire'

Excrescent velars are much more frequent in Surmiran than they are in EFPr. In Surmiran, they occur after mid vowels as well as after high vowels (see 12). Secondly, even more so than in EFPr, Surmiran parasites only occur in stressed syllables (stress is to be understood here in the sense of word stress, lexical stress). Thirdly, they are limited to pre-consonantal position[12]. This restriction points to the possibility, which I won't pursue here, that their feature change through consonantal spreading.

(12) FPr: ɨk, ʊk (and very sporadically after mid vowels)

Surmiran: ig, ug, eg, ɛg, og, ɔg

A possible formulation of the Surmiran hardening process is given in (13):

$$(13) \qquad \begin{bmatrix}+\text{high}\\-\text{cons}\end{bmatrix} \;\text{-->}\; [+\text{cons}] \quad / \quad \overbrace{V \quad \_\_}^{\text{N(ucleus)}} \; [+\text{cons}]$$

There is one important similarity between Surmiran and EFPr: In both languages, PV's pattern after consonants with respect to a number of phonetic rules. In EFPr, they undergo several assimilation processes, as seen above in (5). In Surmiran, they undergo devoicing. Word-final obstruent devoicing, a pervasive process in most of Raeto-Romansch, affects the entire cluster, as shown in (14). In [savɛkr], [r] is voiceless. Since word-final [r] after a V never devoices, obstruent-devoicing clearly treats [k] as a consonant.

(14) Devoicing : saveir /savɛjr/ >savegr > [savɛkr] 'to know'

Yet the most interesting aspect of the behavior of hardened glides in Surmiran is the fact that they remain glides for several phonological purposes, in spite of their phonetic character. If hardening were a mere feature change, turning a glide into an obstruent which would keep on behaving like any other obstruent in the remaining part of the derivation, then it would be relatively trivial. Modern phonology, on the whole, knows how to interpret phonetic processes involving a change in major category (from V to G, from C to V, etc.). Surmiran hardening, however, constitutes a greater challenge to the phonologist, as Kamprath has demonstrated on several occasions. She argues that hardened glides remain phonological glides, and fail to obstruentize in a phonological way, because1) they fail to resyllabify, and 2) they fail to trigger epenthesis when followed by an extrasyllabic segment. She further contends that this proves that hardened glides remain nuclear. Not only do they not get out of the syllable, but they do not even get out of the nucleus. About the items in (15), Kamprath writes: "After core syllabification, the final [r] in /metr/ will be extrasyllabic; in /zdrejr/, however, the glide is associated to the N, and the final resonant can syllabify into the right branch of the rime. Then, by ordering epenthesis before hardening, /metr/ will become [metər], but /zdrejr/ will not meet the structural description for epenthesis at the point in the derivation where it applies. Later, glide hardening applies to /zdrejr/ and feeds word-final rime-internal obstruent devoicing to produce [zdrekr]."

(15) /zdrejr/ [zdregr] > [zdrekr], not * [zdregər] 'to destroy'
but
/metr/ [metj <r>] > [metər] 'to send'

The counter-feeding rule-ordering[13] Kamprath posits is shown in (16):

(16) Counter-feeding rule-ordering
Epenthesis (applies to metr only)
Resyllabification
Hardening (applies to zdrejr)
Devoicing

The best demonstration that hardened glides are nuclear has to do with reduction processes. In Surmiran, complex nuclei get reduced to single vowels in unstressed position. Neither diphthongs nor long vowels occur in unstressed position, and even single vowels undergo severe neutralizations. The relevant point is that all vowel + hardened glide sequences reduce to a single vowel when unstressed, as shown in (17) and (18). Yet, as shown in (19), the sequence vowel + glide where the glide is a coda never undergoes reduction.

(17) Lexical Nuclear Reduction in Surmiran
/lavowr+er/ [ləvuré] 'to work'
but
/lavowr+a/ [ləvógrə] 'works' (3 sing.)

(18) Post-lexical Nuclear Reduction

la bigza	'the snow storm'	la bisa seca	'the sleet'
trigda	'ugly'	la trid ora	'the bad weather'
dzukr	'over'	dzur nwec	'overnight'

(19) No reduction of V G-codas

N Co
| |
/ l a j / always [laj] in all positions

Kamprath's conclusions are that we need to recognize the special status of these velar segments and that the source of their ambiguity, in a constituent-based phonology (= CP) is precisely that although they hardened, they remain nuclear. It follows that a phonological model which is not equipped to make distinctions between coda glides and nuclear glides in falling diphthongs will prove inadequate when confronted with the Surmiran data. In her 1989 LSA paper, Kamprath makes the point that Moraic Phonology (= MP)(Hayes, 1989; McCarthy &Prince, forthcoming) is indeed such a model.

3. Hardened glides vs. parasites

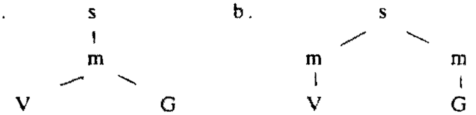
The view that the Swiss Verschärfung has undergone a steady process of deterioration appears to be well-documented. It is important to recall here that we are considering a phenomenon which shows up in varieties of Romance spoken in Northwestern Italy, Southeastern France, and most of Switzerland, thus affecting in different ways languages which do not belong to the same close family, since for instance Franco-Provençal is not a branch of Raeto-Romance. Gauchat (1906), Gerster (1927), Jeanjaquet (1931), together with several other philologists who studied the dialectology of that area all referred to the possible existence of a very old substratum, claiming that hardening used to cover a much wider area, and that we are presently seeing only the tip of the sinking iceberg. Interestingly, the Bimoraicity Condition affected a similar area and we do not seem to find hardening outside of the area where Bimoraicity once played a role.

Sociolinguistically, the degeneration is also very much in evidence. Many speakers now misuse the effect, it is marked as old folks speech, its role is misunderstood, its use has become idiosyncratic and lexicalised. Grammarians consistently stress the fact that the orthographic norms of the dialects, however inconsistent they may be, ignore it.

Even within Central and Eastern Romantsch, where it has generally retained vigor, glide-hardening is often used with considerably less coherence than in Surmiran[14]. Consider for instance its use in Puter (High Engadine): according to Peer (1962), both long [i:] (fil 'thread', terribel 'terrible', ris 'rice') and short [i] (figl 'son', stigl 'thin') can develop parasites: [riks], [figλ]. Following high round vowels, the situation is more complex: 1) parasites develop after long [u:] in open syllables (/u:ra/ [ugra] 'hour') and after long [y:] in both open and closed syllables (mür [mykr] 'wall'/'mouse', glüsch [λykš], 'light', stüva [štügvə] 'room'); but nothing happens after short [u] in closed syllables (rumper 'to break', luf 'wolf', tun 'sound'), or after short [y] in both open and closed syllables (müffa 'mould', güst 'right', mül 'mule'). Similarly, no parasitic effect occurs with falling diphthongs [ai], [au], [ei], [eu], [ui] or with triphthongs [ieu], [iou], [eau], [uoi]. But [ou] is consistently pronounced [ok]: /bouv/ > [bokf] 'ox', /nouva/ > [nogva] 'new'.

I will contend in this section that from a purely phonological point of view, there is also deterioration of a kind. Specifically, I will argue that while it may still be correct to allow for nuclear hardened glides in Surmiran, the same elements have now regularized as normal coda material and have assumed a purely parasitic function in EFPr.

Consider again in the phonology of EFPr the position which velar excrescences occupy in the syllable. It can be characterized in the most straightforward manner from the moraic point of view, but not so easily from the perspective of a constituent-based phonology. MP recognizes two ways to represent off-glides:

(20)


The short diphthong (or full vowel with a non-moraic coda) in (20a) represents the case where Weight-by-Position has not applied. In Romance, this is the marked case. (20b) formalizes a regular diphthong (or full V with a moraic coda). This is the unmarked case, where the moraic glide may or may not be nuclear[15]. In fact, with such a representation, MP makes the claim that nothing phonological hangs on such distinctions as nuclear vs. non-nuclear glides.

Is the contrast in (20) operative in EFPr? The answer is probably negative. The fact, mentioned earlier, that no stressed V in a closed syllable ever gets lengthened, suggests that codas are moraic in EFPr and the Weight-by-Position parameter is on. This eliminates one possible use of (20a). Similarly, the generalization that long lax V's occur, but never before parasites suggests that parasites too are mora-bearing. They are precisely used to preserve bimoraicity to some degree. MP predicts that whatever happens in Franco-Provençal must happen within the construct in (20b).

In a constituent-based phonology, the answer is more complex because the affiliation of these velar segment (to nucleus or to coda?) is unclear. On the one hand, there is evidence that they might be nuclear, as seen above, and on the other, we would like to think of them as codas, since they are velar, the unmarked articulation in syllable-final position. It would be reasonable to posit a restructuring rule, which changes their constituent association and have the features [+back, +cons] provided for free by fill-in. Recent work by Trigo (1988) shows the strong connection that links the coda function to velar articulations[16]. Specifically, Trigo argues that debuccalized or placeless segments acquire velar features by redundancy.

This line of research suggests a rather interesting alternative. We have linked the sequence lax vowel + parasite to a Bimoraicity effect. In a constituent-based phonology, this translates into a Strong Rime Condition (SRC = stressed rimes must branch). It may well be that glides have to be nuclear at that point in the derivation. But we know for instance that, although the SRC is still functioning in a transparent fashion in Standard Italian, it has become rather opaque in Northern dialects. It has been argued (Montreuil 1989, 1990) that the SRC still regulates a good portion of the deep phonology of Milanese, in spite of the fact that it is not a surface requirement since Northern Italian dialects have lost their geminates.

Unlike what happens in Surmiran, parasitic velars are never followed by tautosyllabic consonants in EFPr. This is a totally unexpected distribution statement unless the velar is a coda. In other words, what motivates the glide in the first place, i.e. in the deep phonology, has to do with the nucleus, but what makes it surface as a velar obstruent has to do with the coda. The grammar of EFPr seems to run as shown in (21). Nuclei have to branch early in the derivation for rimes to be bimoraic. But some undergo a restructuring rule which reinterprets some nuclear material as being under Coda. Fill-in occurs, and later rules treat the new material as a regular consonantal coda. Recall that there are no coda glides in EFPr.

(21) 1. Bimoraicity Effect: under stress, nuclei branch

1) into a long V, when tense

2) into a sequence VG, if lax (optional on mid V)

2. Restructuring Rule

```
   N                    N      Co
  / \                  / *    /
  [+high]      >      [+high]
```

3. Coda Fill-in

```
   Co                   Co
   |                    |
               >      [+cons, +back..]
```

4. Assimilation Effects (and later rules)

It is easy to see that the Restructuring Rule is not at all an ad-hoc stipulation[17], and that its motivation is of the simplest, most forceful kind, namely: everything else in the language that follows a full vowel is a coda. This is a very clear demarcative clue for an accurate internalization of syllable-structure. The only exceptions would be those glides that follow lax vowels. It is not unreasonable then to conceive that the system may want to reinterpret them as codas, in a move which amounts to grammar simplification[18].

Again, MP may constitute a better framework for dealing with the parasite effects in EFPr. It makes a significant difference whether we conceive of the weight requirement which affects stressed vowels as a Strong Rime Condition or a Bimoraicity Condition. If it is the latter, and nothing more, then there is no restructuring, in fact there is no point at all where parasites are glides. MP presents the simplest possible analysis since it follows from it that parasites do not result from any kind of structure-changing rule.

How would the Restructuring reanalysis transfer back to Surmiran? It would leave the relative ordering shown in (16) intact, but it would insert Restructuring between Epenthesis and Hardening, thus providing a motivation for the latter. Recall that the two relevant differences between the two languages are that 1) there do not exist coda glides in EFPr and that 2) hardened glides in Surmiran must be followed by consonants. The first difference does not constitute an obstacle to reanalysis: coda glides would not be affected since they would be pre-specified, and hardening is no longer conceived of as feature-changing, but as feature-filling. The second difference could be more of a problem in terms of sonority requirements and well-formedness of codas. But at that low-level of the derivation, it would be unreasonable to expect strict sonority conditions to still obtain. And in any case, if hardened glides are nuclear, sonority is violated within the rime.

So in the final analysis, the existence of a Restructuring Rule in Surmiran will depend on what is the proper treatment of the reduction processes discussed in (17-19). As things stand, we will just note that since reduction applies in the phrasal phonology, it cannot precede restructuring at the lexical level. That argument alone drives us to view Kamprath's analysis as essentially correct for Surmiran. It should be also noted that EFPr does display strong reduction effects, since, as noted earlier, length never occurs outside of stress. Yet we stated, and illustrated in (9), the fact that sporadic occurrences of unstressed PV's can be observed in Krier's corpus. That this be possible in EFPr but impossible in Surmiran is quite congruent with a restructuring hypothesis: if they are felt as codas, unstressed PV's can freely occur (sometimes through analogical formations like [duk] => [duksemen], Fr. doux, doucement 'soft, softly'[19])

In a sense, Kamprath's approach can be characterized as phonetic-based. The question for Surmiran was: since first glides hardened into obstruents at the segmental level (but for what reason?), should it not follow that they change their affiliation from N to Co at the suprasegmental level? Kamprath argued that it did not follow. Hence, the abnormality of the language.

The present reanalysis is more phonology-based. Looking at EFPr, it reverses the question: since some N material got restructured into codas (for reasons having to do with simplification), should it not follow that they acquire consonantal features at the segmental level? The answer is yes, it does; and they do.

It is precisely because Kamprath's analysis of Surmiran ultimately retains all of its validity that the need to opt for a Restructuring analysis in EFPr takes its full significance. The diachronic source of velarized adventitious segments in the two languages is the same. By altering its lexical representations through the elimination of marked associations (i.e. linking of N to [+cons] material), EFPr has phonologically trivialized the function of excrescent velars.

Footnotes

[1]In addition to surveying velar parasites in Romance, Andersen (1988) provides illuminating data on the diffusion of similar phenomena in German, Dutch and Danish. His discussion includes consideration of other parasitic effects such as velar friction and glottal stops.

[2] In Indo-European phonology, Verschärfung (=sharpening) specifically refers to the obstruentization in Gothic and in Norse of Proto-Germanic geminate glides /jj/ and /ww/. See most recently Rasmussen (1990) and references therein.

[3] Krier's Text # 1 is a corpus of more than 2500 words in spontaneous speech, divided in sections numbered 1-111. The numbers under <u>Ref</u> in our examples refers to those sections. In this article, I have sometimes provided French glosses along with (or in lieu of) English ones to enhance cognate recognition.

[4] Regressive assimilation to labial (instead of expected coronal) consonants seems to occur only when the preceding vowel is round. In Valaisan from Montana (Gerster 1927), parasites surface as labials after [u], irrespective of the point of articulation of the following consonant. After [i], however, parasites are always velar. Thus: nūdu > [nup], fūsu > [fup], dūru > [dubr], dūra > [dubra]; but, rīdere > [rigr], *[ribr], nīdu > [nik], *[nip].

[5] It turns out that actual k/glide alternations can only be observed when the Miège/Chermignon item contains a mid-vowel, which is the exception. With a high vowel, a homorganic glide is disallowed, so that most alternations are of the form: k/ø, as in:

<u>Saint-Luc</u>	<u>Miège/Chermignon</u>		
dɛk	di, dis	<u>doigt</u>	
'finger'			
nɛk	ni, ni:t	<u>neige</u>	'snow'
grɨgžo	grɨžo	<u>gris</u>	'grey'
frɨktʃ	frɨtɨ, fritti	<u>fruit</u>	'fruit'
dʊks	dus	<u>doux</u>	'sweet'
bʊgro	buro	<u>beurre</u>	'butter'

[6] Out of 200 occurrences of glides in Text #1, there is only a handful of <u>surface</u> coda glides. These occur 1) through post-lexical vowel-deletion,

e.g. [laj] 'il y avait' is laje before vowel, or 2) through optional gemination, e.g. [lajje] "il y avait', or [pojje], 'pouvait'.

7 In the course of analyzing similar nasal parasites in Bolognese, Hajek (to appear) reviews nasal glide hardening cross-linguistically. He also discusses their phonetic justification and their phonological (segmental and suprasegmental) import.

8 There is a lexical interference: broad ɑ is always long, as in [hɑ:t] "haut", as in French. On the surface, some consonants, in particular [r] and [ž] occasionally lengthen preceding vowels. Furthermore, EFPr displays consistent utterance-final lengthening, as in French: In Krier's corpus, all instances of lengthening in stressed checked vowels occur in utterance-final syllables.

9 The Surmiran data has been discussed in Lüdtke (1955), in Lutta (1923) and has been thoroughly analyzed by Kamprath (1985, 1987). Most of the data given in the following pages are extracted from her work.

10 Lutta 1923 refers to them as "verhärtente Vokale".

11 With one exception: high vowel + hardened glide alternates with high vowel, not with high vowel + regular glide, because homorganic high glides are systematically deleted. Also, hardened glides occur preconsonantally only where regular glides occur in other environments: for instance, the fact that [ak] is not listed in the inventory is directly imputable to the fact that the diphthong /aj/ also fails to occur.

12 This difference results from the interference of later rules, but of course the same set of words were affected by the same historical rule of hardening in both languages. However, word-final consonants were often preserved in Romantsch, while they underwent deletion in Franco-Provençal. Compare (examples from Gauchat 1906):

Lat.	sitim >	Valais:	[šɛk]	Romantsch	[sɛkt]
	nivem		[nɛk]		[nɛkf]
	lupum		[lok]		[lukf] [lokf]

13 It might appear that this ordering in fact weakens Kamprath's claim about glides being nuclear. In a sense, it is phonological overkill to obtain the desired effect from two sides at once: rules and representations. The question could be raised: is the contrast in (15) a consequence of the particular ordering of a set of rules, or is it the result of a configurational difference between two subsets of glides? If hardened glides are nuclear, and regular glides associated to the coda, there is no need for ordering; it is enough to mention syllable-information in the structural description of epenthesis. Epenthesis applies only between post-nuclear consonants. The reason why Kamprath retains this specific rule-ordering is that epenthesis is not strictly speaking a rule of grammar, but rather a persistent condition, a natural consequence of the fact that /r/ in /metr/ is extrasyllabic (unsyllabified) in the first place.

14 We have used the term Surmiran without meaning to imply that all variants of Surmiran display hardening effects, which would be

incorrect. Kamprath, whose research focused on the speech of Bravuogn (German: Bergün) uses the more precise term of Bergüner Romansch.

15 The reader should not be confused by terms which mix weight and constituency. There are no onsets, rimes, nuclei or codas in MP, but it is a clear expository convenience when comparing the two frameworks to refer to such notions as a moraic coda (= a coda which corresponds to a moraic element in MP) or a nuclear mora (= a mora linked to an element which would be nuclear in CP).

16 The focus of Trigo's dissertation is Sanskrit anusvara, a post-vocalic, pre-consonantal glide which surfaces as a nasal. There are interesting parallels to be drawn between anusvara and hardened glides in general, nasal parasites in EFPr in particular.

17 Kamprath presents as a strong point of her analysis the fact that in Surmiran, there is no rule that would syllabify a glide out of the nucleus. She invokes Kaye & Lowenstamm's Nucleus Integrity Constraint (NIC), which forbids resyllabification of material into or out of a branching nucleus. Obviously, our reanalysis violates that constraint. But there seems to be good evidence that the constraint is too strong anyway. There are well-attested cases of glides originating from split nuclei getting strengthened and beginning to function as onsets (for instance, in Spanish dialects). There is a clear case in the history of Romance of coda glides resulting from the yodization of velars. The derivation of French 'fruit' runs as follows: [frykt] > [fryjt]. Coda [k] turned to [j], which still functioned as a coda. Then further vocalized around the beginning of the 10th c. and was reinterpreted as nuclear [fryit]; this reinterpretation allowed it to receive the stress when nuclearity shifted in the 12th c.: [fryít], modern: [fryí]. This is the source of the alternation 'fruit/ fructifier' in Modern French. These kinds of reinterpretations are well-documented and point to the inadequacies of the NIC, as formulated. (Kamprath (p.c.) informs me that her analysis does not crucially depend on whatever the merits of the NIC may be, and she agrees that in fact it may well be the NIC which sorely needs the support of analyses such as hers).

18 Hajek (to appear) also argues in favor of a process shifting glides from nucleus to coda in Bolognese. He points out that not only is this, metatheoretically, a desirable return to unmarked syllable structure, but also that it correlates well with the fact that "all nuclei incorporating historically non-low vowels are unary when nasalized or before any nasal" (and in Bolognese, low vowels do not precede glides).

19 In Aiript, as documented in Pougnard (1950:129-130), such back formations create forms where the excrescent velars come to precede a stressed vowel: abrík/abriká, Fr. abri/abriter 'shelter/to shelter'; núk/nuká, Fr. noeud/nouer, 'knot/to knot'. If these were analyzed as nuclear, and thus unable to resyllabify, this would result in syllabifications even more aberrant than the previously discussed [dug.ra]. The phonology of Aiript would have to be sensitive to a contrast between V.CV and VC.V sequences.

References

Andersen, Henning. 1988. Center and Periphery: Adoption, Diffusion and Spread. Trends in Linguistics, 37:39-85. Berlin: Mouton de Gruyter.
Canfield, D. Lincoln. 1981. Spanish Pronunciation in the Americas. Chicago: U Chicago Press.
Gauchat, Louis. 1906. Sprachgeschichte eines Alpenübergangs (Furka-Oberalp). Archiv für das Studium der neueren Sprachen, 117:345-361.
Gerster, Walter. 1927. Die Mundart von Montana (Wallis). Aarau.
Gilliéron, Jules. 1902. Atlas Linguistique de la France. Paris: Champion.
Jeanjaquet, Jules. 1931. Les patois valaisans. RLiR 7: 23-51.
Haiman, John. 1988. Rhaeto-Romance. The Romance Languages. Pp. 351-391. New York: Oxford University Press.
Hajek, John (to appear) The Hardening of Nasalized Glides in Bolognese. Certamen Phonologicum 2. Torino: Rosenberg & Sellier.
Hayes, Bruce. 1989. Compensatory Lengthening in Moraic Phonology. Linguistic Inquiry 20:250-306.
Kamprath, Christine K. 1985. Suprasegmental Structures in a Raeto-Romansch Dialect. Ph.D. Diss. The University of Texas at Austin.
__________. 1987. Morphological Constraints on Epenthesis and Adjunction. PLS 28:201-217. Dordrecht: Foris.
__________. 1988. The Syllabification of Consonantal Glides: Post-Peak Distinctions. Proceedings of NELS XVI.
__________. 1989. Moraic Theory and Syllable-Internal Structure. Paper presented at the LSA Meeting: Washington, DC.
Kaye , Jonathan & Jean Lowenstamm. 1984. De la syllabicité. Forme sonore du langage. Paris: Hermann.
Krier, Fernande. 1985. La zone frontière du francoprovençal et de l'alémanique dans le Valais. Vols. 1 & 2. Forum Phoneticum: 33, 2. Hamburg: Helmut Buske Verlag.
Lüdtke, H. 1955. Zur Lautlehre des Bündnerromanischen. VRom 14:223-242.
Lutta, Carl M. 1923. Der Dialekt von Bergün und seine Stellung innerhalb der Rätoromanischen Mundarten Graubündens. Beihefte zur Zeitschrift für romanische Philologie, 71. Halle: Niemeyer.
Matte, E. 1982. Histoire de modes phonétiques du français. Paris: Droz.
McCarthy, John & A. Prince. (forthcoming). Prosodic Morphology. Cambridge: MIT Press.
Montreuil, Jean-Pierre. 1989. Non-moraic Codas in Romance. 2nd Colloquium on Romance Linguistics. UT-Austin.
__________. 1990. Length in Milanese. New Analyses in Romance Languages. LSRL-18:32-48. Amsterdam: John Benjamins.
Peer, Oscar. 1962. Dicziunari rumantsch. Samedan: Lia Rumantscha.
Pougnard, Gaston. 1950. Parler 'franco-provençal' d'Aiript. Revue de Linguistique Romane 17:121-157.
Rasmussen, Jens E. 1990. Germanic Verschärfung: Tying up Loose Ends. Papers from the 8th ICHL. Current Issues in Linguistics Theory 66:425-443. Amsterdam: John Benjamins.
Sonder, Ambros & Mena Grisch. 1970. Vocabulari da Surmeir. Coira: LR.
Trigo, Loren. 1988. On the Phonological Derivation and Behavior of Nasal Glides. MIT: Ph.D. diss.

A-BINDING AND AGR-BINDING

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0. Introduction

Chomsky(1981) gives the following binding principles, accounting for the distributions of NP binding types in natural language.

(1) A. An anaphor is bound in its governing category.
B. A pronominal is free in its governing category.
(i) β is a governing category for α iff β is the minimal category containing α, a governor of α, and a SUBJECT accessible to α.
(ii) A SUBJECT is AGR or the subject of an infinitive, a gerund, an NP or a small clause.
(iii) α is accessible to β iff β is in the c-command domain of α and assignment to β of the index of α would not violate $*[_{\gamma} \ldots \delta \ldots]$, where γ and δ bear the same index.

Since these principles were proposed, there has been much work on parameterizing *governing category* for binding, specifically on the parameter of SUBJECT. In this area, long distance binding has been one of the issues of reflexive-binding. There have been two different trends in accounting for long distance anaphora: The one is the parameterization theory of Manzini & Wexler (1987) and Yang(1984), where reflexives are not locally bound due to the lack of AGR; the other is LF-movement theory of Cole, Hermon, & Sung (1990) where anaphors move at LF level via NP-to-INFL and INFL-to-INFL movement.

As is well known, Korean reflexives show long distance binding. In some constructions, however, the reflexive fails to be bound by a c-commanding NP in the higher clause. These locally bound reflexives show characteristic properties of the constructions. This paper is concerned about the distributional difference between unbounded and bounded reflexives in Korean, and proposes a unified theory of two types of anaphor-binding, showing this account is superior to the previous ones, e.g., parameterization theory and LF-movement theory. We propose two distinct binding relations for theta-position reflexives and non-theta-position reflexives. Reflexives in theta-positions are bound by AGR, whereas those in non-theta-positions are bound by an NP in Argument position.

1. Korean Reflexive-Binding: Data and Problems

1.1 Bare Reflexives and Compound Reflexives

Korean has two kinds of reflexives, i.e., bare reflexives and compound reflexives, which are different in their morphological structure. The form of bare reflexive is *caki*, while a compound reflexive is composed of *casin* and a pronominal corresponding to its antecedent. The following table illustrates the compound reflexives.

(2) a.	masculine sg.	ku-casin	'himself'
b.	feminine sg.	kunyo-casin	'herself'
c.	plural	kutul-casin	'themselves'
d.	neutral	caki-casin	'self'

The compound reflexives of (a, b) are subject to the gender agreement condition with their antecedent, but the neutral form of (2d) can be used whatever the antecedent is. It has often been pointed out that the bare reflexive is unbound whereas the compound ones are bound in its governing category. The following examples, however, show that the two kinds of reflexives are not different in their binding domains.

(3) John$_i$-i Mary$_j$-ka $\underline{\text{caki}}_{i/j}$ -lul salangha-un-tako malha-ass-ô.
J-Nom M-Nom self-Acc love-Pres-Compl said
"John$_i$ said that Mary$_j$ loved self$_{i/j}$."

(4) a. John$_i$-i Mary$_j$-ka $\underline{\text{cakicasin}}_{i/j}$ -lul salangha-un-tako malha-ass-ô.
J-Nom M-Nom self-Acc love-Pres-Compl said
"John$_i$ said that Mary$_j$ loved self$_{i/j}$."

b. Sue$_i$-ka Mary$_j$-ka $\underline{\text{kunyocasin}}_{i/j}$ -lul salangha-un-tako malha-ass-ô.
S-Nom M-Nom herself-Acc love-Pres-Compl said
"Sue$_i$ said that Mary$_j$ loved herself$_{i/j}$."

In (3) the bare reflexive *caki* can be bound either by the matrix subject *John* or by the embedded subject *Mary*. In (4a), we can see that the compound reflexives are not subject to the local binding condition. Moreover, when the two c-commanding NPs have the same gender-feature, as in (4b), compound reflexives in the embedded clause can be bound naturally by either one of them. Therefore we can state that the binding domain of reflexives(bare and compound) is unbound.

1.2 Problems in Long-distance Analysis of Reflexive-Binding

Among previous accounts of the unbounded ("long distance") reflexives in Korean, Yang(1984) claims that the unboundness of Korean reflexives is due to the lack of AGR in INFL of Korean, like Japanese, Chinese, and Malayalam. His parameterization of SUBJECT, however, has empirical and theoretical problems which will be discussed in the following sections, 1.2.1-1.2.4. Among other things, reflexives in some constructions have to satisfy Local-binding, and we need AGR-features, in particular the number-feature, in order to correctly interpret the reflexives.

1.2.1 Local binding cases

Let us consider the following examples:

(5) a. John$_i$-i $\underline{\text{caki}}_i$-ka Seoul-e ka-kilo kyolsimha-ass-ta.
J-Nom self-Nom Seoul-to go-Compl decided
"John decided self to go to Seoul."

(5) b. Mary$_i$-ka John$_j$-i caki$_{*i/j}$-ka Seoul-e ka-kilo
M-Nom J-Nom self-Nom
kyolsimha-ass-tako malha-ass-ta
decided-Compl said
"Mary said that John decided self to go to Seoul."

The verb *kyolsimha-* in (5) takes an infinitival complement, which can be characterized as [-Tense]. Here we assume that an infinitive has an INFL category in it, following Chomsky(1981). Then (5a) can be easily thought of as a control construction, but the reflexive *caki* is occupying the PRO position, i.e., embedded subject position. (5b) has the same control construction in embedded clause. A question should arise here: Is the position occupied by *caki* the PRO-position?

What is unexpected is, in (5b), a bare reflexive *caki* cannot be bound by the matrix subject *Mary*. This shows a striking difference from the following (6a), where *caki* can be bound by the matrix subject.

(6) Mary$_i$-nun John$_j$-i caki$_{i/j}$-ka Seoul-e ka-ass-tako
M-Nom J-Nom self-Nom Seoul-to go-Past-Compl
malha-ass-tako mit-ass-ta
said-Compl said
"Mary believed that John said that self went to Seoul."

In (6), the most deeply embedded clause is tensed, that is, the verb *malha-* is taking a [+Tns] complement clause. If an empty subject appears instead of *caki* in (6), it can be interpreted as a free variable like 'pro'. Thus control structure is not involved in (6). Then the failure of unbounded interpretation of reflexive in (5b) might seem to be due to the control structure in it.

Now let us consider (7):

(7) a. Mary$_i$-ka sukce-lûl caki$_i$ -ka ha-ass-ta
M-Nom homework-Acc self-Nom do-Past
"Mary herself did the homework."
b. John$_i$-i Mary$_j$-ka sukce-lûl caki$_{*i/j}$ -ka ha-ass-tako malha-ass-ô.
J-Nom M-Nom homework-Acc self-Nom do-Past-Compl said
"John$_i$ said that Mary$_j$ herself$_{*i/j}$ did the homework."

(7a) is a simplex sentence, where it is clear that *caki* has an "emphatic" function, as shown in its English translation. (7b) is embedding (7a) with the tense-marker *ass*(Past) unaffected. No control structure is found in (7b). However, as in (5b), the embedded *caki* cannot be construed as bound by matrix subject. What should be noted here is that the reflexives in (7a, b) are not in theta-position, since there is a full NP-subject which gets an 'agent' theta-role from the verb *ha-* in each of (7a, b). If the reflexive *caki* were in the theta-position and assigned an 'agent' theta-role, (7a,b) would violate theta-criterion. In Korean, such emphatic reflexives as in (7) can be found easily in any type of sentences.

The impossibility of unbounded interpretation of *caki* holds in the sentences containing compound reflexives, as can be seen in (8) (cf. 7b).

(8) John$_i$-i Mary$_j$-ka sukce-lûl <u>cakicasin</u>$_{*i/j}$ -i ha-ass-tako malha-ass-ô.
"John$_i$ said that Mary$_j$ herself$_{*i/j}$ did the homework."

1.2.2 Sloppy-Identity Readings in VP-anaphora Construction

It has been pointed out that an element whose semantic function is that of bound variable gets only a "sloppy identity" reading in VP-anaphora constructions. The following English examples show that the reflexives are functioning as bound variables, whereas pronouns need not.

(9) a. John loves himself and so does Bill.
b. = John$_i$ loves himself$_i$ and Bill$_j$ loves himself$_j$.
c. ≠ John loves himself and Bill loves John.

(10)a. John loves his mother and so does Bill.
b. = John$_i$ loves his$_i$ mother and Bill$_j$ loves his$_j$ mother.
c. = John$_i$ loves his$_i$ mother and Bill$_j$ loves his$_i$(John's) mother.

(9b) and (10b) show the sloppy identity readings of (9a) and (10a), respectively. However, we cannot get a "strict identity(or referential)" reading for (9a), as shown in (9c), while (10c) shows such reading of (10a) naturally.

In Korean, however, the situation is different from English. We find a contrast of sloppy vs. strict reading not between reflexive/pronoun, but between the reflexives in theta-positions and those in non-theta-positions. Let us consider the following sentences:

(11)a. John$_i$-i caki$_i$-ka iki-ôss-tako sângkakha-ôss-nûnte,
J-Nom self-Nom win-Past-Compl think-Past-Conn('and')
Mary$_j$-to <u>kûlô-ha-ass-ta</u>
M-also so-do-Past
"John$_i$ thought that self$_i$ won, and so did Mary."

b. John$_i$-i caki$_i$-ka iki-ôss-tako sângkakha-ôss-nûnte
Mary$_j$-to [$_{vp}$ caki$_{i/j}$-ka iki-ôss-tako sângkakha-ass-ta]
self-Nom
"John$_i$ thought that self$_i$ won, and Mary$_j$ thought that self$_{i/j}$ won, too."

The VP-anaphor of Korean is *kûlô-ha-* ('do so'). In (11a), the second clause has a VP-deleted structure indicated by underlined pro-VP form, and (11b) is the result of VP-copying in its LF-representation. The copied VP-constituent is marked by brackets, [$_{vp}$ ...], in (b). This VP constituent contains an embedded clause whose subject NP is the reflexive *caki*. *Caki* in the antecedent clause is bound only by its matrix subject, *John*$_i$. The reflexive in the copied VP, however, can be bound either by its c-commanding subject NP, *Mary*$_j$, or by the subject of the antecedent clause, i.e., *John*$_i$. The former is the 'sloppy identity' reading, the latter the 'strict referential' reading. These two readings for the reflexive in a copied VP-constituent arise in the same way in the following examples, where the reflexive appears in object position.

(12) a. $John_i$-i $Mary_j$-ka $caki_{i/j}$-lûl cohaha-un-tako sangkakha-nunte,
J-Nom M-Nom self-Acc like-Pres-Compl think-Conn('and')
$Bill_k$-to <u>kûlô-ha-ta</u>
B-also so-do
"$John_i$ thinks that $Mary_j$ likes $self_{i/j}$, and so does Bill."

b. $John_i$-i $Mary_j$-ka $caki_{i/j}$-lûl cohaha-un-tako sangkakha-nunte,
$Bill_k$-to [$_{vp}$ $Mary_j$-ka $\mathbf{caki_{i/j/k}}$-lûl cohaha-ûn-tako sangkakha-un-ta]
think-Pres
"$John_i$ thinks that $Mary_j$ likes $self_{i/j}$, and $Bill_k$ thinks that $Mary_j$ likes $self_{i/j/k}$, too."

b'. "$John_i$ thinks that $Mary_j$ likes $herself_j/him_i$, and $Bill_k$ thinks that $Mary_j$ likes $herself_j/\mathbf{him_i}$, too."

b". "$John_i$ thinks that $Mary_j$ likes $herself_j/him_i$, and $Bill_k$ thinks that $Mary_j$ likes $herself_j/\mathbf{him_k}$, too."

The reflexive *caki* in (12a) receives a theta-role from the most deeply embedded verb *cohaha-*, for it is in object position. Further, it can be bound by either one of its c-commanding subjects, i.e., *John*$_i$ or *Mary*$_j$. In (12b), VP-copying occurs, substituting the pro-VP form with the VP-constituent of the antecedent clause. Then the reflexive *caki* in the copied VP can be interpreted as bound by *John*$_i$ or *Bill*$_k$, corresponding to (b') and (b"), respectively. (b') represents a strict referential reading, whereas (b") a sloppy identity reading. Then does the reflexive in the copied VP always have the two readings? The answer is "no". Look at the following sentences containing an emphatic reflexive in non-theta position.

(13)a. $John_i$-i sukce-lul $caki_i$-ka ha-ass-nunte,
J-Nom homework-Acc self-Nom do-Past-Conn('and')
$Mary_j$-to <u>kûlô-ha-ass-ta</u>.
M-also so-did
"John did the homework himself, and so did Mary."

b. $John_i$-i sukce-lul $caki_i$-ka ha-ass-nunte,
$Mary_j$-to [$_{vp}$ <u>$caki_{*i/j}$-ka sukce-lul ha-ass-ta</u>]
"John did the homework himself, and Mary did the homework herself, too."

In (13b), *caki* cannot be interpreted as bound by the matrix subject *John*$_i$, that is, it has only a sloppy identity reading as a bound variable. The difference between (12) and (13) is that the reflexive of (13) is not in theta-position, functioning emphatically. Then let us consider a control structure:

(14)a. John$_i$-i sukce-lûl caki$_i$-ka ha-ko sip-ôss-nunte
J-Nom homework-Acc self-Nom do-Compl want-Past-Conn
Mary$_j$-to kûlô-ha-ass-ta.
M-also so-do-Past
"John wanted self to do the homework, and so did Mary."

b. John$_i$-i sukce-lûl caki$_i$-ka ha-ko sip-ôss-nunte
Mary$_j$-to sukce-lul caki$_{*i/j}$ -ka ha-ko sip-ass-ta
"John$_i$ wanted self$_i$ to do the homework, and Mary$_j$ wanted self$_{*i/j}$ to do the homework, too."

In (14a,b), the verb *sip-* is taking an infinitival complement, i.e., [-Tensed] clause, where PRO can be posited in its subject position. Thus when a null subject appears in the subject position, it is always interpreted as controlled by a matrix subject NP. After the VP-copying, in (b), *caki* does not show a strict referential reading, i.e., it is not bound by the subject NP *John*$_i$ of the antecedent clause. Then it seems to follow that the failure of strict referential reading in VP-anaphora constructions is due to the lack of theta-role of the emphatic reflexive.

1.2.3 Number/ Gender Agreement

Korean has a plural form of bare reflexive, *caki-tul*, as well as that of compound ones(cf. section 1.1). The behavior of this plural reflexive shows a delicate difference in the interpretation of reflexives with respect to their number. First let us look at the following examples where the reflexives are in theta-position.

(15)a. Haksaeng-tul$_i$-i caki-tul$_i$-i NewYork-e ka-kess-tako malha-ass-ta
student-pl-Nom self-pl-Nom N.Y.-to go-Fut-Compl said
"The students said that they would go to N.Y."

b. Haksaeng-tul$_i$-i caki$_i$-ka NewYork-e ka-kess-tako malha-ass-ta
self-Nom
"Each of the students said that he would go to N.Y."

Both (15a) and (b) have their natural interpretations, as shown in the English counterparts. But (15a) has a 'collective' reading for *cakitul*, while (15b) has only a 'distributional' reading for *caki*. The two NPs in (b) cannot be coreferential, in a strict sense of coreference, since *caki* does not refer to the whole collection of students but refers to 'each one of the students' individually. In contrast , the following (16) shows that we cannot get the distributional interpretation of reflexives in non-theta-positions.

(16)a. Haksaengtul-i {*caki-ka, cakitul-i } N.Y.-e ka-ass-ta
self(sg.) selves(pl) went
"The students themselves went to N.Y."

b. Haksaengtul-i {*caki-ka, cakitul-i } hojcang-ul
self(sg) selves(pl) president-Acc
ppop-ko sipoha-n-ta
elect-Compl want-Pres
"The students want themselves to elect the president."

(16a) is a simplex sentence, and (b) contains a control structure. In (16) the reflexive shows only a 'collective' reading, and further, the singular form reflexive cannot show up in the position. This fact implies that there is a strict condition regarding number-feature on the occurrence of reflexives in non-theta positions.

2. A Generalized Account of Korean Reflexives

We have seen so far that, in some constructions, reflexives are not interpreted as bound by a distant NP of a higher clause, and that this failure of long distance binding seems to come from the lack of theta-role of the reflexive. Let me call such reflexives without a theta-role 'emphatic reflexives.' In this section, I will try to answer the following questions: (i) what position does the emphtic reflexive occupy?; (ii) How can we handle the different behaviors of reflexives with respect to their positions?

Before going into details of binding principles, let me briefly describe control structure of Korean and the status of PRO.

2.1 INFL and Control Structures

In Korean, we can find many verbs involving a control structure. These verbs take an infinitival complement whose empty subject is always interpreted as bound by the subject of the higher clause. The following verbs are included in the 'subject control verbs': *sipoha-* ('to want'), *kyolsimha-* ('to decide'), *yaksokha-* ('to promise'), *nolyokha-* ('to try'), *silhoha-* ('to dislike'), *cohaha-* ('to like'), etc. Some of them were examplified already in section 1. Now look at the following:

(17)a. John$_i$-i [$e_{i/*k}$ N.Y.-e ka-ko] sipoha-n-ta
J-Nom N.Y.-to go-Compl want-Pres
"John wants to go to N.Y."

b. John$_i$-i [caki$_i$-ka N.Y.-e ka-ko] sipoha-n-ta
self-Nom
"John wants himself to go to N.Y."

c. *John$_i$-i [Mary$_j$-ka N.Y.-e ka-ko] sipoha-n-ta
"John wants Mary to go to N.Y."

The embedded clauses of (17) are not tense-marked, i.e., [-Tns]. In (17), (a) and (c) are not problematic, but (b) looks cumbersome for the PRO theorem and case theory, if we want to posit a PRO in the empty subject position in (a). But the small pro is not a candidate for the position, since the empty subject cannot be free, i.e., $e_{i/*k}$. The reflexive *caki* in (b), however, is not in a true subject position, as we saw earlier. In section 1.2, It was pointed out that the reflexive in apparent PRO positions does not act like those in a theta-position (cf. 1.2.1-1.2.4). Therefore I claim that the reflexives in controllee-NP position, as in (17b), is not in the true PRO position, but rather in a non-q position.

Let us compare control structures with the following sentences:

(18)a. John$_i$-i [$e_{i/k}$ Seoul-e tochakha-ass-tako] malha-ass-ta
J-Nom S-to arrive-Past-Compl said
"John$_i$ said that he$_{i/j}$ arrived Seoul."
b. John$_i$-i [caki$_i$-ka Seoul-e tochakha-ass-tako] malha-ass-ta
"John$_i$ said that self$_i$ arrived Seoul."
c. John-i [Mary-ka Seoul-e tochakha-ass-tako] malha-ass-ta
"John said that Mary arrived Seoul."

First we can see the difference in tense-marking of embedded clauses. The embedded clauses in (18) contain a tense-marker *-ass-* (Past), which was not found in (17). The matrix verb *malha-* ('to say') takes a tensed complement clause, let us call [+Tns] clause. Further, as expected, the embedded empty subject in (18a) can be free(cf. (17a)). This embedded subject position can be occupied by a lexical full NP, too, as in (18c). Thus we can postulate the small 'pro' here. Now the reflexive in (b) is not problematic any more, if we assume that an anaphor can appear in pro-position, which is independently motivated to explain the reflexives in subject positions.

As noted earlier, we assume that infinitives contain an INFL category, and it is composed of TENSE [-Tns] and AGR. In Korean, the tense-interpretation of an embedded clause is totally dependent on that of matrix clause. This is true for the tense-marked embedded clauses, as well as for infinitives. If an embedded tense is marked as 'Present' and the matrix tense is 'Past', then the former should be interpreted as a past tense. And if an embedded tense is 'Past' and the matrix one is also 'Past', then the embedded clause should get the reading of 'Past Perfective.' As for the [-Tns] clauses, they are interpreted as taking the same tense as the matrix clause. See Enç (1985) for an account of the interpretation of Temporal dependency. I propose the following Principle for the interpretation of INFL category.

(19) Feature-Inheritance Principle: INFL-TO-INFL
Every tense or agreement feature has to be interited from higher INFL to lower INFL.

Later we will revise this in discussing the index-inheritance: AGR-to-AGR (cf. 2.2).

2.2 AGR-binding and A-binding

Let me briefly summarize the discussion in 1.2 and 2.1.

(20)a. A reflexive *caki* in a theta-position is unbounded, whereas *caki* in a non-theta-position is locally bound.
b. *caki* in a non-theta-position can only get a sloppy identity reading in VP-deleted structure, but *caki* in a theta-position can get a strict referential reading as well as a sloppy identity one.
c. reflexives in non-theta-positions are subject to the strict number-agreement condition, whereas those in theta-positions are not.

The above observations reveal that the distinction between q-positions from non-theta-positions plays an important role in reflexive-binding in Korean. Moreover, the local-binding of *caki* in a non-theta-position cannot be accounted for only by parameterizing the SUBJECT in defining governing category. If we simply say that Korean has no AGR in INFL, then the different binding domains for *caki* in different positions cannot be explained. Moreover, LF-movement theory of Cole, Hermon, & Sung (1990) would find it difficult to account for (20b).

As we saw in 2.1, the tense/agreement features of an embedded clause are dependent on those of the matrix clause. Thus, under the assumption that INFL has AGR as well as TENSE, I claim that the governing category for any reflexive is the same, but the reflexives in the two distinct positions be bound by different sources, as shown in the following principle:

(21) AGR-binding and Argument-Binding
   a. *Caki* is bound in its minimal governing category.
   b. i. *Caki* is bound by a c-commanding argument when it occurs in a non-theta position.
      ii. *Caki* is bound by AGR when it occurs in a theta position.

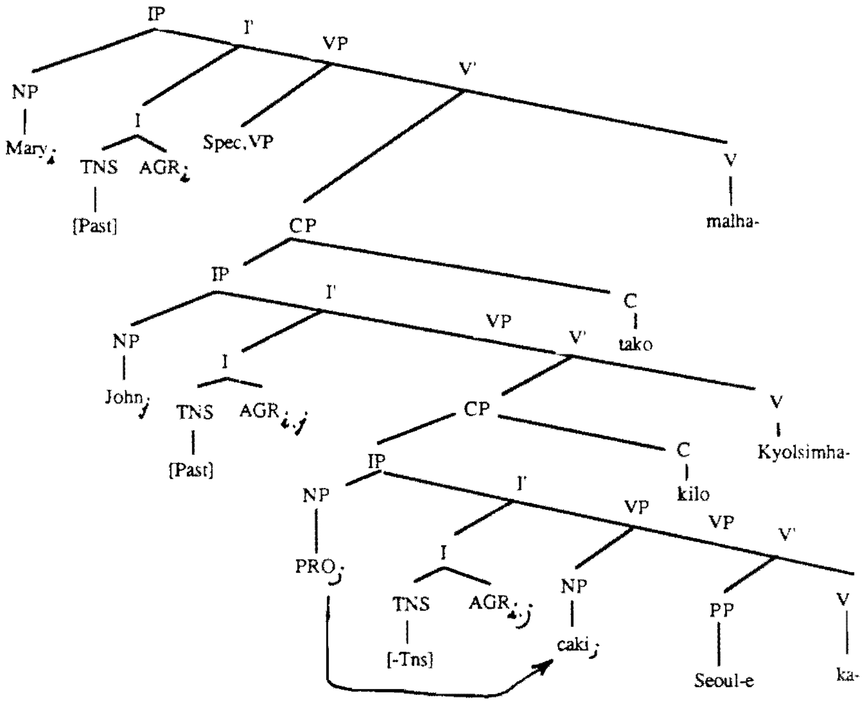
Here, following H. Borer's(1986) analysis, we assume that the INFL node both in tensed clauses and in non-tensed clauses must be coindexed with an NP in its specifier position. By this coindexing mechanism, every AGR other than that of null subject clauses get an index from an NP in subject position. Further, we propose a principle of index-inheritance as in (22):

(22) AGR-Index Inheritance:
   The AGR of an embedded clause inherits the index of AGR of the higher clause which is assigned by coindexing it with its subject NP.

Now, let me account for the observations summarized in (20) by the principle of (21). (21) and (22) can give an elegant account of the locality condition for the reflexives in non-theta-positions, i.e., (20a). The following (23) and (24) show the LF-representations of (5b) and (6) discussed in 1.2.1.

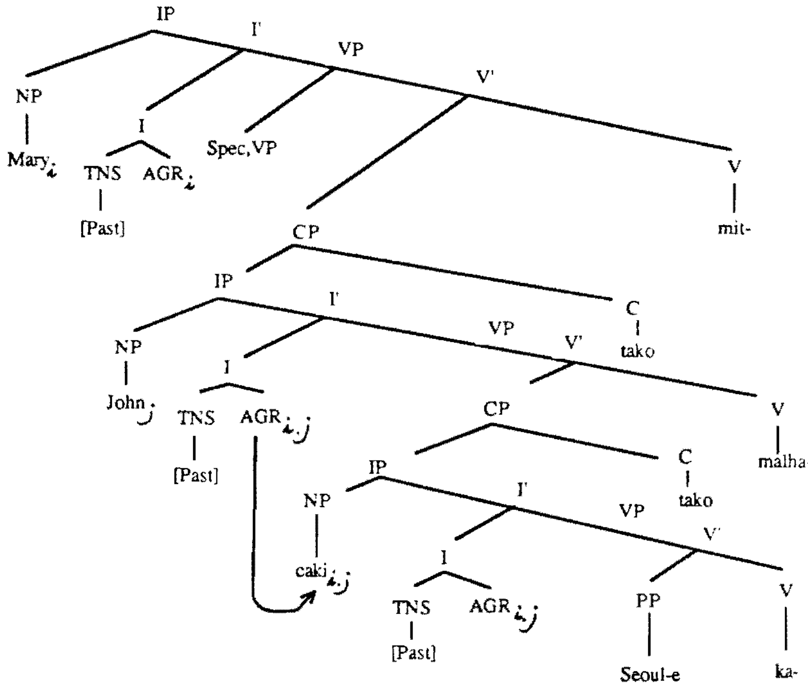
(5) b. Mary$_i$-ka John$_j$-i <u>caki</u>$_{*i/j}$-ka Seoul-e ka-kilo
M-Nom J-Nom self-Nom
kyolsimha-ass-tako malha-ass-ta
decided-Compl   said
"Mary said that John decided self to go to Seoul."

(23)



(6) Mary$_i$-nun John$_j$-i <u>caki</u>$_{i/j}$-ka Seoul-e ka-<u>ass</u>-tako
M-Nom   J-Nom self-Nom Seoul-to go-Past-Compl
malha-ass-tako mit-ass-ta
said-Compl   said
"Mary believed that John said that self went to Seoul."

(24)

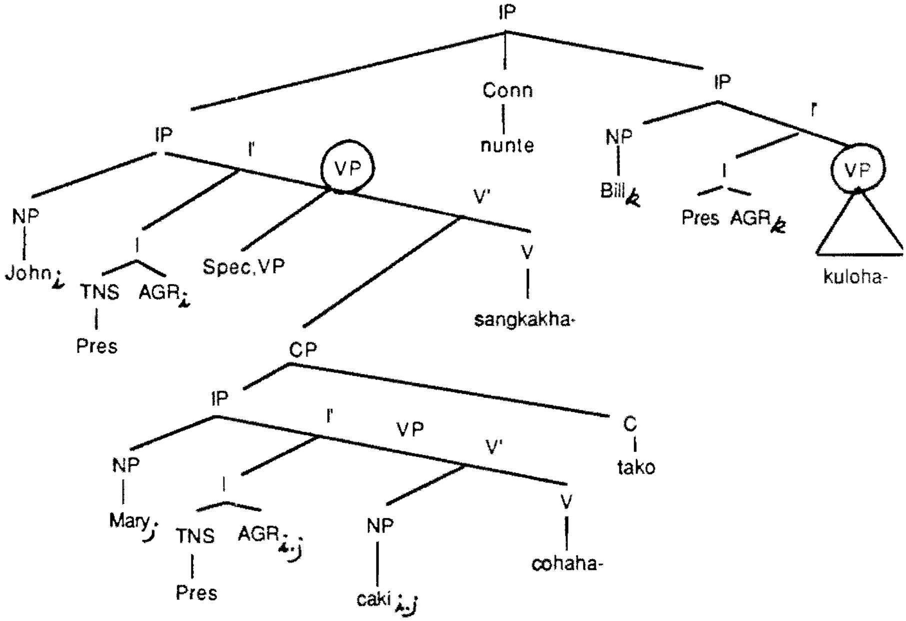


In (23), the most deeply embedded *caki*$_j$ does not have a theta-role, and it is bound by the immediately c-commanding NP, PRO$_j$, which is controlled by *John*$_j$ in the higher IP. Thus *caki* cannot get the index of *Mary*$_i$, since it cannot be bound by AGR in its governing category, due to (21). The indices {i,j} of AGR in the lowest IP are inherited from the AGR of the higher AGR. In (24), however, *caki*$_{i,j}$ is in a theta-position and bound by AGR in its govering category which has the indices {i,j}. Thus the long distance binding of *caki* in a theta-position is explained by (21) and (22).

Now let us consider "sloppy vs. strict identity" readings in VP-deletion constructions. Compare the (12a) and (13a), repeated below. In (12a), *caki* is in a theta-position as an object, while *caki* in (13a) is not. (25) and (26) below are the S-structures of (12a) and (13a), respectively.

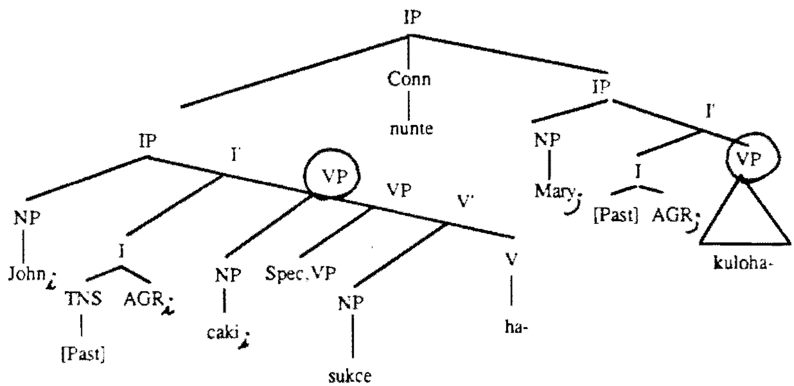
(12) a. John$_i$-i Mary$_j$-ka caki$_{i/j}$-lûl cohaha-un-tako sangkakha-nunte,
J-Nom M-Nom self-Acc like-Pres-Compl think-Conn('and')
Bill$_k$-to <u>kûlô-ha-ta</u>
B-also so-do
"John$_i$ thinks that Mary$_j$ likes self$_{i/j}$, and so does Bill."

(25)



(13)a. John$_i$-i sukce-lul caki$_i$-ka ha-ass-nunte,
J-Nom homework-Acc self-Nom do-Past-Conn('and')
Mary$_j$-to <u>kûlô-ha-ass-ta</u>.
M-also so-did
"John himself did the homework, and so did Mary."

(26)



When (25) goes through VP-copying at LF, *caki* can get another index from *Bill*$_k$ without violating (21), since the AGR in the copied VP would inherit the index k from the higher AGR$_k$ in IP$_2$. Then the AGR in the copied VP of IP$_2$ carries three indices {i, j, k}, and *caki* also can get the three indices. In (26), however, while *caki* in the copied VP can be bound by *Mary*$_j$, it cannot preserve the original index i, since *caki* cannot be bound by *John*$_i$, due to (21). Then *caki* can be bound only by the c-commanding NP *Mary*$_j$ in IP$_2$.

In 1.2.3, we saw that reflexives in non-theta-positions are subject to the strict number-agreement condition, whereas those in theta-positions are not. I cannot give a full account of this difference at present, but this difference seems to arise from the different binding mechanism, as proposed in (21). Following (21), since a reflexive in a non-theta-position is bound by its immediately c-commanding NP, the binder/bindee relation is more direct than that of reflexives in theta-positions. That is, the number agreement condition for Argument-binding is stricter than the case of AGR-binding. When AGR-binding violates the number agreement condition, we can get a distributional reading, even though we cannot get a collective reading (cf. (15)).

3. Concluding Remarks

This paper has examined the different charateristics of reflexives in non-theta-positions in Korean, and has proposed a generalized account of the reflexives in terms of a distinction of AGR-binding for reflexives in theta-positions and Argument-binding for those in non-theta-positions. Further, I have come to define the governing category with the help of AGR, and generalized the locality condition of binding principle (A) by the "AGR-Index Inheritance," proposed in (22).

Many problems about the emphatic reflexives remain unsolved: (i) Why does an emphatic reflexive not appear in non-subject positions in Korean, whereas it does in English; (ii) How is it assigned a case (nominative case in Korean); (iii) Why does it prevent the other reflexives in its c-commanding domain from being bound by a different antecedent from the antecedent binding it? The last problem arises in the sentences like the following:

(27)a. John$_i$-ûn Mary$_j$-ka **caki**$_{i/j}$-ûi sukce-lûl an ha-ôss-tako
J-Top M-Nom self-Gen homework-Acc not do-Past-Compl
malha-ass-ô
say-Past-Decl
"John$_i$ said that Mary$_j$ did not do self's$_{i/j}$ homework."

b. John$_i$-ûn Mary$_j$-ka
caki-ûi sukce-lûl **caki**-ka an ha-ôss-tako malha-ass-ô
j j
*i *i
*i *j
*j *i
"John said that Mary herself did not do her homework."

The reflexive *caki* case-marked as genitive in (27a) can be bound by either *John* or *Mary*, whereas that of (b) cannot be bound by matrix subject, *John*. Moreover, in (27b), the two reflexives in the embedded IP cannot be disjoint-referential either. It is clear that this failure of long distance binding of *caki* in (27b) is due to the emphatic reflexive in the same IP. Let me leave these problems open to attack.

Footnote:

[1] In this paper the following abridged terms for grammatical morphemes are used (unabridged terms in parentheses): Nom (nominative case marker); Acc (Accusative case Marker); Top (topic marker); Gen (genetive case marker); Pres (present tense marker); Past (past tense marker); Fut (future tense marker); Compl (complementizer); Conn(connective ending); Decl(declarative sentential ending); Interr (interrogative sentential ending).

References
Bickerton, D. (1987) '*He himself*: Anaphor, Pronoun, Or ... ?,' *LI* 18: 345-348.
Borer, H. (1986) 'I-Subjects,' *Linguistic Inquiry* 17: 375-416.
____ (1989) 'Anaphoric AGR,' ms. UC Irvine.
Chomsky, N. (1981) *Lectures on Government and Binding*, Foris Publications.
____ (1986) *Knowledge of Language: Its Nature, Origin, and Use*, New York: Praeger.
Cole, P., G. Hermon, and L.-M. Sung (1990) 'Principles and Parameters of Long-Distance Reflexives,' *LI* 21: 1-22.
Enç, M. (1985) 'Temporal Interpretation,' ms., Univ. of Southern California.
Huang, C.-T. J. (1984) 'On the Distribution and Reference of Empty Pronouns,' *LI* 15: 531-574.
Huang, C.-T. J. and C.-C. J. Tang (1988) 'On the Local Nature of the Long-Distance Reflexive in Chinese,' ms., Cornell University.
Hyams, N. and S. Sigurjonsdottir (1988) 'The Development of 'Long Distance

Anaphora': A Cross-Linguistic Comparison with Special Reference to Icelandic,' ms., UCLA.
Kang, B.-M. (1988) 'Unbounded Reflexives,' *Linguistics and Philosophy* 11: 415-456.
Lasnik, H. and M. Saito (1984) 'On the Nature of Proper Government,' *LI* 15: 235-290.
Lee, H.S. (1987) 'Pronominal Anaphors and Binding Domain: with Reference to a Quasi-Reflexive *caki* in Korean,' ms., UCLA.
Manzini, M. R. and K. Wexler (1987) 'Parameters, Binding Theory, and Learnability,' *LI* 18: 413-444.
Sportiche, D. (1986) '*Zibun*,' *LI* 17: 369-374.
Stowell, T. (1982) 'On tense of Infinitives,' *LI* 13: 561-570.
Yang, D.-W. (1984) 'The Extended Binding Theory of Anaphors," *Theoretical Linguistic Research* 1: 195-218.
_____ (1986) 'hankwuke-uy tayyongsalon,' (A discussion of Korean Anaphors) *Jounal of Korean Linaguistics* 15: 41-162, Seoul: The Society of Korean Linguistics.

Warlpiri Versus Phonology–Free Syntax

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Ken Hale (1973:313) reports an interesting counterexample to the separation of phonology and syntax. He says that the Warlpiri auxiliary is formed in clause-initial position and is inserted in second position obligatorily if the auxiliary base is less than disyllabic; otherwise, auxiliary insertion into second position is optional in the language.[1] An example of a disyllabic base, negative *kula*, is found in (1a & b) — with optional location in first or second position:

(1) a. Ngaju *kula–rna* wangku–ja
I *NEG–1SG* speak–PAST
'I didn't talk' (Nash 1986:238)

b. *Kula–rna* wangku–ja
NEG–1SG speak–PAST
'I didn't talk' (Nash 1986:237)

The stipulation that the initial or second position of the auxiliary verb depends on the number of syllables in its base is in clear violation of Zwicky and Pullum's Principle of Phonology-Free Syntax (PPFS), which is intended to strengthen a restricted theory of syntax by disallowing a mixture of phonological and syntactic rules. Zwicky and Pullum state the principle as follows:

> **The Principle of Phonology-Free Syntax** (PPFS): The syntactic component has no access to phonological information. (Pullum and Zwicky 1984:105)

Any proposed violation of the PPFS may fall into one of several types; only three are considered here: (a) a spurious generalization — the putative counterexample turns out not to be in violation of the principle, (b) a tendency rather than a rule — this type does not violate the principle insofar as it is extragrammatical, or (c) a universal phonological constraint imposed on a syntactic rule — as a universal the phonological condition is not, however, to be stated as part of the language-particular rule. This last (c) is important because Pullum and Zwicky (in press) allow certain universal, non-language-specific considerations to override the PPFS. Here there is the possibility that reference to stress and/or number of syllables may be a candidate for universality, and that the Warlpiri facts might require this sort of (perceived) weakening of the principle, but do not entirely invalidate it. I argue here that this kind of apparent violation need not be employed in light of a detailed investigation of the grammar of a specific language like Warlpiri, and therefore, should be disallowed in principle. Warlpiri is amenable to a reanalysis whereby the principle is preserved intact as in (a) and is not weakened as in type (c).

I point out that because bound words are frequently shorter than their free word counterparts (or their historical sources) and sometimes also have special syntax associated with them, it would appear that phonological length is relevant to the statement of syntactic rules. In Warlpiri, for example, the second person singular independent pronoun *nyuntu* has tremendous syntactic freedom compared to the second person singular subject clitic *n(pa)* and the second person singular object clitic *ngku*, both of which are restricted to Wackernagel position (i.e., the second slot in a clause). The traditional approach derives the clitic version from the independent pronoun by having cliticization take place (i.e. morphophonological change from *nyuntu* to *n(pa)* or *ngku*) and then restricting the clitic syntactically to second position. Under this approach, without cliticization having occurred, there would be no way to identify the clitic that is to have special positioning constraints. But, by dictating that a word marked [CLITIC:+] or [STRESS:–] or some such designation provides the relevant input to the syntactic rule limiting the now clitic words to the Wackernagel slot, the traditional analysis violates the Principle of Phonology-Free Syntax.

It is in fact generally rather easy to translate such a scheme into another, equally viable analysis, and one that is more compatible with the PPFS. We can turn the sequence of events around by marking the syntactically restricted pronouns with some feature, say [WL:+] for Wackernagel's Law, and leaving the syntactically independent pronouns unmarked for this feature. Once syntax has finished positioning the free pronouns and the [WL:+] pronouns, the items marked [WL:+] may become phonologically attached to a neighbor, though they need not be.[2] This approach has the advantage of positioning both clitics and other unstressed words (and even fully stressed words, for that matter) without first requiring cliticization. This also means that a syntactic feature may predict or imply the presence of a phonological feature in the lexicon, but not vice versa; on this see Pullum and Zwicky (1984:114) who propose that lexical implication principles where a phonological property is used to predict a syntactic property should be disallowed in principle.

We now turn our attention to the details of the Warlpiri auxiliary, which is sometimes an independent word and sometimes a bound word (i.e. a "clitic"). Hale's student David Nash reiterates Hale's claim that Warlpiri mixes phonological properties with syntax and notes that ...

> The Auxiliary may begin a sentence if its first element is a polysyllabic base... The monosyllabic bases may occur clause initially, or after a hesitation, but not at the beginning of an utterance and are more commonly cliticised to a preceding word. An Auxiliary beginning with a pronominal clitic is always cliticised to a preceding word, even if the pronominal clitic is polysyllabic. (p. 61)

He continues later:

> The Auxiliary may be in "first position" only if it has a "base" which is disyllabic or longer. An Auxiliary of any size may be in "second position", and is intonationally subordinated to the preceding word, if not in fact cliticised to it. (p. 186)

The auxiliary, then, is sometimes a full phonologically and prosodically independent word, sometimes a prosodically dependent word, and sometimes a bound word or "clitic". It is possible to tease out the differences among these behaviors in Warlpiri. Because primary stress falls on the initial syllable of a word, a word beginning with a primary stress can be treated as a phonologically and prosodically independent word. A word beginning with a secondary stress will not be considered prosodically independent — it is instead a **leaner** (a.k.a. quasi- or semi-clitic). But a truly clitic word further exhibits word-internal sandhi as demonstrated in Warlpiri by vowel harmony and phonotactic patterns.

Primary stress on an initial auxiliary verb is reduced to a secondary stress in second position, so it is apparent that the auxiliary is prosodically subordinated to it host on the left. Stress assignment usually alternates in a word, appearing on each odd syllable except the final syllable. Although the auxiliary is a leaner, stress assignment within the auxiliary starts with its own first syllable, not with that of its host. Thus in (4) secondary stresses are counted from the first syllable of the auxiliary (present tense *kà*), not from the first syllable of the host *wáng*, even though the stress on *ka* has been reduced from primary to secondary by prosodic means. The alternating stresses are seen most clearly in (4d). Only a monosyllabic auxiliary fails to restart stress assignment due to the stipulation that stress may not fall on the final syllable of a phonological word, as in (4a).

(4) a. Wángka-mi *ka*
speak-NPAST *PRES*
'He's speaking' (Nash 1986:102)

b. Wángka-mi *kà-rna*
speak-NPAST *PRES-1SG*
'I'm speaking'

c. Wángka-mi *kà-rna-ngku*
speak-NPAST *PRES-1SG-2SG*
'I'm speaking to you'

d. Wángka-mi *kà-rna-ngkù-lu*
speak-NPAST *PRES-1SG-2SG-PL*
'We (Exclusive Plural) are speaking to you'

e. Wángka-mi *kà-rna-ngkù- lu- rla*
speak-NPAST *PRES-1SG-2SG-PL-DAT*
'We are speaking to you for it'

Besides being a prosodic leaner with a certain amount of autonomy, the second position auxiliary can also be a true clitic. Vowel harmony applies only within the word, and applies across the host through to the end of the auxiliary, thus providing word-internal phonological evidence for the bound status of the auxiliary in second position.

Hale (1973:313) states the vowel harmonizing assimilation rule as follows:

> [A] suffixal high vowel assimilates to a preceding final high vowel (for example, /kaḷi-ku/ —> [kaḷi-ki] 'boomerang-dative'...). Enclitic person markers behave like suffixes in this regard. For example, (a) becomes (b) by vowel assimilation:
>
> (a) maliki-ḷu ø-ṭu yaḷku-ṇu
> dog–ergative past–me bite–past
> 'The dog bit me'
>
> (b) maliki-ḷi ø-ṭi yaḷku-ṇu

This rule is corroborated by Nash, who states the rule somewhat differently: *u* —> [i] in suffixes and enclitics following a stem *i* (p. 80). Thus we can contrast the auxiliary having *u*'s after a host like *kurdu* 'child' in (5) with the auxiliary having *i*'s after a host like *maliki* 'dog' in (6), from Nash (1986:86):

(5) kurdu–kurlu–rlu–*lku–ju–lu*
child–PROP–ERG–*then–1SG–3PL*

(6) maliki–kirli–rli–*lki–ji–li*
dog–PROP–ERG–*then–1SG–3PL*

A second piece of evidence that the auxiliary is phonologically bound comes from phonotactic patterns in the language. Nash (p. 78) reports that the canonical shape of the word-initial syllable is CV(V)(C). Only a few morphemes in the auxiliary deviate from this canon; the rest of the auxiliary may or may not exhibit word-initial behavior, but clearly *–lku* 'then, 'now' and *–lpa* 'imperfect auxiliary base' are to be considered word-internal morphemes.[3]

Thus, there are three phenomena we are dealing with in the Warlpiri auxiliary: **an independent word**, as with sentence-initial *kula–rna* in (1b); **a prosodic leaner**, as in (1a) and (4a–e); and **a phonologically bound word**, as in (5) and (6). These facts generally support Klavans' (1985) separation of syntax and phonology in cliticization. Note that the trigger for post-syntactic phonological attachment is the lexical feature [LIAISON] (Klavans 1982, 1985) and that attachment is always leftward, so the value for liaison is [LIAISON:LEFT]; see Nevis (1987).

The auxiliary verb consists of some combination of the following: a tense and/or a complementizer, a subject marker, an object marker, a dative, a conjunction, and one of a set of bound "particles". A maximal expansion of the auxiliary would contain the elements in (7). The relevant morphemes include those in (8), from Nash (1986:17, 56, 59-60).

(7) CONJ'N+PARTICLE+TENSE+COMPL'R+SUBJECT+OBJECT+DATIVE

(8) a. Tenses

kapu ~ kapi ~ ngarra	'future'
kalaka	'admonitive'
ka	'present'
lpa	'imperfect'
kala	'usitive'

b. Complementizers

kula	'negative'
kaji	'if, when'
kuja, ngula	'relative'
yungu ~ yinga (~ *yi* non-finally, optionally)	'causal'

c. Subject Pronouns

rna	1
n(pa)	2
rli	12
rlijarra	11
n(pa)-pala	22
pala	33
rlipa	122
rna-lu	111
nku	222
lu	333

d. Object Pronouns

ju	1
ngku	2
ngali(ngki)	12
jarrangku	11
ngku-pala	22
palangu	33
ngalpa	122
nganpa	111
nyarra	222
jana	333
nyanu	reflexive

e. Dative Pronouns

rla	dative
jinta	dative extender

f. Conjunctions	
kala	'but'
manu ~ kapi	'and'

g. "Bound Particles"	
ja	'assertive'
jala	'after all, obviously, as you know, actually'
ju, ji	'topic, definite, the; phonological extender'
juku	'still, yet, now as then'
kirli	'precisely'
kula	'contrastive, concessive, rather'
lku	'now, then, and then'
nya	'emphatic, focus, interrogative'
waja	'I say, obviously'
wiyi	'first, before'
wurru ~ wu	'emphatic'
yijala	'also'

Besides the auxiliary elements in (8), there is a small set of "modal particles" that behaves like the auxiliary in occurring in initial or second position, and in some instances in other sentence positions (such as clause-finally):[4] (from Nash 1986:186)

(9)	*karinganta*	'declarative'
	pangkala ~ kirli	'permissive'
	kulanganta	'present counterfactual'
	marda	'perhaps'
	kari	'assertive'

And there is in addition a second even tinier set of "modal particles" that cannot appear sentence-initially and in fact prefers second position:

(10)	*japa*	'interrogative'
	nganta	'supposedly'
	mayi	'presumably'
	waja	'emphatic'

To summarize the ordering facts: the auxiliary (8), conjunctions (8f), and bound particles (8g) are either initial or in second position; the modal particles of (9) may be initial, second, or occasionally elsewhere; and the modal particles of (10) tend to be restricted to second position and never occur initially. Furthermore, in initial position the auxiliary constitutes an independent phonological word. In second position it may be a leaner or a bound word, depending on certain considerations to be discussed below.

Turning now to the syntax of the Warlpiri clitics, I point out that the initial position after which a clitic may occur can be filled by a preverb–verb combination (11), a plain preverb (12), a verb (13), a simple noun or adjective (14), a noun phrase (15), an infinitival phrase (16), a conjoined phrase (17), and almost any other word class except the auxiliary, which does not host adverbial enclitics.

(11) Wuruly(pa)–ya–ni–*rli*
seclusion–go–NPAST–*12*
'Let's go and hide' (Nash p. 51)

(12) Wurulypa–*rli* ya–ni
seclusion–*12* go–NPAST
ibid.

(13) Ya–ni–*rli* wurulypa
go–NPAST–*12* seclusion
ibid.

(14) a. jarntu–ngku *ji* yarlku–rnu wiri–ngki
dog–ERG *1SG* bite–PAST big–ERG
'The big dog bit me' (adapted from Hale, p. 314)

b. wiri–ngki *ji* yarlku–rnu jarntu–ngku
big–ERG *1SG* bite–PAST dog–ERG
ibid.

(15) jarntu wiri–ngki *ji* yarlku–rnu
dog big–ERG *1SG* bite–PAST
ibid.

(16) Karli jarnti–rni–nja–rla–jinta–*rna–ju* pantu–rnu
boomerang trim–INF–REFL–PROX–COMP–*1SG–1SG* pierce–PAST
'I cut myself (accidentally) while trimming the boomerang'
(Nash, p. 178)

(17) a. karnta–ngku manu ngarrka–ngku–*pala* kurdu nya–ngu
woman–ERG and man–ERG–*33* child see–PAST
'The woman and the man saw the child' (Nash, p. 176)

b. karnta–ngku ngarrka–ngku–*pala* kurdu nya–ngu
woman–ERG man–ERG–*33* child see–PAST
ibid.

The difference between (17a) and (17b) is the presence or absence, respectively, of a lexical conjoiner *manu* and the special nominal intonation pattern characteristic of non-lexical conjunction (Nash, p. 178).

What is not treated as filling the initial slot is the conjunction *kala* 'but' or *manu* ~ *kapi* 'and', or a preposed topic. The two conjunctions are usually initial, but may be in second position; if initial, they seem not to count for the purpose of determining second position in the clause (18). A topicalized element also fails to count as initial in clause (19). Sentence (20) probably shows another topicalized element; otherwise it is anomalous.

(18)	...kala	yirdi–ki–*lki*	*kula–rna*	pina	ngajulu–ju
	but	name–DAT–*then*	*NEG–1SG*	knowledgeable	I–TOP

'...but right now I don't know the name' (Nash p. 207)

(19)	Wawiri	nyampu,	ngajulu–rlu–*rna*	parntu–rnu
	kangaroo	this	I–ERG–*1SG*	spear–PAST

'This kangaroo, I speared' (adapted from Hale, p. 313)

(20)	Japiya	muku	*ka–lu*	panu–ngku	nga–rni
	big	all	*PRES–333*	many–ERG	eat–NPAST

'Many of them are eating a whole lot' (Nash, p. 54)

As for the internal syntax of the auxiliary, Nash proposes the clitic template in (21). The auxiliary is composed of a tense, optionally preceded by a complementizer, but obligatorily followed by pronominal markers for subject, object, and/or indirect object:

(21) Nash's Clitic Template:[5]

TENSE		SUBJECT	OBJECT	DATIVE
kapu, kapi, ngarra		rna	ju	rla
kalaka		n(pa)	ngku	
COMPLEMENTIZER	TENSE	rli	ngali(ngki)	
kula	ka	rlijarra	jarrangku	
kaji	lpa	n(pa)–pala	ngku–pala	
kuja~ngula	kala	pala	palangu	
jungu~yinga		rlipa	ngalpa	
		rna–lu	nganpa	
		nku–lu	nyarra	
		lu	jana	

The object slot includes reflexive *nyanu*. After the dative *rla* may be an additional dative "extender" *jinta* which requires the precedence of dative *rla*. This can be handled by adding another slot after the dative for *jinta* (with some sort of lexical implicature statement: *jinta* → *rla*), or else by including a complex dative *rla–jinta* alongside simplex *–rla* in the dative slot. I adopt this latter stance.

Nash tells us that the expected order 'subject pronominal clitic before object pronominal clitic' is not found for the combination of third person plural subject *lu* or third dual subject *pala* plus first person singular object *ju* or second singular object *ngku*. He proposes the transformation in (22):

(22) *lu* *ju*
pala *ngku*
1 2 —> 2 1, obligatory

A transformation is not in fact needed here if we surrender the generalization that all subject pronominal clitics precede all object pronominal clitics — and this generalization certainly does not hold on the surface for *lu*, *ju*, *pala*, and *ngku*. Incorporating the ordering data from above, Nash's template can be expanded in the following manner (23).

(23) Expanded Template:

TENSE		SUBJECT	OBJ.	SUBJ.	OBJECT	DATIVE
kapu, kapi, ngarra		rna	ju	lu	ju	rla
kalaka		n(pa)	ngku	pala	ngku	rla–jinta
COMPLER	TENSE	rli			ngali(ngki)	
kula	ka	rlijarra			jarrangku	
kaji	lpa	n(pa)–pala			ngku–pala	
kuja~ngula	kala	pala			palangu	
jungu~yinga		rlipa			ngalpa	
		rna–lu			nganpa	
		nku–lu			nyarra	
		lu			jana	
					nyanu	

And if we treat each of the above slots as sets ranging over groups of words (not just sub-word morphemes), then the template can be easily converted to linear precedence (LP) statements:

(24) class 2 = all tenses and all complementizers
subclass 2.1 = all complementizers
subclass 2.2 = certain tenses (*ka, lpa, kala*)
class 3 = subject pronouns (minus *lu* and *pala*)
class 4 = *ju* and *ngku*
class 5 = *lu* and *pala*
class 6 = object pronouns (minus *ju* and *ngku*)
class 7 = datives

(25) a. $2 < 3 < 4 < 5 < 6 < 7$
b. $2.1 < 2.2$

The linear precedence statements in (26) accomplish essentially the same ordering as the elaborated template in (23). Note that the tenses *kapu*, *kapi*, *ngarra*, and *kalaka* are not ordered after the complementizers because the former are not members of class 2.1 and are therefore not subject to the linear precedence statement in (25b).

Since modal particles, conjunctions, and "pure enclitics" may precede the auxiliary (appearing to "bump" the auxiliary to third position), they should be included here as class 1 as in (26), so now the linear precedence is as in (27).

(26) CLASS 1:

kala	'but'
manu ~ kapi	'and'
ja	'assertive'
jala	'after all, obviously, as you know, actually'
ju ~ ji	'topic, definite, the; phonological extender'
juku	'still, yet, now as then'
kirli	'precisely'
kula	'contrastive, concessive, rather'
lku	'now, then, and then'
nya	'emphatic, focus, interrogative'
waja	'I say, obviously'
wiyi	'first, before'
wurru ~ wu	'emphatic'
yijala	'also'
karinganta	'declarative'
pangkala ~ kirli	'permissive'
kulanganta	'present counterfactual'
marda	'perhaps'
kari	'assertive'

(27) a. $1 < 2 < 3 < 4 < 5 < 6 < 7$
b. $2.1 < 2.2$

Two examples of class 1 modal/conjunction "bumping" are (28) and (29):

(28)

Mirnya–jangka	*mayi*	*ka–npa*	kiri–jarri–mi	waninja
flu–RESULT	presumably	PRES–2SG	striped–INCH–NPAST	throat

'Presumably your throat is sore from 'flu?' (Nash, p. 187)

(29)

Murdukayi–rli	*ka–lu*	parnka–nja–rla	walya	manya–ma–ni,
vehicle–ERG	PRES–3PL	run–INF–SEQ	ground	soft–CAUS–NPAST

puluku–rlu	*manu*	*ka–lu*	walya	manya–ma–ni ...
bullock–ERG	and	PRES–3PL	ground	soft–CAUS–NPAST

'Vehicles passing are softening the ground, and cattle are softening the ground' (Nash, p. 187)

Nash's work sets the stage for the lumping together of modal particles, conjunctions, auxiliaries, complementizers, and "pure enclitics" by using the negative features [N:–, V:–, C:–], where the feature [C] is case (p. 14). Adding [ARG:–] (for argument), we can now isolate those items in Warlpiri grammar that may be restricted to Wackernagel position or initial position. Words that are [N:–, V:–, C:–, ARG:–] may be marked with the margin feature [FIRST:+] or the Wackernagel feature [WL:+]. (30) does not utilize a regular linear precedence mechanism, but the immediate precedence of Zwicky and Nevis (1986) and Nevis (1986, 1988); it calls for anything that is marked [WL:+] to follow immediately anything marked [FIRST:+].[6]

(30) [+FIRST] << [WL:+]

It is crucial that the [N:–, V:–, C:–, ARG:–] words be marked with either [FIRST:+] or [WL:+]. For ease of reference I label such words with a feature [CLASS 10], as in (31). In some instances only one mark will suffice, in others the choice is optional. The modals *japa*, *nganta*, *mayi*, and *waja*, for example, cannot be clause-initial, so they form a subset of class 10.

(31) a. [CLASS 10] = [N:–, V:–, C:–, ARG:–]
b. [CLASS 10] → [FIRST:–] or [WL:–]

(32) *japa, nganta, mayi,* and *waja* are [FIRST:–]

Recall Nash's (p. 61) and Hale's (1973:312–313) observation that auxiliaries beginning with a disyllabic or longer "base" (that is, complementizer or tense) may be either initial or second, but if there is no overt tense or complementizer, then a purely pronominal auxiliary may not begin a clause and must therefore appear in second position. Classes 3–7 are pronominal and must have a preceding host to attach to. This is not because of a "zero" complementizer, but because a clause-initial pronominal auxiliary string would lack the host required by [LIAISON:+] and would therefore result in ungrammaticality. Classes 1 and 2 are only optionally clitic and thus are compatible with both initial and second position. For phonological reasons then only an auxiliary beginning with members of class 1 or 2 may occur sentence-initially. Without a class 1 or class 2 member, the auxiliary has the semblance of having a phonologically zero base.

(33)	class 1:	liaison:left:optional
	class 2:	liaison:left:optional
	class 3:	liaison:left:obligatory
	class 4:	liaison:left:obligatory
	class 5:	liaison:left:obligatory
	class 6:	liaison:left:obligatory
	class 7:	liaison:left:obligatory

We must state somewhere in the grammar that an initial constituent has to be [LIAISON:–] and that in Warlpiri any class 3–7 second position constituent must have obligatory leftward leaning. For other second position elements [WL:+] may imply [STRESS:–], but the prosodic facts are not entirely clear and call for further investigation.

(35) [FIRST:+] $\neg$ [LIAISON:–]

(36) [WL:+] & [CLASSES 3–7] $\neg$ [LIAISON:LEFT]

Although Hale and Nash agree on the status of disyllabic or longer auxiliary bases and zero auxiliary bases, they disagree over the status of monosyllabic bases. Hale (1973:313) states that second position is needed if "that portion of the auxiliary preceding the person markers is less than disyllabic (that is, monosyllabic or phonologically null)", and

Nash (p. 61) tells us that the monosyllabic bases "may occur clause initially, or after a hesitation, but not at the beginning of an utterance and are more commonly cliticised to a preceding word." I have followed Nash in the above discussion, because the disyllabic complementizer *yungu* ~ *yinga* has the optional reduced form *yi* (so long as it is not the only element in the auxiliary). Nash says that *yi* may also be utterance-initial, though he does not provide an example of this (p. 61). If *yi* can be initial, then Hale's generalization "less than disyllabic" is not without exceptions. In fact, the premise that "bases" shorter than disyllabic occur obligatorily in second position is somewhat suspicious since, under Hale's analysis, there are four elements that qualify (out of a total fourteen "bases"): present tense *ka*, imperfect *lpa*, complementizer *yi*, and Ø. I have already shown that *yi* is a counterexample. The phonologically null auxiliary "base" is offered by Hale, but is not really needed, as I have shown here. This leaves us with *ka* and *lpa*, which I suggest be treated as the modals in (32) — they are simply [FIRST:–], though clearly imperfect *–lpa* requires a host for liaison.

I have argued that the apparent syntax-phonology interaction suggested by Hale and Nash does not hold up under careful scrutiny. Auxiliary bases (that is, tenses and complementizers in the auxiliary) may be either initial or second in the clause, but this fact is not dependent on the syllabic length of the base. A "zero base" à la Hale (1973) leaves the auxiliary with obligatorily clitic pronouns, and in the analysis proposed here, pronominal enclitics require a host, thus explaining in a non-syntactic fashion why "phonologically null auxiliary bases" do not occur clause-initially. Hale's claim that monosyllabic "bases" are also restricted to second position, not first position, is controversial. If it turns out that he is correct, then this statement is faulty when *yi* is taken into account. And ignoring even this counterevidence, it is possible to handle Hale's generalization without mixing syntax and phonology by grouping the two monosyllabic bases under discussion with the disyllabic modals that are restricted to second position for independent reasons.

One side effect of this approach is that it avoids the use of zero morphemes; on this see Janda and Manandise (1985) who argue that there is no need for zeroes in morphological description.

In addition, I have attempted to capture the ordering requirements of Warlpiri modal particles, conjunctions, complementizers, auxiliaries, and what Nash terms "pure enclitics" by means of the margin feature [FIRST] and numerous linear precedence statements. I have avoided the snarings of a transformational account, as well as reference to phonological shape; I have been able to have a syntactic property predict a phonological one, but not vice versa; and I now conclude that the facts of the Warlpiri auxiliary do not run afoul of the Principle of Phonology-Free Syntax.

Endnotes

1 Hale (1973:313) claims that "Aux-Insertion is ... blocked if the auxiliary is the negative and is immediately followed by the verb", but the data in (1) from Nash (1986) suggest otherwise.

2 Note here that both free and bound words are to be found in second position in Warlpiri. The "modal particles" below are not phonologically bound, and therefore act as independent syntactic units subject to the ordering constraint known as Wackernagel's Law. I interpret this to mean that Wackernagel's Law is a matter for syntax to handle and cannot itself be reduced to phonological wrapping, as was suggested in the questioning period.

3 There is however a process of cluster simplification in fast speech of some speakers that reduce *lku* and *lpa* to *ku* and *pa* respectively (Nash, p. 79).

4 The particles *kulanganta* and *marda* do sometimes occur elsewhere, having scope over an immediately following or preceding expression (respectively) in lieu of sentential scope.

5 Glosses for these morphemes are in (8–10) above.

6 Moreover, anything marked [WL:+] must subcategorize for the feature [FIRST:+]. I thank Chu Ren Huang for bringing this observation to my attention.

References

Hale, Kenneth. 1973. Person Marking in Walbiri. In *A Festschrift for Morris Halle*, ed. by S. Anderson & P. Kiparsky, pp. 308–344. Rinehart & Winston.

Janda, Richard D. & Esméralda Manandise. 1985. Zero Really *Is* Nothing: Basque Evidence Against "Ø-Morphemes" (and Also Against "Morphologically-Conditioned Phonological Rules"). *ESCOL '84*.

Klavans, Judith L. 1982. Some Problems in a Theory of Clitics. Indiana University Linguistics Club. (1980 PhD dissertation, University College London.)

Klavans, Judith L. 1985. The Independence of Phonology and Syntax in Cliticization. *Language* 61.1:95–120.

Nash, David. 1986. *Topics in Warlpiri Grammar.* Garland Outstanding Dissertations in Linguistics. Garland Publishing.

Nevis, Joel Ashmore. 1986. A Syntactic Account of Second Position Clisis. *ESCOL' 85*:186–197.

Nevis, Joel Ashmore. 1987. Clitics and Semi-Clitics. *The Nordic Languages and Modern Linguistics* 6:251–263.

Nevis, Joel Ashmore. 1988. *Finnish Particle Clitics and General Clitic Theory.* Garland Outstanding Dissertations in Linguistics, Garland Publishing, New York.

Pullum, Geoffrey K., & Arnold M. Zwicky. 1984. The Syntax-Phonology Boundary and Current Syntactic Theories. *OSU WPL* 29:105-116.

Pullum, Geoffrey K., & Arnold M. Zwicky. 1986. The Principle of Phonology-Free Syntax: Introductory Remarks. *OSU WPL* 32:63–91.

Pullum, Geoffrey K., & Arnold M. Zwicky. In Press. The Syntax-Phonology Interface. *Linguistics: The Cambridge Survey*. Cambridge University Press Encyclopaedia.

Wackernagel, Jacob. 1892. Über ein Gesetz der indogermanischen Wortstellung. *IF* I:333–436.

Zwicky, Arnold M., & Joel Ashmore Nevis. 1986. Immediate Precedence in GPSG. *OSU WPL* 32:133-138.

The Use of Metaphor in English Noun-Noun Combinations

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The traditional assumption about figurative language held in both rhetoric and philosophy was that it was a special literary or stylistic device (e.g. Locke 1706/1959, Ogden and Richards 1946). In contrast, the majority of researchers in metaphor today believe that its use is central to everyday language and thought (e.g. Boyd 1979, Kuhn 1979, Rumelhart 1979). Despite this conviction, there has been surprisingly little investigation of its occurrence in ordinary, day-to-day speech. Moreover, research has concentrated on clausal metaphors, especially of the equative, A is a B type:

(1) Man is a machine.
Her ex-husband is a worm.

Yet intuition suggests that the majority of metaphors in ordinary speech may belong to other categories; certainly most of the dead metaphors used are phrasal, for example:

(2) kick the bucket, up a creek, the last straw, back to the drawing board

and while proverbs are often clausal, they are hardly ever equative:

(3) You can't tell a book by its cover.
Don't look a gift horse in the mouth.

The purpose of this paper is, first, to discuss some of the characteristics of clausal metaphors generally proposed; second, to describe the use of metaphor in a non-clausal construction commonly found in English, noting its differences from clausal metaphors; and, third, to propose a model to account for the differences between the two types of metaphors.

One of the basic issues in metaphor research is that of identification. How is a metaphor recognized by a listener? The cue to identifying metaphors that has been most commonly suggested is that of semantic anomaly (e.g. Blank 1988, Kintsch 1974, Matthews 1971, Searle 1979). That is, the realization that an expression can not be literally true triggers an attempt to find a metaphorical interpretation for it. For example, consider the expression:

(4) Insurance is an umbrella you buy for a rainy day.

where insurance cannot be a literal umbrella. The semantic incongruity may not be in the expression itself, but in the combination of the expression and its context, either linguistic or extra-linguistic, producing whole-sentence metaphors. For example, while the sentence:

(5) Then came the drought.

could easily be taken literally, if it is uttered in the context of a discussion of the end of an artist's creative activity, its literal meaning will not make sense in that context, and it will be interpreted metaphorically instead. Thus, all clausal metaphors seem to be characterized by a perceived incongruity, either internal to the expression, or between the expression and the context.

A second characteristic of clausal metaphors is that the common feature or features on which the metaphor is based are much less salient to the topic of the metaphor, the thing being commented on, than they are to the vehicle, the thing used to comment on the topic (Ortony 1979). For example, consider the metaphorical statement:

(6) The clouds were an angry mob.
topic **vehicle**

Some highly salient features of an angry mob are entities closely bunched together, rapid movement, and aggressive or destructive intentions. None of these qualities are highly salient to clouds; if a person were asked to give the most common characteristics of clouds, few if any of these would listed.

In summary, clausal metaphors show a semantic incongruity, either within the expression or between the expression and the context. In addition, they exhibit a salience asymmetry in the common features on which the metaphors are based, with the features being of high salience to the vehicle and of low salience to the topic.

I will now turn to the use of metaphor in a non-clausal construction, one that contain two nouns and is itself a noun or noun phrase. These expressions, which I call noun-noun combinations, include established noun-noun compounds, such as:

(7) handsoap, catfish, fire station

and nominal expressions that are not necessarily considered compounds, such as:

(8) clay pigeon, student participation

The creation of noun-noun combinations is one of the most highly productive morphological processes in English. If the use of metaphor is common in the production or interpretation of noun-noun combinations, then we not only have strong evidence for its use in common language, but we also have a wealth of data to examine in order to learn more about at least one context in which it functions.

Noun-noun combinations have aroused great interest in linguists for some time because of their seemingly unpredictable meaning. For example, sunglasses protect wearers from the sun and snowsuits protect them from the snow, but sunsuits, instead of _protecting_ wearers from the sun, _expose_ them to it.

The semantic unpredictability in noun-noun combinations is caused by their elliptical structure. The second noun in these forms, the _head noun_, usually identifies the referent of the whole expression (e.g. an apron string is a kind of string), and the first noun, the _modifier_, names a referent related to the second in some plausible way (e.g. an apron string is attached to an apron). However, the noun-noun combination gives no overt indication of what that relationship is.

This semantic imprecision raises an interesting question in cases where one of the nouns might be interpreted metaphorically. If overt semantic incongruity is necessary to identify a metaphorical expression, how would it be recognized in noun-noun combinations? Because of the lack of any expressed connection between the nouns, and because of the wide range of semantic relationships possible between most nouns, there can be no positive indication of semantic incongruity (other than that provided by context) that an interpreter could use to identify a metaphorical use of one or both of the nouns. Thus, if we assume metaphors must have overt triggers, we would predict that a noun-noun combination whose meaning does not conflict with its context will never be assigned a metaphorical meaning. If listeners cannot identify a metaphor in a noun-noun combination, speakers presumably will not use one. If these predictions prove false, we will have to modify our conception of what triggers metaphorical interpretation, at least in noun-noun combinations.

A good place to begin looking for evidence on the _production_ of metaphors in noun-noun combinations is in the meanings of forms already in the lexicon. Metaphors appear sporadically but fairly frequently in many types of established noun-noun combinations. In most cases, only one noun is metaphorized and the head noun is more often used metaphorically than the modifier noun (metaphorical elements are underlined):

(9)	arrow*head*	sand *dollar*	car *bra*
	bar *fly*	blood *bath*	hat *tree*
	match*book*	brain*pan*	blood *bank*
	book *jacket*	wind*sock*	battle*wagon*
	clay *pigeon*	information *leak*	

sun *gem* (Brazilian hummingbird)
leaf *miner* (voracious leaf-eating larva)
water *fire* (acrid aquatic weed)

In addition to these random cases, there are certain patterns of noun-noun combinations that have metaphorical head nouns more often than not. For example, established noun-noun combinations beginning with "sea" have metaphorical heads most of the time. Here are a few out of the dozens that exist:

(10)	sea adder	sea arrow	sea girdle
	sea bat	sea bear	sea grape
	sea beef	sea bells	sea hedgehog
	sea blubber	sea bottle	sea hound
	sea bun	sea bush	sea lemon
	sea cabbage	sea cauliflower	sea lungs
	sea cradle	sea cucumber	sea moth
	sea devil	sea dog	sea necklace
	sea egg	sea elephant	sea pumpkin
	sea fern	sea fire	sea ruffle
	sea furbelow	sea-gate	sea lawyer

The lack of an overt trigger clearly does not stop people from producing metaphorical noun-noun combinations.

In addition to lacking an overt trigger, metaphorical noun-noun combinations differ from clausal metaphors in the relative salience of the common features on which they are based. If we examine the examples given in (9) and (10) above, we can see that the similarity on which the metaphor is based is not only a highly salient feature of the head noun, the vehicle of the metaphor, but is also a very noticeable characteristic of the noun-noun combination's referent, the metaphor's topic. For example, the most striking characteristic of a sea horse is the similarity of its head to that of a real horse. The shape of a hat tree, which is the feature it has in common with a real tree, is its most noticeable characteristic. In short, metaphors in noun-noun combinations show a salience *symmetry*--the salience of the feature on which the metaphor is based is equally high for both the vehicle and the topic of the metaphor.

The differences between clausal metaphors and those in noun-noun combinations raise two questions. First, why *are* the features on which the metaphor is based more salient for topics of noun-noun combinations than they are for clausal metaphors? Second, given that noun-noun combination metaphors often lack an overt trigger, how does the listener even recognize that a metaphorical meaning is intended? Both these questions can be answered by looking at the functions of the two constructions.

Metaphors are based on one or more resemblances between the topic and the vehicle. In the kinds of clausal metaphors generally studied, these common characteristics are being asserted of the topic. I call this function of figurative language knowledge-transforming; the speaker is attempting to alter the listener's understanding of the topic by calling attention to characteristics that were previously either not very salient for him or not known at all. In understanding the metaphor, the listener either adds these features to his conception of the topic, or, if they were already present, increases their prominence. Thus, to return to example (6), repeated here:

(11) The clouds were an angry mob.

the speaker, by uttering this sentence, is attempting to change the listener's conception of the clouds referred to in it by altering his prototypical notion of clouds to include or focus on their bunching together, their rapid movement, and their potential for destructive violence. An attempt to make a more lasting change in a listener's knowledge would be:

(12) Industrial waste is giving our river system hardening of the arteries.

where the speaker is trying to add the potential life-threatening aspect of hardening arteries to the listener's permanent conception of the effects of industrial waste.

The salience asymmetry in clausal metaphors is directly due to their knowledge-transforming function. In order for the listener to discover the new knowledge that is being asserted, the common features on which the metaphor is based must be easily recognized characteristics of the vehicle, i.e. highly salient. If the common features are of low salience for the vehicle, the metaphor will be hard to interpret, or will be misinterpreted. Consider the statement:

(13) Boise is the Washington, D.C. of Idaho.

where the speaker is trying to convey the information that, like Washington, D.C., Boise has a river running through it. The fact that Washington has a river is of low salience and so it will not occur to people to choose it as the common characteristic of the two cities. Instead, they will probably take a highly salient characteristic of Washington, and reach the true but in this case incorrect interpretation:

(14) Boise, like Washington, D.C., is the governmental center of its political region.

Thus, the features on which the metaphor is based must have high salience for the vehicle. However, if they also have high salience for the topic, then the asserted resemblance will not be informative, because it will be providing information the listener already has. For example, consider an utterance such as:

(15) Mountains are nature's fortresses.
topic **vehicle**

where features such as size, general shape, and the quality of being an obstacle are already highly salient not only to the vehicle but also to the topic. While this is certainly a readily comprehended metaphor, many listeners will consider it uninformative and trite.

The situation is quite different with noun-noun combinations. These expressions are not intended to be knowledge-transforming; instead, they function as names. The ideal name for a referent has two characteristics. The first, which is obligatory, is that the name will allow the referent to be distinguished from other similar or related objects. Obviously, if you want to discuss a number of different kinds of fish, it will be extremely difficult to do so if they all have the same name, "fish". The second characteristic is optional but highly desirable; the name should have a non-arbitrary connection to the referent so it will be easily learned and remembered.

Noun-noun combinations approach the ideal. In the simplest case, the head noun refers to a known class of objects to which the new referent belongs, e.g. an angelfish is a kind of fish. The modifier is chosen so that its relationship to the head noun helps distinguish the new referent from the rest of the class in a non-arbitrary way. For example, the term "bee cage" not only indicates that the referent is a type of cage different from other cages (by virtue of having a different name, "bee cage"), but it also gives some clue to how it is different; it is intended to confine bees rather than some other creature.

Of course, the relationship between the nouns in a noun-noun combination cannot give complete information on the meaning of the whole expression, so what aspect will the expression's creator choose to represent? Since the inter-noun relationship is covert, only cued by the presence of the two nouns, it must be a very obvious, familiar one, such as habitat, composition, or similarity, for example:

(16) field mouse (habitat)
brick wall (composition)
zebra fish (similarity)

If there is no noun whose literal meaning refers to the object being named by the noun-noun combination, the speaker will choose a metaphorical head noun to refer to the object and will select a modifier related to the named object rather than to the literal referent of the head noun. Marine life forms provide good instances of this. English has few nouns whose literal meanings refer to aquatic plants or animals. However, many of these life forms have one or more highly salient characteristics, most often color or shape, shared by a terrestrial form. As a result, they have often been given metaphorical noun-noun combinations as names, where the modifying noun, "sea" or "water", refers to the habitat of the referent and the head noun is the vehicle of the metaphor. For example, a sea cucumber is a creature that has the shape and color of a cucumber and lives in the sea:

(17) sea cucumber (particular marine animal)
habitat / vehicle / metaphor topic (covert)

Note that when the head noun is intended metaphorically, while there is an obvious relationship between the expression's referent (the head noun's metaphorical meaning) and the modifying noun, there will be no obvious relationship between the literal meaning of the head noun and its modifier. Thus, while the connection between the creature referred to as a sea cucumber and the sea is the obvious one of habitat, there is no obvious relationship between real cucumbers and the sea, although some relationship could be found if the listener were sufficiently ingenious.

The fact that metaphorical nouns are used to name referents which do not conform to any established noun's meaning explains the bias toward head nouns rather than modifying nouns being metaphorical in noun-noun combinations, since it is the head noun that names the set of things to which the expression's referent belongs.

Creators of noun-noun combinations involving metaphor can increase the chances of successful interpretation by basing their new combinations on one of the patterns using metaphor that is already established in the lexicon, since people are known to base new creations on familiar instances (Bauer 1983). So, for example, the namer of a new marine plant or animal can take advantage of the number of "sea" noun-noun combinations with a metaphorical head noun by creating one of the same type, "sea + X".

(18) sea + X -> sea giraffe

The fact that metaphorical noun-noun combinations are names rather than knowledge-transforming assertions also explains the salience asymmetry of the common feature. As in clausal metaphors, the feature must be highly salient to the vehicle if the metaphor is to be comprehended. However, it must also be highly salient to the topic, the referent of the noun-noun combination, because the similarity must express some obvious characteristic of the referent in order to make the noun-noun combination effective and easily remembered as a name. This is especially true since the topic of the metaphor is not even mentioned in the noun-noun combination, but must be inferred. If the common characteristic is not a very obvious characteristic of both the vehicle and the covert topic, the listener will not be able to identify the referent of the noun-noun combination correctly. To see the difference between the use of a metaphor in asserting versus naming, consider the following two utterances, made while pointing at a sea cucumber:

(19) That creature is (like) a cucumber.
That is a sea cucumber.

The first, which is <u>asserting</u> the similarity would be considered trite by most listeners, since it states an obvious resemblance and is thus uninformative. The second is a completely acceptable statement; it gives a name to the item that, taking advantage of obvious characteristics, will be easy for the listener to remember.

I have shown that the relationship between the vehicle and the covert topic in a noun-noun combination must be an obvious one for the metaphor to be understood, but the question still remains of how the metaphorical use will be recognized at all, if the context does not provide a clue to the semantic incongruity. I propose that, since listeners are also speakers, they recognize the use of metaphor in noun-noun combinations because of their understanding of the process used by speakers in creating them. Based on their knowledge of how noun-noun combinations are created, interpreters of unfamiliar combinations should act on the following assumptions:

(20) 1) the second noun will almost always describe the class of objects to which the referent belongs
2) the relationship between the two nouns will be an obvious one
3) if there is no obvious relationship between the nouns, it is probable that one of the nouns is to be interpreted metaphorically
4) if there is a metaphorical noun, it will be the head noun, because the speaker would choose a metaphorical noun only if there were no nouns that described the class of objects to which the noun-noun combination's referent belongs
5) the creator will take advantage of noun-noun combination patterns already established, some of which have metaphors in them

To test these assumptions, I created a set of 100 novel noun-noun combinations and presented each of them to 40 native English speakers to be interpreted (Ryder 1989). The forms were presented in isolation, so that the only clue to the meaning lay in the juxtaposition of the nouns. Some of the novel noun-noun combinations had very plausible meanings based on familiar inter-noun connections, while others did not. Following are some examples of both types used in the experiment:

(21)	Plausible	Implausible
Location + Noun	mountain-rose	school-shark
Noun + Location	goat-barn	book-river
Container + Noun	box-chair	drawer-pillow
Noun + Container	bean-barrel	elephant-jar
Noun + Human	tractor-man	moose-man
Animal + Carnivore	squirrel-hound	cow-wolf
Animal + Animal	elephant-fish	trout-deer

Of the 100 combinations, a little under half (44) were judged independently to have obvious inter-noun relations. I will refer to these as **reasonable** noun-noun combinations and to the others as **odd**.

The results clearly refute the prediction that people require an overt indication of anomaly to produce a figurative reading. Subjects used metaphors in about 20% of the responses. Even when there was a familiar connection of some other kind between the nouns, some of the responses were still metaphorical. Clearly, the interpreters expected creators of noun-noun combinations to have employed metaphors on occasion, and they themselves had no trouble using them to create corresponding interpretations.

In addition, the results strongly support an interpretation model based on knowledge about the functions of noun-noun combinations and the speaker's strategies in creating them. The responses with metaphors appeared six times as often in **odd** noun-noun combinations as in **reasonable** ones, reflecting the fact that the subjects knew that a lack of any obvious connection between the two nouns generally meant the creator of the noun-noun combination could not find a noun whose literal meaning matched the combination's referent. This assumption is further supported by the fact that when subjects did metaphorize the meaning of one of the element nouns, they changed the head noun about six times as often as the modifier noun; out of all the responses using non-prototypical meanings for the nouns, 16% altered the meanings of both nouns, 16% altered the meaning of the modifier noun, and the remaining 68% altered only the meaning of the head noun.

There was also evidence for the use of linguistic patterns to predict when a metaphor might be involved. For instance, even when there was a plausible relation possible between the word "sea" and the head noun in some of the new noun-noun combinations, some subjects chose to metaphorize the head noun anyway. In each of the following examples there are interpretations that involve at most only moderate changes in meaning of the head noun, but there are at least a few responses for these expressions that employ a metaphorical meaning for the head noun, as in most established "sea" compounds (possible literal interpretation given first, in parentheses):

(22) **sea-lamp:** (a special type of lamp used at sea)
a sea weed that looks like a lamp
a sea creature that looks like a lamp
fluorescent sea animal that lives in the ocean
a species of phosphorescent spineless sea creature
sea-spider: (type of spider found at sea or on the beach)
another name for octopus (3 responses)
a type of sea creature that looks like a spider
a star fish that moves differently
a type of starfish (2 responses)
a marine (underwater) creature resembling a spider
a species of spider-like crustacean dwelling in the sea
a pirate

(examples continued on next page)

sea-cat: (a cat on a sea-going vessel)
kind of fish (in the sea)
a fish which resembles a cat and lives in the sea
aquatic denizen
a sea-horse creature resembling a cat
name of marine animal or maybe vehicle of aquatic recreation
someone who likes the sea
a swimmer/diver
a type of submarine
an animal that lives in the sea
sea-trunk: (a trunk used by sailors and travelers at sea)
a trunk-like animal that lives in the sea
a trunk that a plant in the sea has
a trunk-shaped, animate object that lives in the sea
a trunk that is similar to a tree trunk that is growing on the ocean floor [made of dirt and debris]
trunk found in the sea that is organic but looks similar to a trunk

In summary, a comparison of clausal metaphors and metaphorical noun-noun combinations shows they differ in 1) the likelihood of having overt semantic incongruity as a trigger, and 2) the symmetry or lack of it in the salience of the common feature for the vehicle and the topic. These differences can be accounted for by examining the different discourse functions served by the two kinds of metaphors. Finally, the data from metaphorical noun-noun combinations support the claim that use of metaphor is a natural part of every-day speech, and can be easily identified and interpreted by the average listener.

References

Blank, G. D. 1988. "Metaphors in the Lexicon." Metaphor and Symbolic Activity, 3:21-36.

Boyd, R. 1979. "Metaphor and Theory Change: What is 'Metaphor' a Metaphor For?" In Metaphor and Thought, ed. by Andrew Ortony. Cambridge: Cambridge University Press.

Kintsch, W. 1974. The representation of meaning in memory. Hillsdale, New Jersey: Lawrence Erlbaum Associates, Inc.

Kuhn, T. S. 1979. "Metaphor in Science." In Metaphor and Thought, ed. by Andrew Ortony. Cambridge: Cambridge University Press.

Locke, J. 1702/1959. An Essay Concerning Human Understanding. Ed. by A. C. Fraser. New York: Dover.

Matthews, R. 1971. "Concerning a 'linguistic theory of metaphor.'" Foundations of Language, 7:413-425.

Ogden, C. K. and Richards, I. A. 1946. The Meaning of Meaning, 8th edition. New York: Harcourt, Brace.

Ortony, Andrew. 1979. "The Role of Similarity in Similes and Metaphors." In Metaphor and Thought, ed. by Andrew Ortony. Cambridge: Cambridge University Press.

Rumelhart, D. E. 1979. "Some Problems with the Notion of Literal Meanings." In Metaphor and Thought, ed. by Andrew Ortony. Cambridge: Cambridge University Press.

Ryder, M. E. 1989. Ordered Chaos: A Cognitive Model of the Interpretation of English Noun-Noun Compounds. Unpublished dissertation, Department of Linguistics, University of California, San Diego.

Searle, J. 1979. "Metaphor." In Metaphor and Thought, ed. by Andrew Ortony. Cambridge: Cambridge University Press.

ABSOLUTE NEUTRALIZATION IN A FEATURE-BASED THEORY OF UNDERSPECIFICATION

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I Introduction

In her survey of current approaches to underspecification, Archangeli (1988) argues that a major conceptual difference between Radical Underspecification and a theory of Contrastive Specification involves the sort of phonological primitives available for the construction of underlying representations. She argues that the feature can be considered the most basic unit within the model of underspecification inherent in Radical Underspecification, while the segment must be the most basic unit in Contrastive Specification.

With regard to Contrastive Specification, Archangeli (1988:191-192) notes:

> The five-vowel inventory of a language like Spanish or Japanese ... has the following representation given Contrastive Specification:

(1) Contrastive Specification

	full specification					contrasts	contrastive specification				
	i	e	a	o	u		i	e	a	o	u
high	+	-	-	-	+	{i,e};{o,u}	+	-		-	+
low	-	-	+	-	-	{a,o}			+	-	
back	-	-	+	+	+	{i,u};{e,o}	-	-		+	+
voice	+	+	+	+	+	---					

> The learnability of such a system depends on discovering the feature contrasts explcited in the language and using those contrasts to determine the appropriate representations. In some way, this model requires knowledge of the full specification of each segment: as D. Schlindwein has pointed out to me, such knowledge is required in order to determine the appropriate representation of /a/ and of /o/: [low] distinguishes these two segments only if we know that /a/ and /o/ are both [-high, +back] even though these features are not contrastive for /a/ ...

With regard to Radical Underspecification, where only unpredictable feature values are included in underlying representation, Archangeli (1988:192-194) notes:

> ... This model allows a variety of representations for the vowel inventory considered above; three options follow ...:
>
> (2) Some Radical Underspecification options

	a. i	e	a	o	u	b. i	e	a	o	u
high		-		-			-		-	
low			+					+		
back				+	+	-	-			
voice										

a.	b.
[+low] -> [-high]	[+low] -> [-high]
[+low] -> [+back]	[ ] -> [+high]
[ ] -> [-low]	[ ] -> [-low]
[ ] -> [+high]	[ ] -> [+back]
[ ] -> [-back]	
[ ] -> [+voice]	[ ] -> [+voice]

> ... If we were to simply take the <u>feature specifications</u> [-high], [+low] and [+back] from (2a) and combine them in all logically possible ways, the inventory in (3) is created. (The vertical lines in this and subsequent figures divide feature combinations that represent different segments. Thus, here /a/ is represented by four different combinations and each of /i e o u/ by a single combination.)
>
> (3)

	a				o	e	u	i
high	-	-			-	-		
low	+	+	+	+				
back	+		+		+		+	

> The rules in (2a) derive the same configuration of features from all four representations for /a/. Thus, no information is lost, and a simpler representation is gained, by reducing the four to simply [+low], a move forced by the evaluation metric. As a result, the segmental configuration of (2a) is derived from the free combination of elements in a <u>feature inventory</u>. Thus, the inventory of phonological primitives in such a language is the set of <u>feature specifications</u> that

> the language requires. The set of 'possible segments' is nowhere listed: such feature combinations are derived from the feature inventory.

Indeed, the radically underspecified vowel matrices presented in (2a) can be described quite succinctly in terms of the phonologically primitive feature specifications [-high], [+low], and [+back]. One matrix contains none of these primitive feature specifications. This is the matrix that corresponds to *i*. Three other matrices utilize one apiece of each of the specifications. These are the matrices that correspond to *e*, *u*, and *a*. Finally, one matrix combines the primitive feature specification [-high] with the primitive feature specification [+back]. This is the matrix that corresponds to *o*. But Archangeli's contention that matrices which combine the primitive feature specifications [+low] with [+back] or [+low] with [-high] should be excluded from (2a) on the grounds that such combinations correspond to the vowel which is more economically represented with the single primitive feature specification [+low] does not hold up to critical scrutiny in light of her suggestion that *features* not *segments* are the basic units referred to in the construction of radically underspecified underlying matrices. For in order to determine that underlying combinations involving [+low] with [+back] or [+low] with [-high] would ultimately yield the same vowel as that represented with the single primitive feature specification [+low], we require access to the fact that there exists no more than one low vowel among the surface inventory of vowels in the language under consideration, and we need to know that this low vowel's surface matrix contains the features [+back] and [-high].[2] But access to the fact that there exists only one low vowel and the ability to preview its surface specifications are entirely incompatible with the notion that Radical Underspecification is a truly feature-based theory. So Radical Underspecification, like Contrastive Specification, is actually a segment-based theory. It relies upon consultation of a surface segment inventory to factor out feature specifications that are redundant in their particular intrasegmental contexts.

This is not to say that a theory of underpecification *cannot* be feature-based. I offer below a description of what a truly feature-based theory of underspecification might look like. Following that I show how such a theory enables us to account for absolute neutralization phenomena in a principled way.

1.1 A Feature-Based Theory of Underspecification

Feature Based Underspecification shares with Radical Underspecification several basic assumptions. In Feature Based Underspecification as in Radical Underspecification, it is assumed that only one value of any feature may be specified in underlying representation. It is also assumed that which value of a feature may be underlyingly specified is a language-particular matter. So while in one language [-high] might be present in underlying representations, in another language [+high] might be the feature value that occurs underlyingly.

Thus underlying underspecified matrices in Feature Based Underspecification look very much like underlying underspecified matrices in Radical Underspecification. Because of this, we may repeat the example underspecified underlying vowel matrix inventory presented in (2a) as (4), and use it to illustrate the principles of underlying matrix composition in Feature Based Underspecification:

4)

	i	e	a	o	u
high		-		-	
low			+		
back				+	+

This matrix array, though introduced in (2a) as an example of possible underlying vowel specifications in Radical Underspecification, serves just as appropriately as an example of possible underlying vowel specifications in Feature Based Underspecification.

The underspecified vowel matrix inventory in (4) can be described in terms of the primitive feature specifications [-high], [+low], and [+back] such that one matrix contains none of these features, three matrices contain one apiece of [-high], [+low], and [+back], and one matrix contains the combination of [-high] with [+back]. I pointed out above that the absence from this matrix array of combinations involving the feature [+low] cannot, in a feature-based theory, be attributed to the redundancy of either of the other features in the context of [+low], since such redundancy can only be ascertained via reference to a surface vowel inventory.[5] If the primitive feature specifications [-high], [+low], and [+back] are allowed to combine freely, however, we should get in (4) underlying matrices in which [+low] combines with

[-high] or in which [+low] combines with [+back]. We must therefore assume that in Feature Based Underspecification, primitive feature specifications <u>do not</u> combine freely. Instead, combinations of primitive feature specifications must be explicitly licensed to appear in underlying representation. In the case of the example underlying vowel matrix inventory in (4), [-high], [+low], and [+back] are the primitive feature specifications being used, and only [-high] and [+back] are licensed to combine in underlying representation.[4] The underlying vowel matrix inventory in (4) is truly feature-based in that all that is required to put it together is a collection of primitive feature specifications and a list of underlyingly licensed feature combinations. Nothing need be said about the absence of underlying combinations involving [+low] in (4) when [+low] is not explicitly licensed to combine with other primitive feature specifications in underlying representation.[5]

II Absolute Neutralization

In segment-based theories of underspecification, in which feature specifications that are redundant within their respective intrasegmental contexts are factored out of representations to achieve underspecification of underlying matrices, surface segments and underlying matrices are tied into a one-to-one relationship where there can be no greater number of different underlying matrices than there are distinct surface segments. In such theories of underspecification, a language with a five-vowel surface inventory can have no more than five different underlying vowel matrices.

In contrast, in Feature Based Underspecification, the establishment of underlying representations does not depend upon the removal of surface-true redundant intrasegmental feature combinations. Therefore, in Feature Based Underspecification, a surface five-vowel inventory may be derived from underlying representations in which there are found more than five different underlying vowel matrices, as we shall see immediately below.

Consider an underlying vowel matrix array which uses three primitive feature specifications: [+high], [+back], and [+low]. If the primitive feature specification [+back] is licensed to appear in combination with the primitive feature specification [+high], and if [+back] is also licensed to appear in combination with the primitive feature specification [+low], we get an array of six underlying matrices:

12)

	i	e	æ	a	o	u
high	+					+
back				+	+	+
low			+	+		

I have labeled these six underlying matrices with the vowels which would surface if all blanks were interpreted as [-high], [-back], and [-low]. Assume, however, that the rule in (13) applies during the course of phonological derivation:

13) 0 -> [+back] / [+low]

Application of the rule in (13) would yield from the underlying matrices set up in (12) the surface vowels with which I have labeled the matrices in (14):

14)

	i	e	a	a	o	u	
high	+					+	
back			(+)	+	+	+	0 -> [+back]/[+low]
low			+	+			

A surface inventory of only five distinct vowels is thus derived from six underlyingly underspecified matrices.

What we have just seen is the <u>absolute neutralization</u> of what began as two different underlyingly underspecified [+low] matrices. Prior to their absolute neutralization, one of these matrices could be expected to respond to rules and processes targeting the feature [+back], while the other would remain immune from participation in such rules or processes. That is, despite their eventual convergence, these matrices might exhibit quite different phonological behavior.

Notice that the potential arbitrariness of absolute neutralization is significantly constrained in a theory in which absolute neutralization results from the filling-in of underlyingly absent feature specifications. As Bruce Hayes (p.c.) has pointed out to me, in such a theory, 'abstract' phonemes are not randomly specified for arbitrary neutralizable features. In the scenario described above, the application of a fill-in rule supplying [+back] to matrices containing [+low] ensures that no [+low] matrix may be later interpreted as [-back]. Thus the application of the rule in (13) <u>creates a gap</u>, where a nonback low vowel should be found, in an otherwise symmetrical surface vowel inventory. An 'abstract' phoneme whose absolute neutralization is achieved through the application of a fill-in rule can therefore only be one which corresponds to a definable gap in the surface segment inventory.

2.1 Ainu

The scenario described above is not purely hypothetical. An analysis allowing for the absolute neutralization of two different underlying [+low] vowel matrices to surface a is just what we need to account for the results of melodic dissimilation in the Ainu language.

Itô (1984) presents data from Ainu showing the various realizations of the transitivizing suffix added to monosyllabic verb roots. Following Itô we arrange the data into four groups:

15)

a)	pis-i	'ask'	tus-u	'shake'
	ker-e	'touch'	pop-o	'boil'
	mak-a	'open'	tas-a	'cross'
b)	pir-u	'wipe'	mus-i	'choke'
	rek-u	'ring'	pok-i	'lower'
c)	rap-u	'flutter'	kar-i	'rotate'
	ram-u	'think'	sar-i	'look back'
d)	piw-e	'cause to run'	tuy-e	'cut'
	hew-e	'slant'	moy-e	'move'
	taw-e	'pull with force'	say-e	'wind'

I shall assume along with Itô that the forms in (15a) are derived by the spreading of features from the root vowel to a featureless syllable nucleus comprising the suffix. Thus all five of the surface vowels of Ainu, i, e, a, o, and u, may appear as the realization of the transitivizing suffix here.

Departing from Itô, I assume that the forms in (15b) and (15c) select an allomorphic variant of the transitivizing suffix, namely, a syllable nucleus bearing the primitive feature specifications [+high] and [+back].

I propose that the matrix array in (16), which is a repeat of the feature-based matrix array shown in (12) above, characterizes the underlying vowel system of Ainu:

16)

	i	e	æ	a	o	u
high	+					+
back				+	+	+
low			+	+		

The featureless transitivizing suffix which when added to the verb roots in (15a) triggers spreading is, loosely speaking, the vowel /e/; its allomorphic variant, selected by the verb roots in (15b) and (15c) is, loosely speaking, the vowel /u/.

The dissimilation rule that leads to the surface realization of the transitivizing suffix in the forms in (15b) is a simple one:

17) Back Dissimilation

```
[+back] [+back]
   |       |
   |       ǂ
   X ....  X
```

By this rule, suffixal /u/ loses its [+back] specification in the environment of a root vowel /o/ or /u/, and, because it retains its original [+high] specification, eventually surfaces as i. Suffixal /u/ does not lose its [+back] specification in the environment of a root vowel /e/ or /i/, since the structural description of Back Dissimilation is not met in such cases.

This account can be straightforwardly extended to the forms in (15c) as well. Let us assume that the late application of the rule in (18) supplies [+back] in the intrasegmental context of [+low]:

18) 0 -> [+back] / [+low]

The application of this fill-in rule ensures that the underlying matrix labeled /æ/ actually surfaces as a, generating the five-vowel surface inventory of Ainu from the six different underlying vowel matrices:

19)

	i	e	a	a	o	u
high	+					+
back			(+)	+	+	+
low			+	+		

0 -> [+back]/[+low]

Because surface a may derive, via the late application of a fill-in rule supplying [+back] to [+low] matrices, from underlying /æ/, the transitivizing /u/ can be added to the low-voweled verb roots in the lefthand column of (15c) and remain exempt from the effects of Back Dissimilation. The low-voweled verb roots in the righthand column of (15c), whose surface a presumably derives from an underlying /a/, set the stage for the transitivizing suffix to undergo Back Dissimilation, lose its [+back] specification, and surface as ɪ.

Itô conjectures that a historic æ may once have been part of the Ainu vowel system, and that its effects on the realization of the transitivizing suffix were lexicalized upon the diachronic merger of æ and a. While my account of the forms in (15c) is more abstract than hers, it is synchronically more principled in that no exceptional, suppletive bimorphemic forms need be posited.

The absolute neutralization of underlying /æ/ to a creates a definable gap in the otherwise symmetrical surface vowel inventory of Ainu. Absolute neutralization is accomplished without feature-changing. 'Abstract' /æ/ was at no stage of derivation specified for [-back]; it simply acquired its surface [+back] specification (leading to a) late in the derivation.

Finally, as Itô notes, the glide-final verb roots of (15d), which we have left aside until now, exhibit a morpheme-internal pattern of backness dissimilation between the root vowel and following glide. This shows that the glides are essentially high vowel matrices linked to non-nuclear syllabic positions. If a bare syllable nucleus is added to these roots as a transitivizing suffix, spreading of features from the glides is blocked, due to a general prohibition against wu or yi syllables in the language. Spreading of features from root vowels is also blocked, as the features of the glide are in the way. Thus the suffix remains featureless. As blanks are eventually interpreted as [-high], [-low], and [-back], the suffix surfaces here as e.

2.2 Hungarian

Absolute neutralization via the application of a fill-in rule also neatly accounts for the neutrality of nonlow front vowels in Hungarian Frontness Harmony. I base my discussion of Hungarian on Ringen (1988). My analysis is really quite similar to hers, as I assume with her that it is the left-to-right spreading of [-back] that gives rise to harmony.

The data in (20), taken from Ringen, show Frontness Harmony affecting the dative suffix:

20)	a)	haaz-nɔk	'house'
		vaaros-nɔk	'city'
	b)	üür-nɛk	'gap'
		öröm-nɛk	'joy'
	c)	radiir-nɔk	'eraser'
		kavics-nɔk	'pebble'
		taanyeer-nɔk	'plate'
	d)	viiz-nɛk	'water'
		filleer-nɛk	'penny'
	e)	hiid-nɔk	'bridge'
		ceel-nɔk	'goal'

In (20a) we find back vowel domains, in (20b) we find front vowel domains. In (20c) we witness the harmonic neutrality of i and e, and in (20d) and (20e) we see that these vowels may or may not instigate harmony when alone in a stem.[7]

It is this schizophrenic behavior of the nonlow front vowels i and e with respect to Frontness Harmony that we must account for. Sometimes, as exemplified in (20d), they trigger Frontness Harmony; other times, as exemplified in (20c) and (20e), they do not. In (20c) and (20e) the nonlow front vowels behave as though they are not [-back]. In (20c) and (20e) the nonlow front vowels behave, in essence, as though they were really back vowels.

Conveniently, the nonlow back vowels ɨ and ʌ are conspicuously absent from the inventory of eight Hungarian surface vowels, which can be described as in (21):[8]

21)		i	e	ɛ	ö	ü	a	o	u
	high	+	-	-	-	+	-	-	+
	low	-	-	+	-	-	+	-	-
	round	-	-	-	+	+	-	+	+
	back	-	-	-	-	-	+	+	+

We shall now see how in Feature Based Underspecification we can relate the observed harmonic neutrality of i and e with the conspicuous absence of ɨ and ʌ from the otherwise fairly symmetrical inventory of Hungarian surface vowels.

Let us assume along with Ringen that the harmonizing feature [-back] originates as a floating autosegment, which initially associates to the leftmost vowel of its host morpheme and then spreads rightward to define front harmonic domains.[9] If [-back] originates as a floating autosegment, then the only features that we need in order to describe the vowels of Hungarian are [high], [low], and [round].

A feature-based matrix array of five underlying vowels can be constructed using the primitive feature specifications [-high], [+low], and [-round], where [-high] is licensed to combine with [-round]:

22)

	ɨ	ʌ	ɔ	o	u
high		-		-	
low			+		
round	-	-			

I have labeled the matrices in (22) with the vowels which would surface should the absence of any specification for [back] be interpreted as implying [+back], and should only a (phonetically well-motivated) fill-in rule supplying [-high] to [+low] matrices appy during the phonology.

The underlying five vowels are doubled to ten once the floating [-back] autosegment is introduced:

23)

	ɨ	ʌ	ɔ	o	u	¦	i	e	ɔ	ö	ü	
high		-	(-)	-		¦		-	(-)			0 -> [-high]
low			+			¦			+			/[+low]
round	-	-				¦	-	-				
harmonic back						¦	-	-	-	-	-	

Again I have labeled these matrices with the vowels which would surface should only a (phonetically well-motivated) fill-in rule supplying [-high] to [+low] matrices apply during the phonology, and have this time explicitly indicated the application of such a rule.

The rightmost five matrices in (23) thus represent the different matrices we could expect to find once a floating [-back] autosegment associates and spreads (and thereby defines a front harmonic domain), and the leftmost five matrices in (23) represent the different matrices we could expect to find where no floating [-back] autosegment is available to associate and spread.

Assume now that a fill-in rule supplying the feature [-back] to matrices containing [-round] applies:

24)	i	e	ɔ	o	u	i	e	ɔ	ö	ü	
high		-	(-)	-		-	(-)	-			
low			+					+			
round	-	-				-	-				
back	(-)	(-)				-	-	-	-	-	0 -> [-back] /[-rnd]

This fill-in rule is the rule that accomplishes absolute neutralization of /ɨ/ and /Λ/. Application of this rule turns intermediate /ɨ/ and /Λ/ into *i* and *e*. Because application of this rule has been delayed until *after* the association and spreading of [-back], *i* and *e* are created from intermediate /ɨ/ and /Λ/ in domains not touched by Frontness Harmony.

Just one more rule need be posited to derive from (24) the vowels that we actually find in Hungarian. This last rule, which furnishes [-round] to matrices containing [+low], derives the matrices in (25) from those in (24):

25)	i	e	a	o	u	i	e	ɛ	ö	ü	
high		-	(-)	-			-	(-)	-		
low			+					+			
round	-	-	(-)			-	-	(-)			0 -> [-round] /[+low]
back	(-)	(-)				-	-	-	-	-	

Interpreting blanks in these matrices to imply [+high], [-low], [+round], and [+back], we find that the five vowels with which I have labeled the rightmost five matrices in (25) are exactly the five vowels which surface in front harmonic domains. And the five vowels with which I have labeled the leftmost five matrices in (25) are exactly the vowels that surface in domains untouched by Frontness Harmony.

The neutrality of *i* and *e* in back vowel domains is thus accounted for in Feature Based Underspecification. Neutral *i* and *e* can be found in back vowel domains not because they are ever specified for the feature [+back] but because they acquire their eventual [-back] specification only *after* Frontness Harmony has applied. Furthermore, the absence of nonlow nonround back vowels in the surface inventory of Hungarian has been shown to be not accidental; the application of the fill-in rule supplying [-back] to [-round] matrices actually creates the gaps where such vowels should otherwise be found.

NOTES

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1. I have renumbered the figures in quoted text. That which appears here as (1) corresponds to Archangeli's figure (13), and those which appear below as (2) and (3) correspond to Archangeli's figures (15) and (16).

2. It might be suggested that we can ascertain the predictability of [+back] and [-high] in the context of [+low] by inspecting the redundancy rules listed under the matrix array in (2a), which yield full surface specifications from the underlying matrices. But the positing of the redundancy rules [+low] -> [+back] and [+low] -> [-high], which are the relevant redundancy rules to which we would have to refer, depends upon recognition of the <u>surface-true</u> redundancy of [+back] and [-high] in the context of [+low].

3. Be aware that the phoneme labels appearing above the matrices in (4) are included for convenience only. In Feature Based Underspecification, by definition, no reference can be made to this eventual surface inventory in determining the composition of underlying matrices.

4. I assume that the licensing of combinations is less costly than the proliferation of primitive feature specifications. Thus, an underlying array of five matrices which utilizes three primitive feature specifications and licenses one combination is to be preferred over an array of five matrices which utilizes four primitive feature specifications and licenses no combinations. Radical Underspecification assumes a similar feature-minimization principle (Archangeli (1984)).

5. To ensure that the [+low] matrix in (4) eventually surfaces as a nonhigh back vowel, we can assume that rules like those in (i) apply during the course of phonological derivation:

i) 0 -> [+back] / [+low]
   0 -> [-high] / [+low]

6. Itô suggests that the verb roots in (15b) and in the second column of (15c) all carry a floating [+high] autosegment which links to the featureless V slot of the transitivizing suffix and triggers a rule of backness dissimilation:
[+high] -> [-α back] / [α back] ___. In the absence of the transitivizing suffix, the floating autosegment would be deleted, since it apparently serves no other purpose than to determine the surface realization of this suffix. See Itô (1984) for details.

7. Sequences of heterosyllabic nonlow front vowels appear <u>not</u> to be harmonically neutral. See Ringen (1988) for a plausible explanation of their behavior. Hungarian also exhibits a roundness harmony which shall be ignored here.

8. Though the rest of the vowels can be realized as short or long, /e/ underlies only long <u>ee</u>, and short <u>ɛ</u> has no long counterpart.
I shall assume along with Ringen that short <u>ɔ</u> is basically the nonround low vowel /a/.

9. In disharmonic stems such as <u>büroo</u> (<u>büroo-nak</u>) 'bureau' and <u>soföör</u> (<u>soföör-nek</u>) 'chauffeur', [-back] is exceptionally prelinked. As Ringen demonstrates, the Strict Cycle Condition can be invoked to account for the disharmonic behavior of stems like these.

REFERENCES

Archangeli, D. (1984) <u>Underspecification in Yawelmani Phonology and Morphology</u>, PhD dissertation, MIT.

Archangeli, D. (1988) "Aspects of Underspecification Theory," <u>Phonology</u> 5, 183-207.

Itô, J. (1984) "Melodic Dissimilation in Ainu." <u>Linguistic Inquiry</u> 15, 505-513.

Ringen, C. (1988) "Transparency in Hungarian Vowel Harmony," <u>Phonology</u> 5, 327-342.

Vago, R. (1976) "Theoretical Implications of Hungarian Vowel Harmony," <u>Linguistic Inquiry</u> 7, 243-263.

THETA-GRID, CASE-ASSIGNMENT AND THE PHRASE STRUCTURE CONDITION OF CHINESE

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0. Introduction

It has long been noticed that a Chinese transitive verb can subcategorize for more than one NP with the theta-role of patient, and there are certain restrictions on where these NPs can appear. When the verb takes one patient NP, the NP can occur either in the postverbal position or, if the NP is definite, in a preverbal position marked by the morpheme *ba*. The two sentences (1a)[1] and (1b) are therefore both acceptable and have similar interpretation.

(1) a. *Wo maile wode jiuche.*
I sell Asp. my old car
'I sold my old car.'
b. *Wo ba wode jiuche maile.*
I BA my old car sell Asp.
'I sold my old car.'

When the verb subcategorizes for two patient NPs, only one of them can occur in the postverbal position. The other has to function as a passive subject or, even it is indefinite, to stay in the preverbal *ba* phrase. The verb *zhuangduan* 'break' in (2), for example, takes two patient NPs, but only one of them, i.e., the NP *tui* 'leg', can appear after the verb. The other NP *Lisi* has to become part of the *ba* phrase, as in (2a), or occur in the subject position of a passive sentence, as in (2b). If the two patient NPs are both in the postverbal position, the sentence will be ungrammatical regardless the order of the two NPs. Either (2c) or (2d) is thus not acceptable.

(2) a. *Wode chezi ba Lisi zhuangduanle tui.*
my car BA Lisi break Asp. leg
'My car broke Lisi's leg. (literally 'My car broke-leg Lisi.')
b. *Lisi bei wode chezi zhuangduanle tui.*
Lisi BEI my car break Asp. leg
'Lisi's leg was broken by my car.'
(literally 'Lisi was broken-leg by my car.')
c. **Wode chezi zhuangduanle Lisi tui.*
my car break Asp. Lisi leg
d. **Wode chezi zhuangduanle tui Lisi.*
my car break Asp. leg Lisi

In order to subcategorize for three NPs with the theta-role of patient, a verb has to be passivized, because one of the NPs must occur in the passive subject position. Of the remaining two NPs, only one can stay in the postverbal position and the other has to occur in the *ba* phrase, as shown in the sentence of (3).

(3) *Xiaotou bei jingcha ba shuangshou*
thief BEI police BA both-hand
daishangle shoukao.
put-on Asp. handcuff
'The thief was hand-cuffed by the policeman.'
(literally 'The thief was put-on-handcuff-to-both-hand by the policeman.')

1. The Phrase Structure Condition of Chinese

The distribution of patient NPs can be described as a constraint that only one of them can occur in the postverbal position. This constraint has been generalized to cover the distribution of other arguments and non-arguments within the VP. A well-known example is the phrase structure condition (PSC) of Huang (1982:41). He suggests that the Chinese phrase structure is head-initial at the lowest level, but is head-final at all the higher levels. Given the binary branching structure adopted in Huang (1982) (cf. Chomsky 1981), the PSC allows only one postverbal position in the structure of a Chinese VP. This amounts to say that only one maximal projection, no matter argument or adjunct, can occur after the verb and all the other elements have to occur in preverbal positions.

An immediate consequence of the PSC is that no PP or adverbial can co-occur after the verb with a patient NP. The sentence in (4a) (from Huang 1982:48), for example, is said to be unacceptable because the verb is followed by two constituents. the direct object and the adverbial of frequency. In order to avoid the violation of PSC, the direct object has to appear in a preverbal *ba* phrase, as in (4b), or in a reduplicated VP, as in (4c).

(4) a. **Ta kai che le liangci.*
he drive car Asp. two time
'He drove twice.'
b. *Ta ba che kaile liangci.*
he BA car drive Asp. two time
'He drove twice.'
c. *Ta kai che kaile liangci.*
he drive car drive Asp. two time
'He drove twice by driving the car.'

Yoon (1989) pushes the account one step further and attempts to provide an explanation for why it is always the patient NP, but never the adverbial, that has to move out of the postverbal position in sentences like (4a). He claims that the effect is brought about by the interaction between a universal thematical hierarchy and a mapping principle. The mapping principle requires that the constituent bearing the lowest theta-role in the hierarchy maps onto the position closest to the verb in the structure. The adverbial role is assumed to be part of the hierarchy and the lowest in it. Given the structure of VP assumed in Huang (1982), the position closest to the verb is the lowest one, namely, the postverbal position. When the adverbial of frequency occurs in a VP, it will always occupy the postverbal position. The patient NP will then be forced out to a preverbal position because of the PSC requirement.

2. Some Problems of the PSC

Either version of the phrase structure condition seems to provide a satisfactory account for the contrast between (4a) and (4b), but also makes the same dubious prediction. Under both analyses, only one constituent can occur in the postverbal position. This is not always true. An obvious problem is a Chinese sentence with both direct and indirect object. The indirect object always occurs in the postverbal position, either as a bare NP or as part of a PP, as in (5c) and (5a) respectively. The direct object usually has the option of staying in a preverbal *ba* phrase, as in (5b), or appearing in a postverbal position after the bare NP indirect object, as in (5c). The PSC does not permit a verb to be followed by two maximal projections, but sentences with two postverbal objects are actually quite common.

(5) a. *Wo yao song zheben shu gei ta.*
I will send this Cl. book to him
'I will send him this book'
b. *Wo yao ba zheben shu song gei ta.*
I will BA this Cl. book send to him
'I will send him this book'
c. *Wo yao song ta zheben shu.*
I will send him this Cl. book
'I will send him this book'

Another problem for this line of analysis is the co-occurrence of postverbal direct object and PP. Many Chinese transitive verbs allow their PP adverbial to appear either in a preverbal position or in a postverbal position after the direct object. The sentence in (6b), for example, is as acceptable and interpretable as its counterpart in (6a), in spite of the different position for the PP of location. Nevertheless, the former will be ruled out by the PSC.

(6) a. *Wo zai ta koudaili fangle*
I in he pocket put Asp.
jige tongban.
several Cl. copper-coin

'I put several coins in his pocket.'

b. *Wo fangle jige tongban*
I put Asp. several Cl. copper-coin
zai ta koudaili.
in he pocket
'I put several coins in his pocket.'

Even the contrast between (4a) and (4b) is not as sharp as being claimed. What is more, the unacceptable status of (4a) may not be caused by violation of any structurally determined principle at all. This is illustrated by the contrast between (7) and (4a). The sentence in (7) has a structure similar to that of (4a), with two postverbal constituents, but it is perfectly grammatical.

(7) *Ta dale Zhangsan liangxia.*
he hit Asp. Zhangsan two time
'He hit Zhangsan twice.'

The obvious difference between (7) and (4a) is that the patient NP in (7) is definite but the one in (4a) is indefinite. If some modifiers are added to the patient NP of (4a) to make it definite and referential, as in (4d), the sentence will become acceptable. Further improvement on the sentence can be obtained by changing the aspect marker on the verb from the perfective *le* to the experiential *guo*, as in (4e). With appropriate aspect on the verb and proper definiteness status for the postverbal elements, even three constituents can appear after the verb. Sentence (8), which is taken from a short story, provides such an example.

(4) d. *Ta kaile zheliang xin che liangci.*
he drive Asp. this Cl. new car two time
'He drove this new car twice.'

e. *Ta kaiguo zheliang xin che liangci.*
he drive Asp. this Cl. new car two time
'He has driven this new car twice.'

(8) *Wo yijing wenguo ta zhejian shi*
I already ask Asp. him this Cl. matter
haoduoci le.
many time Part.
'I have asked him about this issue several times.'

The exact nature of the contrast between (4a) and (4e) will not be discussed in this paper. Suffice it to say that the sheer number of postverbal constituents does not seem to be a significant factor affecting native speakers' judgement on these sentences. The main factor here is how the postverbal patient NP is interpreted. If it is generic or indefinite, it cannot be followed by an adverbial. If it is specific or definite, an extra adverbial after it is usually acceptable to native speakers.

3.An Alternative Analysis

Apparently, the distribution of postverbal adverbial and that of postverbal NPs are not regulated by the same constraint, and the constraint on the number of postverbal NPs is sensitive to the theta-role assigned to these elements. The proposal of this paper is that the constraint on postverbal NPs be derived not from structural factors alone, but from the interaction between structure, theta-role assignment and case assignment.

Following Koopman (1984) and Li (1990), it will be assumed in this paper that Chinese is strictly head-final at all projection levels in D-structure. It will also be assumed that theta-role and case assignment is directional. A Chinese verb assigns theta-role to its left, but case to its right. An immediate consequence of this assumption is that in D-structure all NPs subcategorized for by a verb are generated in positions on the left side of the verb. The theta-roles, but not cases, can be assigned by the verb directly to these positions. In order to receive case directly from the verb, the NPs have to move to the right of the verb. There is an exception, though. If the NP is assigned the theta-role of patient, it has the option of staying in situ and receiving the accusative case indirectly via the morpheme *ba*, which is assumed to be a case assigner. What is crucial is the assumption that a transitive verb can only assign one accusative case directly to its right. When it subcategorizes for two or more NPs with the theta-role of patient, only one of them can move to its right and receive case directly. The other NPs have to stay on the left of the verb and receive case indirectly. This will give rise to the phenomenon that only one patient NP can occur in the postverbal position.

The proposed analysis is capable of accounting for some related phenomena as well, such as the semantic relation between the patient NPs subcategorized for by the same verb and the ordering of these NPs.

When a verb takes two or more patient NPs, it cannot randomly take any two NPs. The sentence in (9) is similar to (2) in structure, but it is neither acceptable nor interpretable. The major difference between the two sentences is that the two patient NPs in (2) are in a so-called inalienable possession relation but the ones in (9) are not semantically related in any obvious way. The multiple patient NP construction apparently has to be licensed by certain semantic relation between the NPs. In addition to the inalienable possession, the semantic relations of partitive, part and whole, and victim and result of the infliction are all possible licensers for multiple patient NP construction, as can be seen in examples (10), (11) and (12) respectively.

(9) **Wode chezi ba Lisi zhuangduanle shuzhi.*
my car BA Lisi break Asp. twig
'My car broke Lisi's twig. (literally 'My car broke-twig Lisi.')

(10) *Wo ba wuge pingguo chile liangge.*
I BA five Cl. apple eat Asp. two Cl.
'I ate two of the five apples.' (literally
'I ate-two the five apples.')

(11) *Wo ba wuzi jiale wuding.*
I BA house add Asp. roof
'I added a roof to the house.' (literally
'I added-roof the house.')

(12) *Ta ba zhimen tile yige dong.*
he BA paper-door kick Asp. one Cl. hole
'He kicked a hole on the paper door.'
(literally 'He kicked-a-hole the paper door.')

There is a fixed order for all the patient NPs of the same verb. If an NP appears in the postverbal position, it is always the one being interpreted as the possessed, the part, or the result of infliction. In sentence (2a), for example, it is always the possessed NP that occurs in the postverbal position and the possessor NP that appears in the preverbal *ba* phrase. In the passive version of such a sentence, the subject is invariantly the possessor NP. If the order is altered, the sentence will become unacceptable or acquire a different interpretation.

The semantic relation and the order of these patient NPs are structurally guaranteed in the analysis of this paper. Adopting a proposal made by Thompson (1973) and developed by Huang (1982) and Li (1990), the D-structure of a Chinese VP is posited as (13).

(13)

```
        VP
       /  \
    NP3    V
          / \
       NP2   V
            / \
         NP1   V
```

The essence of this structure is that the NP at the lowest level of the VP, NP_1 in the structure of (13), is incorporated into the verb (cf. Baker 1988). The two elements now form a new verb node that is capable of assigning theta-role and case to another NP, i.e., NP_2. It is possible for NP_2 to be incorporated into the $[_V \text{ V } NP_1]$ node as well. The new verb node subcategorizes for another NP, NP_3 in (13), as its complement.

The semantic rationale behind the notion of incorporation is that the newly formed verb represents an action, and the action can affect another entity. In the sentence of (2a), for instance, the NP *tui* 'leg' is incorporated into the verb *daduan* 'break' to form a complex verb *daduan-tui* 'break-leg'. The NP in the preverbal *ba* phrase, namely, *Lisi*, is affected by the action of leg-breaking. Notice that the NP *tui* 'leg' is interpreted as generic, and the NP

Lisi is, of course, definite. The order of the two NPs cannot be reversed. The person Lisi can be affected by the action of leg-breaking, but it is semantically absurd to assert that a leg is affected by the action of breaking a particular person Lisi. In other words, the NP *tui* 'leg' has to occur in the lowest position in the structure of (13), and the NP *Lisi* one level higher. Since the semantic and pragmatic constraint on what can affect what is built into the structural representation, it is guaranteed that in an active sentence, all the patient NPs subcategorized by the same verb have to be related, and that they can only occur in a fixed order.

The fixed order of these NPs in corresponding passive sentences is also guaranteed by the structure in (13). It is usually assumed that a passive morpheme is generated under the INFL node of a passive sentence. At a certain stage, the passive morpheme is attached to the verb dominated by that INFL, either by lowering the I or by raising the verb. The passive morpheme absorbs the accusative case from the verb and the patient NP is forced to move to the Spec of IP for case (Chomsky 1986, Jaeggli 1986). When the VP of a sentence has the shape of (13), the passive morpheme can only be attached to the V node immediately dominated by the VP node. Given the usual assumption that no syntactic process should affect the internal structure of a lexical item, i.e., the so-called Lexical Integrity Hypothesis (Chomsky 1981), this is the expected pattern. since the highest V node is lexical in nature. As a consequence, only the highest NP in the structure can be moved to the subject position. The observable effect is that only the NP with certain semantic content will be the passive subject.

A straightforward account can also be derived on basis of the structural representation in (13) for the effect of the phrase structure condition and the constraint that only the NP with certain semantic content can occur in the postverbal position. Notice that the NP allowed to occur in the postverbal position is always the one at the lowest level in the representation of (13). It can be assumed that only the simplex V node at the lowest level of (13) is capable of assigning accusative case directly to its right. and all the higher complex verb nodes are only capable of assigning accusative case indirectly via the marker *ba*. This will guarantee that only one patient NP and only the correct one can occur in the postverbal position.

4. Conclusion

The main concern of this paper is to preserve the insight of the phrase structure condition for Chinese, and to eliminate the undesirable effect that many grammatical sentences are ruled out by the generalized version of PSC. It is argued that the constraint on postverbal NPs only applies to those with the theta-role of patient. The constraint can be derived from the interaction between theta theory and case theory, on basis of the VP structure posited in this paper. The correct order of all the patient NPs subcategorized by the same verb is built into the structure of VP and is therefore guaranteed.

NOTE:

1. The following symbols will be used in this paper:
   Asp. --- aspect marker
   BA --- the *ba* morpheme
   BEI --- the passive marker or a preposition
   Cl. --- classifier
   Part. --- sentence particle

REFERENCES:

Baker, Mark. (1988). *Incorporation: a Theory of Grammatical Function Changing*, the University of Chicago Press, Chicago.

Chomsky, Noam. (1981). *Lectures on Government and Binding*, Foris, Dordrecht.

----. (1986). *The Barriers*, MIT Press, Cambridge.

Huang, James C-T. (1982). *Logic Relations in Chinese and the Theory of Grammar*, PhD. dissertation, MIT.

Jaeggli, Osvaldo. (1986). 'Passive', *Linguistic Inquiry* 17, 587-622.

Koopman, Hilda. (1984). *The Syntax of Verbs: from Verb Movement in the Kru Languages to Universal Grammar*, Foris, Dordrecht.

Li, Audrey Y-H. (1990). *Order and Constituency in Mandarin Chinese*, Kluwer Academic Publishers, Dordrecht.

Thompson, Sandra. (1973). 'Transitivity and the *ba* Construction in Mandarin Chinese', *Journal of Chinese Linguistics* 1, 208-221.

Yoon, James H. (1989). 'Word Order and Thematic Structure in Mandarin', *ESCOL* '89, Ohio State University.

English tense and aspect in narratives: perfectivity, imperfectivity, and the two time axes[1]

Graham Thurgood[2]

0.0 Introduction. In order to comprehend a narrative, it is crucial for the audience to know when the reported events took place and what order these events occurred in. The attempt on the part of the storyteller to make the order of events clear accounts for much of the tense and aspect marking of English (and, I suspect, much of the tense and aspect marking found in other languages).[3] Here, comprehension is aided by the English tense system, which marks the present and the past time axes, and by the English aspectual system (the perfect and the progressive), which helps clarify our understanding of the sequence of events.

However, only a part of the necessary information about temporal settings and event sequencing is explicitly coded. What is marked is only set off in contrast to what is not marked: that is, what is marked is set off against what we assume to be the case unless we are explicitly told otherwise. In fact, much of what we use in understanding a narrative—particularly information about the sequence of events—comes not from something explicitly coded but from our familiarity with a set of what I have come to believe are essentially cross-linguistic rather than language specific conventions for reporting sequences of events. In part, what this paper tries to do is to make this set of unmarked conventions explicit.

1.0 Tense and the two time axes. In English, temporal settings are established both lexically and grammatically. Specific temporal settings are established lexically through the use of such phrases as *On November 20th, 1066, at 4:00 in the afternoon...* or *Later...* and two general time axes are established through the use of the present and past tenses. Once a time axis has been established in English, the obligatory tense marking on English main verbs serves to maintain the same time axis unless a new time axis is established. Even in languages without obligatory tense marking on main verbs, the maintenance of a time axis is done in a quite parallel way (cf. Thai, Malay): once a time axis has been established lexically, it remains the time axis for the narrative until a new one is established lexically. In English, the major function of the two tenses is tracking the two time axes—the present and the past.[4]

2.0 Aspect and tracking the sequence of events. The other requirement for understanding a narrative is keeping track of the sequence of events. Normally, this tracking requires no special marking. In telling a story, events are reported iconically, that is, in the same order that they occurred: what happened first is reported first, what happened second is reported second, and so on. The expectation is that, unless we are told otherwise, events are reported in the same order that they occurred. As Hopper and Thompson (1980:281) state: "...the foregrounded portions [=in sequence] together comprise the backbone or skeleton of the text, forming its basic structure; the backgrounded clauses put flesh on the skeleton, but are extraneous to its structural coherence."[5]

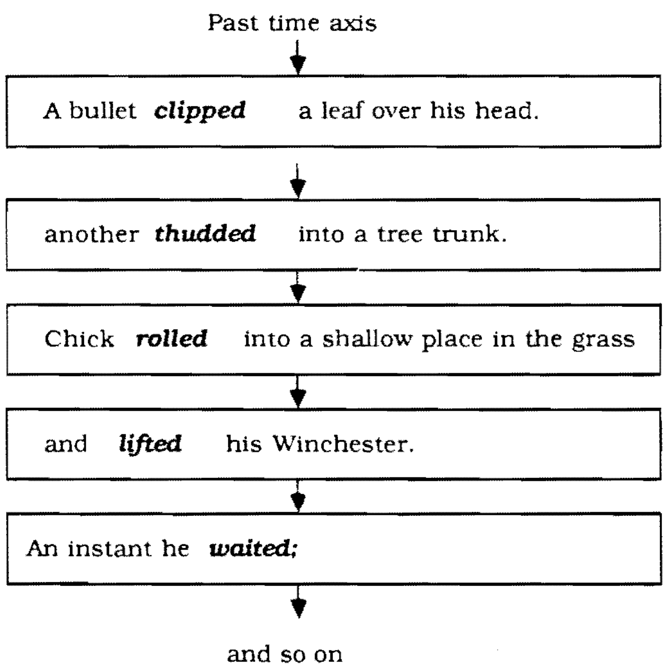

Figure 1. Iconic sequencing and perfective aspect: the unmarked case (L'Amour 1984:142)

A second expectation is that, unless we are told otherwise, events are reported perfectively, that is, "the whole of the situation is presented as a single unanalyzable whole, with beginning, middle, and end rolled into one; no attempt is made to divide up this situation into the various individual phases that make up the action of the entry" (Comrie 1976:3).

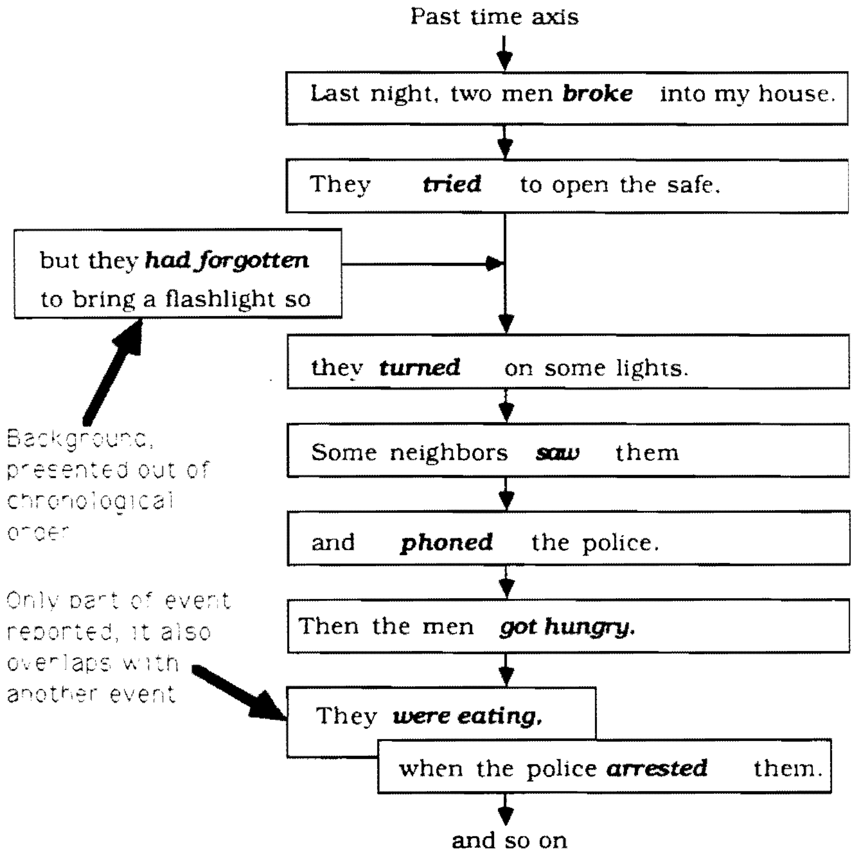

Figure 2. Non-iconic sequencing and imperfective aspect: what needs to be marked

This expectation that past events are reported perfectivity develops from one of the typical properties of events in discourse.[6] "Each event ... is bounded at its beginning by the termination of the preceding event, and at its end by the initiation of the next event. The discourse thus imposes a perfective interpretation on foregrounded events" Hopper and Thompson (1980:286) .

As long as the events in the narrative are reported in sequence and are perfective, that is, are complete and non-overlapping, there is no need for aspectual or any other marking of events. It is when these conditions are not met that marking is required. Events reported out of sequence are usually marked either by the perfect or by some other device. Non-perfective events that overlap with each other or with other events are usually marked with the progressive. In short, the function of aspect (the perfect and the progressive) is to mark the non-iconically presented and non-perfective events in what is otherwise an iconically presented, perfective narrative (see Figure 2).

A digression on terms. The unfortunate similarity between the terms 'perfective' and 'perfect' often causes unnecessary confusion. The perfective is not overtly marked in English; the term itself refers to events being viewed as complete wholes (cf. the Comrie quotation cited above). The perfect is overtly marked in English; the perfect primarily marks events reported out-of-sequence as background to the relevant time axis.

2.1 The past perfect. There are both basic and stylistic uses of the past perfect. The basic uses involve clarification of the flow of events in the narrative. The stylistic uses are less central to understanding the flow of events in the narrative; thus, there is considerable stylistic variation in marking them.

2.1.1 For out-of-sequence events. Overwhelmingly, the past perfect is used to mark events reported out-of-sequence as background to the events occurring on the time axis. In Thurgood (1989), the occurrences of the past perfect in Louis L'Amour's short story "South of Deadwood" were analyzed. The text itself is a twenty-one page short story, containing some 7,107 words and 69 examples of the past perfect. Of the 69 instances, 11 were in conditionals, one was in indirect speech, one was in a negative statement providing collateral information about what did not happen. The remaining 56 instances report situations reported as background to the events on the past time axis; and, in 54 of the 56 examples, the past-perfect-marked event is reported out of sequence.

Riddle found a similar distribution. In Riddle (1988:4), she examined "80 pages total from 4 mystery novels, 80 pages total from 4 academic works on history, 104 pages of transcribed natural conversation from Quirk and Svartik's corpus of English conversation, and other miscellaneous examples of spontaneous speech." Of the 286 examples, 92% "represented out-of-sequence descriptions" (1988:14).

2.1.2 Other clarifications of sequencing: *when*-clauses. Unlike the conjunctions *while, after,* and *before,* the conjunction *when* does not indicate whether two events overlapped or whether they occurred sequentially. As a consequence, the past perfect is often used in *when*—clauses to show two events did not overlap, but instead occurred sequentially.

a. When they ***had eaten*** dinner, they talked about the future.
b. When they ***ate*** dinner, they talked about the future.

In sentence (a), with *had eaten* in the past perfect, eating and talking about future events must be interpreted as sequential. In sentence (b), with *ate* in the simple past tense, there is overlap between eating dinner and talking about future plans. In this pair of sentences, the past perfect is used not because something is being reported out of sequence but rather because otherwise it is unclear whether the events are overlapping or sequential. Although this use is statistically minor, it is basic to understanding the relationships between reported events.

2.1.3 Stylistic uses. In subordinate clauses with *while, after, before,* ...., the relationship of the event reported in the subordinate clauses to the event reported in the main clauses is clear from the conjunct. As is obvious, the events reported in a *while*-clause overlap with the events reported in the main clause; the events reported in a *before*-clause obviously occurred before the events in the main clause; and so on.

After Bill ***wrote*** the letter, he went back to watching TV.
After Bill ***had written*** the letter, he went back to watching TV.

Although in principle one is reluctant to say that both sentences mean exactly the same thing, the difference in meaning is not major. Perhaps in such contexts it provides "added reinforcement" to the sequential interpretation or perhaps it suggests the the coded event is a little more remote from the TV watching than the simple past version does. However, the past perfect is certainly not needed to clear up any ambiguities about the interpretation of event order.

The use of the past perfect in such examples is a stylistic choice, not a basic use. L'Amour, in the sample of his writing I examined, seems to consistently differentiate between *when*-clauses in which the reported event overlaps with the event reported in the main clause and *when*-clauses in which the reported event happened before the event reported in the main clause.

a. He seemed about to speak ***when*** the stage ***rolled*** into the yard at Pole Creek Station and raced to a stop. (L'Amour 1984: 132)

b. ***When*** they ***had picked*** a few to supplement their supper, they walked back. (L'Amour 1984: 141)

In the L'Amour text "South of Deadwood," the one when-clause in which the two events are sequential is marked with the past perfect; the other 19 *when*-clauses, in which the two events are concurrent, are not marked with the past perfect. Perhaps what L'Amour is doing here is using the past perfect to reinforce the sequential interpretation of the *when*-clause.[7]

2.1.4 What do the grammars tell us? An examination of four grammars[8] tells us little. The grammars agree quite closely about the meaning of the past perfect. (i) Quirk *et al.* (1972: 92), provides the following description: "The past perfect has the meaning of past-in-the past." (ii) Frank (1972: 82) gives another variant: "The past perfect tense expresses one past time before another past time." (iii) Celce-Murcia and Larsen-Freeman (1983: 65) supply a quite comparable answer when they write that the past perfect is used for "[a]n action completed in the past prior to some other past event." (iv) Finally, Crowell's characterization, although a little wordier, is also similar (1964: 391): "To express an action (1) which occurred or was completed before another action or time in the past or (2) which continued up to another time in the past." In summary, the grammars agree that the past perfect indicates that the event coded with the past perfect occurred before some other past time. This characterization, although certainly not false, is neither particularly insightful nor useful.

Not only do these grammars leave us with the false impression that the use of the past perfect represents the unmarked case for the sequencing of past events, they also largely fail to distinguish between "basic" and "stylistic" uses of the past perfect: (i) Thus, Quirk *et al.* write (1972: 92): "In some contexts the simple past and the past perfect are interchangeable. eg: *I ate my lunch after my wife {came/had come} home from her shopping.*" (ii) Similarly, Celce-Murcia and Larsen-Freeman (1983: 65) write "...that since a time word like *before* ... already tells us the order of events, simple past tense may be used instead of the past perfect ... without any loss of meaning." (iii) And, Crowell says (1964: 391): "The simple past is often employed instead of the perfect past [=past perfect] with the words *before* and *after*..." (iv) Only Frank (1983: 83) refrains from saying that the past perfect is the unmarked case. She does not deal with the distribution questions directly, but she does make it clear that there is some variation in the appearance and non-appearance of the tense.

Unfortunately, it is the stylistic uses, not the more important uses discussed already, which are the focus of many English-as-a-Second Language (=ESL) materials—a situation not unconnected with the quality of the available descriptions.

2.2 The past progressive: imperfective events. The progressive aspect marks an event as in progress (and, hence, as imperfective). With past events and thus with the past progressive, events are usually reported as progressive only when they overlap with another event or are in progress at a specific time. Even then, the only events that are in the progressive are those still incomplete at that point in the story line—most frequently because the event is still in progress. In short, events marked by the past progressive are imperfective, as a consequence of their being reported with respect to their overlap with another event (or, as a consequence of their being reported as in progress with respect to a particular time).

This overlap leading to use of the progressive is quite evident in these sets of examples (taken from Michael Sharwood Smith 1988:227-229).

> I ***drew*** the curtains apart. The sun ***was shining.*** The children ***were playing*** in the yard. Some women ***were hanging*** clothes on the washing lines. (Michael Sharwood Smith 1988:228)

What is being reported here is not a sequence of events but a description of what was happening—in progress and more or less simultaneously—when the curtains were parted.

> The prison guard ***ran*** to the wall. Two convicts ***were climbing*** to the top. Another ***was*** already ***jumping*** down to the other side. (Michael Sharwood Smith 1988:229)

Again, what is being reported here is not a sequence of events but a description of what the guard saw happening—in progress and more less simultaneously—when he reached the wall.

Not surprisingly, because the past progressive is used to describe a scene—that is, it describes what is in progress at a given point in time, it is often associated with a so-called descriptive function. That is, it is used in so-called descriptive passages.[9]

3.0 The present time axis. Although narratives with their past time setting are usually told on the past time axis, many other types of discourse use a present time axis. Not surprisingly, even much of the discussion of past events is discussed because it is relevant to present concerns; as we shall see, the present relevance of past events is often indicated by our tense choices.

3.1 The present perfect. The present perfect relates events that happened in the past to the present time axis, that is, that have "present relevance." In casual conversation, native speakers use this tense with great frequency since one of the most obvious reasons for mentioning past events is that they are somehow relevant to what is happening now. In fact, it is so common for indefinite past events to be reported in present perfect Crowell (1964:388) goes as far as to advise ESL students to choose the present perfect whenever the reader has no way of knowing the exact time when the action took place.[10]

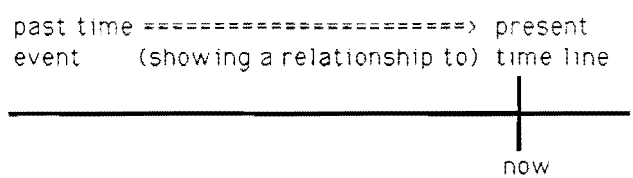

Figure 3. Present perfect: past events related to the present

The view that the basic function of the present perfect is to relate past events *to the present time axis* finds strong support in a major restriction on the present perfect: The present perfect cannot co-occur with a definite past time marker. For example, the sentence *He* ***has taken*** *the medicine*

****at 3:00 yesterday afternoon*** is not possible. If the function of the present perfect is to relate past events to the present time line, the ungrammaticality of such examples makes perfect sense: a clause cannot explicitly refer to two different time axes.

Other 'meanings' ascribed to the present perfect are secondarily derived, inevitably from something else in the sentence or in the context. While it is possible to discuss more specific contexts in which the present perfect is used—McCawley (1971), for instance, talks of the "hot news" and the "experiential" uses, these uses are better described as co-occurring with the present perfect than described as part of the meaning of the present perfect. What is always common to all of these situations is that a past event is being related to the present time axis.

3.2 The present progressive. Unlike events in the past, durative situations reported on the present time axis are typically if not inevitably in progress rather than completed. Thus, for durative situations being reported on the present time line, it is the imperfective progressive aspect that is the unmarked case.[11]

The basic function of the present progressive is to code an event as in progress. Other 'meanings' are secondary. Of course, if an event is in progress, it follows that it must have some duration; if it is still in progress, it follows that it is still incomplete; and if it is still in progress and in the present, it has a certain immediacy, and, hence, a certain vividness.

4.0 Tense variation and the time axes. Riddle (1986) discusses some fascinating examples in which the choice between the past and the present tense relates to which time axis is involved. She cites (1986:281) the opening passage from an Agatha Cristie novel (1934:5):

> Mr. Satterwaite sat on the terrace of Crow's Nest and watched his host, Sir Charles Cartwright, climbing up the path from the sea. Crow's Nest ***was*** a modern bungalow of the better type. It ***had*** no half-timbering, no gables, no excrescences dear to many a builder's heart. It ***was*** a plain, white solid building, deceptive as to size, since it ***was*** a good deal bigger than it ***looked.*** It ***owed*** its name to its position, high up, overlooking the harbor of Loomouth. Indeed, from one corner of the terrace, protected by a strong balustrade, there ***was*** a sheer drop to the sea below. By road, Crow's Nest ***was*** a mile from

the town. The road ***ran*** inland and then ***zigzagged*** high up above the sea.

It is obvious that at least some of the things described in the italicized verbs are probably still true. So why aren't they in the simple present? Because they are being related to a past time axis. Similarly, choosing between *Grimes (1975) argues...* and *Grimes (1975) argued...* depends upon whether the statement is being related to a present time axis or to a past time axis.

In a quite parallel way, the choice between using the simple past and using the present perfect relates to which time axis is involved.

a. As Jake knows, the movie *Ghosts* is showing at the Fig Garden Cinema. He is considering seeing it.

Jake:	***Have*** you ***seen*** *Ghosts?*
Sherry:	Yeah. ***Haven't*** you ***seen*** it? It ***is*** great.
Jake:	No, I ***haven't.***

b. As Jake knows, last night was the last showing of the movie *Ghosts* before it left town.

Jake:	***Did*** you see *Ghosts?*
Sherry:	Yeah. ***Didn't*** you see it? It ***was*** great.
Jake:	No, I ***didn't.***

In example (a), the comments relate to a present time axis, one established by Jake's interest in seeing the film. In example (b), the comments are related to a past time axis.

5.0 Conclusion. Much of the use of tense and aspect in English makes sense in terms of the pragmatics of what it is necessary for us to understand when we listen to a narrative. First, we have to know what the time axis is—that is, what the temporal setting is. In part our tense choices correlate directly with the time axis involved.

Then, we have to know what sequential order the various events occurred in. Some of this information comes from our knowledge of certain apparently largely universal conventions about narrative structure. On the past time line, events are reported using iconicity of sequencing and a perfective point of view; when iconicity and perfectivity are violated, the information needed to understand the situation must be explicitly marked either with aspect or through other means.

On the present time axis, durative events are for obvious reasons reported in the progressive.

And, not only does much of the use of tense and aspect in English makes sense in terms of the pragmatics of what it is necessary for us to understand when we listen to a narrative, but it appears that this pragmatic orientation is still the key to understanding English tense and aspect. Paraphrasing Hopper and Thompson (280), this paper takes the position that the tense and aspect systems originate in a general pragmatic function, one that has a communicative function. Until we understand that function, our work remains incomplete.

Bibliography

Brinton, Laurel J. 1988. The Development of English aspectual systems. Cambridge Studies in Linguistics 49. Cambridge University Press.

Celce-Murcia, Marianne, and Diane Larsen-Freeman. 1983. *The Grammar Book: an ESL/EFL Teacher's Course.* Newbury House Publishers.

Comrie, Bernard. 1976. *Aspect: an introduction to the study of verbal aspect and related problems.* Cambridge Textbooks in Linguistics, 2. Cambridge University Press.

Cristie, Agatha. 1934. *Murder in Three Acts.* New York: Popular Library.

Crowell, Thomas Lee, Jr. 1964. *Index to Modern English.* McGraw-Hill, Inc.

Frank, Marcella. 1972. *Modern English: a practical reference guide.* Prentice-Hall, Inc. Englewood Cliffs, New Jersey.

Givón, Talmy (ed.). 1983. *Topic continuity in discourse: a quantitative cross-language study.* John Benjamins Publishing Company.

Grimes, Joseph E. 1975. *The Thread of Discourse.* Janua Linguarum Minor. Mouton.

Hopper, Paul J. 1979. "Aspect and foregrounding in discourse." In *Syntax and Semantics: Volume 12 - Discourse and Syntax.* edited by Talmy Givón. New York: Academic Press. Pp. 213-241.

Hopper, Paul J. and Sandra A. Thompson. 1980. "Transitivity in grammar and discourse." *Language* 56.2:251-299.

Johnson, Marion R. 1981. "A unified temporal theory of tense and aspect." In Tedeschi and Zaenen, 145-75.

Kumpf, L. 1984. Temporal systems and universality in interlanguage: a case study. In F. R. Eckman, L. H. Bell, and D. Nelson (eds.), *Universals of Second Language*

Acquisition. Rowley, Massachusetts: Newbury House. Pp. 132-143.

L'Amour, Louis. 1984. "South of Deadwood." *Bowdrie's Law.* Bantam Books. Pp. 131-151.

Longacre, Robert E. 1983. *The Grammar of Discourse.* New York: Plenum Press.

Marion R. Johnson. 1981. A unified theory of tense and aspect. *Syntax and semantics: Tense and Aspect.* Volume 14. Edited by Philip J. Tedeschi and Annie Zaenen. Academic Press. Pp. 145-176.

McCawley, James D. 1971. Tense and time reference in English. In Charles J. Fillmore and D. Terence Langendoen (eds.), *Studies in linguistic semantics.* New York: Holt, Rinehart and Winston. Pp. 97-113.

Pennington, Martha C. 1988. Context and meaning of the English simple tenses: a discourse-based perspective. *RELC Journal* 19.1:49-74.

Quirk, Randolph, Sidney Greenbaum, Geoffrey Leech, and Jan Svartvik. 1972. *A Grammar of Contemporary English.* Longman Group Limited.

Riddle, Elizabeth M. 1986. The meaning and discourse function of the past tense in English. *TESOL Quarterly* 20.2:267-286.

Riddle, Elizabeth M. 1987. Teaching the past perfect tense: problems and solutions. Paper read at the Indiana Teacher of English to Speakers of Other Languages conference. October, 1987.

Riddle, Elizabeth M. 1988. A discourse study of the past perfect tense in English. Paper read at the Pragmatics and Language Learning Conference, Urbana, Ill. April, 1988.

Svartik, Jan and Randolph Quirk. 1980. *A corpus of English Conversation.* Lund: CWK Gleerup.

Tedeschi, Philip J. and Annie Zaenen (eds.). 1981. *Tense and aspect.* Syntax and Semantics, 14. New York: Academic Press.

Thurgood, Graham. 1989. The past perfect, narrative structure, and Louis L'Amour. *University of Hawai'i Working Papers in ESL* 8.2:27-43.

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[1]This is a preliminary paper designed to allow me to explore certain ideas and notions. I am not yet completely happy with the analysis nor with its expression. I shall be astonished if all my errors should prove minor and grateful to readers for their feedback and corrections.

I wish to thank Robert Bley-Vroman and Dave Wood for feedback on an earlier version of the past perfect section of this paper and Miriam Westheimer and Marjorie Fuchs for catching weaknesses in an earlier formulation of some the ideas. I also wish to thank Shigeko Okamoto, Elzbieta Thurgood, Gerald McMenamin for feedback on this version of the paper.

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[3]Note the term aspect is being used here in contrast to the term aktionsart, with aspect being more a consequence of the viewpoint of the speaker and aktionsart being more a consequence of the inherent characteristics of the verb referent.

[4]In typical discourse, the present is the unmarked time axis. In English, there is no special morphemic indication of the present tense, a situation not uncommon in the world's languages. In contrast, a past time axis needs to be explicitly marked at least lexically.

[5]Not surprisingly, because the simple past is used to report sequences of events, it is often associated with a so-called narrative function. Of course, the term 'narrative function' does not explain anything. It is purely descriptive.

[6]Notice that in the example in Figure 1 the individual events are presented as discrete wholes, each distinct from one another and with no overlap between them.

[7]Thus far, I have examined another short story of L'Amour's and the pattern holds, but before pushing this too far, it is imperative to enlarge my sample. In any case, the point is that many of these uses are not required by grammar, but rather are stylistic choices.

[8]The two non-ESL grammars: Randolph Quirk, Sidney Greenbaum, Geoffrey Leech, and Jan Svartvik's *A Grammar of Contemporary English* (1972), and, Marcella Frank's *Modern English: a practical reference guide* (1972); and two ESL grammars: Marianne Celce-Murcia and Diane Larsen-Freeman's *The Grammar Book: an ESL/EFL Teacher's Course* (1983), and, Thomas Lee Crowell, Jr.'s *Index to Modern English* (1964).

[9]The term 'descriptive function' like the term 'narrative function' does not explain anything. It is, if you will pardon the term, purely descriptive.

[10]Crowell's advice is probably not all that misleading. Reported events that are not somehow related to a specific past time axis are probably related to a present time axis.

[11]The restrictions on the present progressive correlate with the inherent durativity—an aktionsart type—of the verb. That is, generally, only to verbs that refer to actions that are inherently durative are capable of being in the present progressive. The requirement that the verb be durative applies to the past progressive as well.

ON THE DISCOURSE REPRESENTATION OF TEMPORAL ORDER

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Current conceptions of the way in which discourse represents the temporal order of real-world actions (Labov and Waletzky 1976, Labov 1981, Hopper 1979) make a difference between clauses that capture the temporal order of past events and those that do not. They do not, however, recognize the fact that a clause which represents a temporally sequenced act also communicates the extent of our shared knowledge about this sequencing at the time of the utterance of this clause. I will first review Labov's and Hopper's treatments of Narrative discourse to indicate that they fail to take note of the discourse representation of given and new information about temporal order, and then demonstrate that there are three types of discourse representation of this knowledge.

In their definition of Narrative as a technical term "referring to one of many linguistic devices available to speakers for recapitulation of past experience", Labov and Waletzky (1976) claim that the listener infers the temporal order of past events "from the temporal sequencing of clauses in the report of those events" (Labov 1981:225). Labov (1981) defines the following criteria for identifying Narrative clauses: Narrative clauses participate in Temporal Juncture. (When a pair of clauses occur in a particular order and a change in their order also changes the order of the real-world events that they denote, they are said to be separated by a Temporal Juncture.) Clauses are only separated by Temporal Juncture if they are in the indicative mood and one of three tenses: the preterit, the historical present, or the past progressive. The 'criterial' test of Narrative is its ability to answer the question 'Then what happened?'

It is possible to demonstrate, however, that there are a set of clauses which while they participate in temporal juncture and are appropriate both in terms of mood and tense, fail the 'Then what happened?' test. Applying this test to the discourse in 1, from Labov (1981), we see that while no Narrative clause need necessarily contain an overt temporal marker of the relationship it denotes to the act of its preceding clause, each clause is able to accommodate such a marker.

1. "A rat ran out in the yard.
   My brother started to talk about it.
   I told him to cut it out.
   (brother refuses)
   I twisted his arm.
   He let me have it with the knife.
   I started bleeding.
   We ran to the doctor.

The doctor said, "Just this much more, and you'd a been dead."

2. A rat ran out in the yard.
   (Then what happened?)
   (Then) my brother started to talk about it.
   (Then what happened?)
   (Then) I told him to cut it out. etc.

This is not true of 3b after 3a. 'Then' is not felicitous in front of 3b in the context of 3a, as is shown in 3c, even though 3b satisfies Labov's first two criteria for Narrative clauses: 3b is appropriate both in terms of mood and tense and also participates in temporal juncture with its preceding clause, since reversing the order of 3a and 3b also reverses the order of their real-world counterparts.

3a. The Johsons had a baby.
 b. They called him Tom.
 c. # Then they called him Tom.

Labov anticipates that certain clauses which may occur in the same temporal order as the original events will fail to fit the definition of Narrative clause because they are not separated by temporal juncture. Referring to subordinate-independent pairs such as "When I let go his arm...he picked it up" he points out that reversing the order of these clauses produces no change in the order of the events they represent, e.g. "He picked it up, when I let go his arm". He does not, however, explain or even mention the peculiarity of clauses such as 3b in the context of 3a. These clauses, despite the fact that they are in the same order as their real-world counterparts and participate in temporal juncture, are made distinct by a discourse constraint disallowing overt marking of the temporal sequencing between the actions they reperesent.

Nor is the relationship of 3b and 3a explained by Hopper's (1979) conception of narrative discourse. Hopper, in differentiating between foregroungded and backgrounded clauses, claims that distinguishing the 'actual story line' and the supportive material is a universal of narrative discourse. He refers to clauses which "relate events belonging to the skeletal structure of the discourse" as foregrounded clauses. They are the events which succeed each other in the narrative in the order of their real-world counterparts. That is, their representation of temporal order is iconic. Backgrounded clauses, on the other hand, are not sequenced to the foregrounded events but concurrent with them. And as a result of this simultaneity they 'amplify or comment on' the main-line events of the narrative. To illustrate this distinciton, Hopper uses the flowchart of 4, in which the main events are chronologically sequenced from top to bottom, while events concurrent to these main-line events are represented by a subordinate subroutine on the right hand side of the diagram.

4. (We went back to camp)
(and ran away during the night) (we passed through a few villages and in all of them there was no tribute to pay)
(We journeyed several days)

He illustrates the backgrounded and amplifying status of, for example, the statement 'We journeyed several days', by indicating that it could be rendered with a nonfinite verb form as in, 'We journeyed for several days, passing through a few villages.' 3b and 3a, as we stated earlier, are in the same order as the acts they represent, but referring to 3b as a foregrounded, temporally sequenced clause would amount to ignoring the infelicity of overtly marking this clause as temporally sequenced. On the other hand, it is by no means more accurate to think of 3b as being backgrounded and asequenced to 3a since it does not amplify 3a as 'We passed through a few villages' amplifies 'We journeyed several days', but represents a separate real-world event occurring after the event of 3a. In short, neither Labov nor Hopper account for this type of representation of temporal order. This is because to explain this representation of temporality it is necessary to recognize that the discourse recapitulation of past events does not merely represent the order of their real-world occurrence but indicates, in addition, what is given and new about this ordering.

To explain the relationship between given and new and the representation of temporal order, I will first refer to three recent developments in the study of the organization of information which are of direct relevance to this explanation.

Traditional accounts differentiated given from new information in the study of the order of words and perceived the differentiation as being a clear cut dichotomy (cf. Firbas 1966a, 1966b, Halliday 1976, Bolinger 1952, 1954). One of the imporatant recent developments in the study of given and new is the realization that the term 'given' has been used to refer to not just one but three different phenomena: a. predictable/ recoverable given: "The speaker assumes that the hearer can predict or could have predicted that a particular item will or would have occurred in a particular position within a sentence" (Prince 1981a:226), b. salient given: "The speaker assumes that the hearer has or couuld appropriately have some particular thing/entity/ ... in his/her consciousness at the time of hearing the utterance." (Prince 1981a:228), and c. shared knowledge given: "The speaker assumes that the hearer "knows", assumes, or can infer a particular thing (but is not necessarily thinking about it)." (Prince 1981a:230)

Another relevant recent development in the study of given-new is the examination of the givenness of whole propositions in addition to the givenness of the nominative arguments relative to the verb. In describing the functions of certain English constructions, Prince (1981b, 1984, 1986, 1988) and Ward (1983, 1985) define these in terms of the givenness of their clausal propositions.

And finally in a somewhat different approach to the same broad issue of the organization of information, Myhill 1984 suggests that in making claims about the givenness of the proposition, one is inevitably making statements about the 'discourse aspect' of the clause. He proposes that when the proposition is given, the discourse aspect of the clause relative to that of its preceding clause is perfect rather than perfective or imperfective. Example 5, from Early Biblical Hebrew, illustrates what he means by this:

5. va-yira? ?elohim ?et ha-?adam, bi-celem
   and-created God Acc the-man in-image
   ?elohim bara? ?otam, zaxar u-miqeyva
   God created(PERF) them male and-female
   bara? ?otam
   created(PERF) them

"And God created man, he created them in the image of God, he created them as male and female."
(Mnyhill 1984:30)

In the first clause, where the propositional content is new, the aspect is perfective and is marked by the aspectual Narrative. In the second and third clauses, on the other hand, the propositional content is given and it is only the manner in which God created man which is instanced. The verb is in the aspectual perfect.

In terms of Myhill's approach, the discourse aspect of 3b is perfect, because the proposition is given. (That is, at the time of the utterance of 3b, naming the baby is salient given to the event of having it). And because its discourse aspect is perfect, rather than perfective, the clause cannot accommodate the adverb 'then'. Myhill's approach would also account for the difference between 3b in the context of 3a and 6b in the context of 6a, below. For 6b, he would say that the proposition is new and therefore the discourse aspect is perfective, rather than perfect, making it possible to felicitously introduce the temporal adverb 'then'.

6a. I got home at five.
 b. Then I took the children to the zoo.

The problem with this approach is that it fails to properly account for 7b in the context of 7a. For 7b one would have to say that since the propositional content is new, the aspect is perfective, rather than perfect, and the clause should therefore accommodate the temporal adverb. But it does not.

7a. I left for school,
 b. and arrived in the nick of time.
 c. ≠ and then I arrived in the nick of time.

In order to account for the relationship of 7b to 7a and its differences from 6b to 6a, and 3b to 3a, I will evaluate the givenness of both the propositional content and the temporal relationship of the clauses in b, using Prince's types of given, referred to above:

1. At the time of the utterance of 3b, it is salient given both that people name their babies and that naming the baby follows the act of having it. What is salient cannot be stated in the environment in which it is salient: Propositions that are completely salient cannot be stated in the environment in which they are salient. This is demonstrated by the infelicity of 8b after 8a:

8a. The Johnsons had a baby.
 b. # They gave him a name.

The same is true of temporal relationships. It is because the temporal relationship it denotes is salient at the time of the utterance of 3b that it is inappropriate to introduce the temporal adverb in 3b.

2. At the time of the utterance of 6b, on the other hand, it is shared knowledge that one may take one's children to the zoo on getting home, not salient that one does. That is, the propositional content is new, and it is shared knowledge that the action denoted by the clause can follow the action denoted by its preceding clause. It is only under these circumstances that the sequenced clause can contain a temporal adverb.

3. At the time of the utterance of 7b, it is salient given that one of a set of actions that can follow the act of departure will follow it. That is, the temporal relationship of 7b to 7a is salient, while the propositional content is new. This is syntactically represented in English by VP conjunction. This relationship cannot be denoted by a clause with a temporal adverb.

Therefore, while all three clausal pairs, namely 3b after 3a, 6b after 6a and 7b after 7a, represent the temporal order of the real-world events they denote, they 1) also represent our shared knowledge about this order at the time of the utterance of the clause in b, and 2) differ form each other in the type of shared knowledge that they code. As we said above, 3b indicates that it is <u>salient given</u> at the time of its utterance that the act it denotes <u>follows</u> the act of 3a. 6b informs us that it is <u>shared knowledge</u> at the time of its utterance that the act it denotes <u>can follow</u> the act of 6a. And 7b indicates that it is <u>salient given</u> at the time of its utterance that one of a set of acts that <u>can follow</u> 7a <u>will follow</u> it.

And hence, it is suggested by these three clausal pairs that discourse does not merely represent the temporal order of real-world events, but also the type and level of our shared knowledge about this ordering. Just as in communicating propositional information we accommodate interlocutor knowledge, so that for example 8b is infelicitous after 8a, we also communicate information about temporality with the same attention to whetner it is given and in what way it is given.

REFERENCES

Bolinger, J. 1952. Linear modification. In his Forms of English, Cambridge: Harvard University Press (1965).

Bolinger, J. 1954. Meaningful word order in Spanish, Boletin de Filologia de la Univeridad de Chile, Vol. 8.

Firbas, J. 1966a. On defining the theme in functional sentence sentence perspective, Travaux Linguistiques de Prague, 1.

Firbas, J. 1966b. Non-thematic subjects in contemporary English, Travaux Linguistiques de Prague, 2.

Halliday, M.A.K. 1976. Notes on transitivity and theme in English, Part 2. Journal of linguistics 3.119-244.

Hopper, Paul J. 1979. Aspect and foregrounding in discourse. In Syntax and Semantics, 12: Discourse and Syntax, ed. Talmy Givon, 213-41. New York: Academic Press.

Labov, William. 1981. Speech Actions and Reactions in Personal Narrative. In Analyzing Discourse: Text and Talk. Georgetown University Round Table. Washington, DC: Georgetown University Press.

Labov, William, and David Fanshel. 1977. Therapeutic discourse. New York: Academic Press.

Labov, William, and Joshua Waletzky. 1976. Narrative analysis: Oral versions of personal experience. In Essays on the verbal and visual arts. Edited by June Helm Seattle: University of Washington Press. 12-44.

Myhill, John. 1984. Aspect, word order and voice. A University of Pennsylvania Dissertation.

Prince, E.F. 1981a. Toward a taxonomy of given-new information. In P. Cole, ed. Radical Pragmatics. New York: Academic Press, 223-255.

Prince, E.F. 1981b. Topicalization, Focus-Movement and Yiddish-Movement: a pragmatic differentiation. Proceedings of the Seventh Annual Meeting, Berkeley Linguistics Society, ed. by Alford, D. et al., 249-64.

Prince, E.F. 1984. Topicalization and Left-Dislocation: a functional analysis. Discourses in Reading and Linguistics, eds. White, S.J. and Teller, V., 213-25.

Prince, E.F. 1986. On the syntactic marking of presupposed open propositions. In A. Farley et al., eds. Papers from the parasession on Pragmatics and Grammatical Theory at the 22nd Regional Meeting of the Chicago Linguistics Society, 208-22.

Prince, E.F. 1988. Discourse Analysis: A part of the study of linguistic competence. In F. Newmeyer, ed. Linguistics: the Cambridge Survey. Vol. 3. Cambridge: Cambridge University Press.

Ward, G. 1983. A Pragmatic Analysis of Epitomization: Topicalization it's not. Papers in Linguistics 17.
Ward, G. 1985. The Semantics and Pragmatics of Presposing. A Univeristy of Pennsylvania dissertation.

ON THE ETYMOLOGY OF ENGLISH *HAND*: A CASE STUDY OF IE AND ALTAIC CONTACT[1]

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1. Introduction. Needless to say, the hand is among the most important human body parts. It is therefore quite proper that the etymology of the word for *hand* should be investigated thoroughly. However, the word for *hand* has long remained without a clear etymological solution. The purpose of this short article is to deal only with the points that have not yet been adequately understood or satisfactorily interpreted in the literature on the etymology of *hand*, drawing on Indo-Iranian, Tokharian and Altaic data. Given the earliest Altaic and Indo-European contact in Inner Asia, there is every reason to believe that a cautious application of Altaic data can provide the referential basis for solving the etymology of *hand* with its phonological developments.

There is a general tendency for Altaic and Indo-European linguists to leave their fields of study reciprocally unattended, and this tendency is particularly strong with regard to the earliest contact and interaction between the two language families. In giving new etymologies of *hand* it is hoped that this approach represents an attempt towards treating Altaic and Indo-European as two closely related areas of study. My main idea is that through Altaic it is possible to trace the development of English *hand* from the attested point of departure in Sanskrit. If I am successful in my exploration, the etymology of the word for *hand* will provide a good specimen of how beneficial it is to study Altaic and Indo-European in the light of their historical contacts, and thus we will be able to gain a better understanding not only of the Indo-European elements which are shared by the Altaic languages in their basic vocabulary, but also of the general historical problems confronting Altaic and Indo-European studies. By arguing so, I should point out that this case study is not concerned with isolated resemblances. In fact, there are some other equally good etymologies. As an additional support for my position taken in this paper, I will also be concerned with the etymologies of English *hunt* and *hinder* which have a phonological pattern similar to *hand*.

2. The loan correspondences. In order to discuss this issue properly, we need a rough examination of the use of such a term as sound correspondence in the literature on historical linguistics. There has been a considerable awareness over a century of the great complexity of proving a genetic relationship of languages, leading to the conviction that if languages are genetically related, there must be phonemic correspondence between the languages concerned: a recurrent correspondence between the phonemes of different languages in words of related meaning. In their recent studies, Thomason and Kaufman (1988:8) made clear statements regarding genetic linguistics as follows:

> Given the possibility of diffused linguistic features of all sorts (and, by implication, to all degrees), no single subsystem is criterial for establishing genetic relationship. In fact, genetic relationship in the traditional sense of one parent per language can only be posited when systematic correspondences can be found in

> all linguistic subsystems --vocabulary, phonology, morphology, and (we add) syntax as well. If only languages that meet this criterion are considered candidates for genetic classification, then those languages that do not meet the criterion will pose no threat to the Comparative Method. The latter group includes not only mixed languages, which have followed a nongenetic path of development, but also, we will argue, languages whose genetic links date from a time too remote to permit establishment of the necessary systematic correspondences.

Thus, in the comparative method the concept of sound correspondence as a technical term points to the genetic relationship of languages. However, in this paper the term "loan correspondence"[2] is properly used to account for loan phonology and vocabulary diffusion, without any implications that a genetic relationship between Tokharian and Altaic languages is postulated.

One of the most important loan correspondences between Altaic and Tokharian may be formulated as follows in (1), with the supporting data in (2) and (3)[3], in which Altaic will be tentatively represented by Dagur, one of the Mongolian languages spoken in China:

(1) **Tokharian sibilants were borrowed as liquids in Altaic in the environment V__C, and as alveolar stops elsewhere**

	ToA	ToB	Dagur	Gloss[4]
(2)	wast	ost	*ordu[5]	house, palace
	ṣka:ra:	aṣka:r	arkën	back
	--	a:stäṃ	ërdëm	heads; wisdom
	--	post	burtul	post, behind; buttock
	koṣt	--	k^wa:rt	blade, dagger
	--	wästarye	bëldug	innards; scrotum
	puska:ñ	--	bulgi	sinew
	pya:st-	--	b'ält-	to grow; to overflow
	kaṣt	kest	käldig	hunger; poor
	--	koṣko	h^wälk	hut; the place where cooking pots and utensils are located
(3)	tsar	ṣar	dal	hand; shoulder-blade
	slyi	säly-	dor	rule
	śälk-	--	tark-	to knock
	säk-	--	dag-	to follow
	śom	śaumo	domul	young person; great grandson
	sa:ry-	--	tär-/tari-	to sow
	ṣotre	ṣotri	todol	sign
	ṣuṅk	--	toŋk-	mouth, snout; to dig with snout
	śiśäk	ṣecake	tasëg	lion; tiger
	--	kwaṣ-	kotun	village; town
	kaś	keś	këd	number; how many
	märs-	mars-/märs-	mart-	to forget

The above is by no means an exhaustive list, but is indicative of the consistency with which Dagur speakers rendered Tokharian sibilants as liquids in the V__C environment and alveolar stops elsewhere. For my part, the contact approach to the languages of different families is an academic experiment, to which I have been deeply committed for a long time, to see if Dagur spoken today in North-East, China should respond to Tokharian spoken in ancient history in North-West, China in one way or another. My initial feeling is that if the loan correspondence mentioned in (1) played in Dagur, it would probably play elsewhere or whenever in the other Altaic languages. So it is important to bear in mind throughout the discussion that today's Dagur data have their deep roots in the ancient Altaic languages in many ways. Given this assumption, I looked for relevant words throughout Altaic languages, so that I can have some evidence to make available the Dagur words with the loan correspondence in the Turkic, Mongolian and Tungusic as far as I can. For example, Tokharian ṣka:ra:/aṣka:r *back* penetrated into Altaic very early: Old Turkic **arka:** *back* and Solon **arkan** *back*. However, the Tokharian sibilants were not always borrowed as it was formulated in (1). Instead, they were sometimes borrowed as such or as some other consonants in Dagur and the other Altaic languages, to deal with which is beyond the purpose of the present paper.

Another important phenomenon is that within Dagur and the other Mongolian languages the liquids were likely to change to different nasals depending on the following consonants. This change probably took place in the course of the Dagur phonological development and it was part of a trend favoring VnC syllable structure against VrC. As a first approximation, I try to propose a scheme and give some supporting data as follows:

(4a) **Liquids changed to nasals in Mongolian languages:**

		[+nasal]		[+conso]
r/l	>	[αanter]	/__	[αanter]
		[βcoron]		[βcoron]

This scheme amounts to the following change:

			m		p, b, m
(4b)	r/l	>	n	/__	t, d
			ŋ		k, g

(5)	Dag.	hundur "high"	ToA.	orto "up"
		tant- "to weep"		tsa:rt- "to weep"
		maŋga < *marg "capable[6]"		ma:ski "difficult"
		l'ämbi- < *lerbi- "to wither"	ToB.	leswi "attacks of weakness"
		n'ombus < *lelbu-[7] "tear"		lesp- "phlegm"
		anta- < *hanta- "to shoot"		karss- "to shoot"
		tond "straight"		ṣärs- (to) order
		dëŋg- "to surpass"		ṣark- "to surpass"
	WMo.	möngke "eternal"		pärkär "long"
		könjil < *köldi- "quilt"		*kwilti[8] "quilt"

In the above list the Dagur and WMo. words with the nasals between V__C were developed from those with the liquids r/l which were borrowed from Tokharian at some point in history.

Having proposed the change in (4), I should point out that in the Mongolian languages we quite often cope with irregular sound changes. It is often the case that some lexical items may not have undergone the change which some other items under the same condition have undergone. In this regard, the theory of lexical diffusion developed by Wang (1969) has considerably improved our understanding of sound changes in the Mongolian languages. According to Wang (1969:14), sound changes are lexically gradual and phonetically abrupt. I think this point can well apply to the change in (4). So in Mongolian languages there are still some words with VlC structure which point to a loan correspondence to those of English. For examples:

(6)	MMo.	qulti- "to fall behind"	Eng.	hinder
		hülde- "to chase, hunt"		hunt
		alda < *halda "arm spread"		hand
	Dag.	hald "handle"		handle

The four words we have described in (6) have a great deal in common. They suggest that the loan correspondence between the Mongolian l and English n in the V__C position be hardly due to chance. This correspondence is indicative of the fact that the Indo-European and Altaic contact should be taken into account in investigating the etymology of English *hand*, *hunt* and *hinder*.

3. Hand. The discussions concerning the etymology of *hand* are exclusively focused on Germanic cognates, paying no attention to its Sanskrit and Tokharian counterparts as well as Altaic borrowing in explaining its phonological development. As a result, it has been widely accepted that no cognates for *hand* are found outside Germanic, i.e. there is no Common Indo-European word for *hand*. A few influential etymological dictionaries expressing this viewpoint, for example, are Skeat (1911:230), Onions (1966:425) and Barnhart (1988:463). On the surface, nothing seems wrong with tracing procedure on the basis of Germanic sources. However, if we display a considerable body of data from Indo-Iranian and Altaic languages, it will be clear that the word *hand* was ultimately borrowed into the Germanic languages from Sanskrit hásta- probably through Altaic languages. Consider the following data:

(7)	Skt.	hásta- hand, forearm as measure of length
		hastaka- hand, a measure of length
	Pal.	hattha- hand, forearm
	Pkt.	hattha- hand, forearm
	NiD.	hasta, astammi *(locative singular)* hand, forearm
	Dhp.	hasta- hand, forearm
	Nir.	ho:st hand, forearm
	Kho.	host hand, arm, cubit
	Ksm.	hostu hand, arm, cubit
	Sd.	o:st hand, arm, cubit
	Sin.	hat cubit; at-a hand, elephant's trunk
	AGy.	hath/ath hand, five
	PGy.	xat hand, arm (Turner,1966:#14024-5)

	Av.	zasta- hand
(8)	ToA.	kaṣ, ToB. keṣe < Proto-Tokharian *kaṣta arm span, fathom
	OHG.	hant the hand and the arm, the arm
		hantalo:n to handle, touch, manage
	OE.	hand/hond hand
		handen to take charge of, seize
		handlian to touch or feel, or move with the hands, manipulate, manage
	OFr.	hand/hond hand
	Got.	handus hand (Barnhart 1988:463-4)

At the outset, the two sides in (7) and (8) seem to be mutually incompatible. Fortunately, this is not the case, because historical linguists viewing sound change as the central concern of their interest would have little trouble getting a quick impression of what are similar and what are different between the two sides, even though they might not be able to figure out at once what gave rise to this subtle relationship.

The juxtaposition of Indo-Iranian, Tokharian and Germanic forms indicates that the significant difference between the two sides to be accounted for is the Sanskrit s and Tokharian ṣ and the Germanic n in the V__C environment. It should be stressed that there is little difficulty in catching the similarities between the two sides both in phonetic and semantic grounds, except for the difference indicated. The resultant nasal n in Germanic may be interpreted in terms of the antecedent liquid l in the V__C position which is best observed when the word *hand* in (8) is compared with those of Altaic languages:

(9)	PMo.	*kasda arm spread, hand
	WMo.	alda < *halda arm spread, span
		aldala- to measure with the arm spread
	Dag.	ald arm spread, span
		aldëla- to measure with the arm spread
	Mon.	alda/arda arm spread, span
	Don.	anda < *alda arm spread, span
	Evk.	alda arm spread, span
	Ork.	alda interval, distance
	Ulc.	alda(n) interval; crack; between
	Nan.	alda interval, distance; crack; mediator
	Ma.	aldasi/andasi halfway, midway
		aldasila- to turn back or stop halfway; to be incomplete, die young
	Orc.	agda(n) interval (Cincius 1975:30-1)
	Gag.	hendezā elbow, a measure of length
(10)	PTu.	*kasta- to touch with the hand, handle
	Ulc.	kanta-/kantagu- < *kalta- to touch, reach (by stretching the hand)
		kantaci- to reach, touch (with the hand)
	Nan.	ka:ndaci-/ka:ntaci- to reach, touch (with the hand) (Cincius 1975:373)
	SMa.	haldē- to touch, finger, meddle with (Yamamoto 1969:#1564)
	Dag.	hand- to touch, approach (with the body or hand)

For the words in (9) and (10) I have not yet found Turkic parallels, except for the Gagauz word hendezā. Notice that in their different reflection of the proto-forms *kasda and *kasta- which were borrowed from Tokharian, Mongolian and Tungusic languages have formed doublets in (9) and (10), most of which underwent lambdacism. And further the liquid l changed to nasal n in some words. These consecutive changes account for the evolution path by which the structure of VsC in Tokharian was borrowed into the Mongolian and Tungusic VsC or VlC and further into VnC. For example, the Dongxiang word **anda** in (9) was apparently developed from ***alda** and the liquid l of the Spoken Manchu word **haldë-** in (10) changed to the nasal n in Ulcha and Nanai. Moreover, the words in (10) have the same meaning as Old English **handlian** has in (8), not to mention the obvious similarities between Dagur **hand-** and Old English stem **hand-** both in semantic and phonetic grounds. The following set of data can provide further support for my position:

(11)	Skt.	***hastaku:ta-** hand hammer
	Dam.	**asterá:** hammer (Turner 1966:#14028)
	Dag.	**haldug** hammer
	WYu.	**cëmdan** < ***gëndan** ax < *hammer
(12)	Eng.	**handle**, OE. **handle** part to be grasped by the hand
	OHG.	**hantilla** towel
	Dag.	**hald** handle
(13)	MMo.	**hatqu-/atqu-** < ***halta-/hasta-** to take in hand
	Dag.	**hatkʷ/hatug** cupped hand, handful
		hatkʷla-/hatugla- to take, seize with the hand(s)
	SMo.	**atag**, WMo. **atqu** cupped hand, handful
		atga-, WMo. **atqu-** take in hand
	Evk.	**hata** brush, fetlock (under hoof); pillow (on the dog's paw)
	Evn.	**hatika** (**at/atika/háttan**) brush, fetlock (under hoof)
	Orc.	**haptamuka** < ***haβta** < ***hasta-** membrane (on the bird's paw)
	Ma.	**fatha** hoof, foot (of fowl), claw
	Nan.	**fatha** sole (of foot or boot), foot (of slope), paw
	Ude.	**pataga/patahe** paw (Cincius 1977:318)

In (11) Dagur **haldug** was ultimately from Sanskrit ***hastaku:ta-** probably through an unknown Tokharian word, and in (12) Dagur **hald**, which is semantically and phonetically consistent with English **handle**, was also borrowed from Sanskrit **hásta-**. The existence of the initial k-, c- and h- in some Altaic words in (9-13) provides a solid demonstration of the validity of my reconstruction of the initial *h- < *k- for Mongolian and Tungusic words in (9).

Having looked at the vocabulary diffusion and loan phonology between Indo-European and Altaic, we can summarize some remarkable sound changes in specific languages as follows:

(i) The initial fricative h- and syllable-final s lost in some words respectively or jointly. This change occurred in Indo-Iranian and Altaic respectively. For instance, Shutuli **o:st** in (7) and Dagur **ald** in (9) lost the initial h-; Sinhalese **at-a** in (7) and Spoken Mongolian **atga-** in (13) lost h- and s jointly; **hath** of the Armenian dialect of Gypsy in (7) and Evenki **hata** in (13) lost s. Regarding the loss of s in Altaic, I am now not aware of whether it lost before or after it was borrowed and lambdacized.

(ii) There is correspondence or alternation between vowel a and o: Dhp. **hasta-** versus Kashimir **hostu** in Indo-Iranian languages in (7); Old English and Old Frisian have alternation a/o in **hand/hond** in (8).

(iii) The initial h- developed into f- and further into p- in Tungusic languages, e.g. Manchu **fatha** became Udehe **pataga** in (13). This kind of well-attested change is of great importance to cope with the Altaic problem. Concerning the existence of initial p- in some Tungusic languages, there has been an influential hypothesis in Altaic comparative studies, which devises a sound change of *p- > f- > h- > 0. This hypothesis seems to me to be untenable. On the contrary, I have collected a good many examples that prove the sound change of k- > h- > f-/0- (see Wang 1990c).

(iv) Van Windekens (1941:27) compares Tokharian **kaṣ** and **keṣe** with Hittite **keššar** *hand*, Sanskrit **hásta-** and Avestan **zasta-** *hand* as well as IE. ***ĝhes-/ĝhesto-**. However, he failed to include English **hand** in his etymology. It is clear through Van Windekens' comparison that Tokharian **kaṣ** and **keṣe** lost the subsequent syllable **-*ta-**. There are some cases whereby some Tokharian words underwent final-segment deletion in comparison with the other Indo-European counterparts. A couple of example can be cited here:

(14) Hit. **kesta-/kista-** to be quenched; **kestanu-/kistanu-** to quench
ToA. **käs-**, B **käs-/kes-** < ***kästa-** to extinguish (Van Windekens 1941:37)
Dag. **gind-** < ***girda-** to cool, quench

(15) ToA. **pa:s-**, ToB. **pa:sk-** to guard, protect
IE. ***pa:-ske/o-**
Lat. **pa:scere** to feed, nourish, support (Adams 1988:20)
OT. **balïk** city. Xak. **balïk** a stronghold town (Clauson 1972:335-6)
WMo. **balγasun** city, town, village. Mon. **valcasë** wall
Evk. **balaγan** dwelling, house (Cincius 1975:68)

Notice that in comparison with B, Tokharian A **pa:s-** lost its subsequent consonant k. The original meaning of the Old Turkic word **balïk** (< ***balk**) might be *a protected (or guarded) place*, from which derived the meaning of *village, town*.

(16) ToA. **ku**, ToB. **ku** < ***kund** dog
OE. **hund**, Welsh **ci**, Irish **cu** dog
Ma. **indahu:n** < ***hunda-**, Jur. **indahun**, Ulc. **inda** dog
OT. **ït** < ***hïsta**, WYu. **ëṣt**, Kazax **iyt** dog

Van Windekens (1941:47) compares Tokharian **ku** with Greek **kuo:n** *dog*. Skeat (1911:247) pointed out that English **hound** is allied to Latin **canis** and Greek **kuo:n**.

4. **Hunt and hinder.** Like the etymology of *hand*, we might be inclined to question the limited interpretation of English *hunt* and *hinder* that is given in the etymological dictionaries.

(17a) OT. **iste:-/irte:-** to seek, pursue (something)
Xak. **iste-** to seek. Cag. **iste-** to wish for, seek
Osm. **iste-** to seek, search for (something) (Clauson 1972:243)

According to Clauson (1972:243), the subsequent history of the two Old Turkic words differed; **irte:-**, where it survives, still has that meaning, but **iste:-** has developed extended meanings, including in south-western Turkic group *to wish, to wish for (something).*

The cooccurrence of **iste:-** and **irte:-** provides us strong evidence of rhotacism/lambdacism within Turkic languages. Regarding its earlier form, I prefer to reconstruct Proto-Turkic ***histe-** *to seek, search, hunt* in order to compare it with Middle Mongolian **hülde-** and English **hunt**. Consider the following data:

(17b) MMo. **hülde-**, WMo. **ülde-** to chase animals, pursue, hunt
Bao. **hundë-**, Don. **funjië-** to chase animals, pursue
OE. **hunten, huntian** < ***hulte-** to chase animals, pursue, capture
Eng. **hunt**

English **hunt** is reconstructed as Teutonic ***hunth-**, weak grade of ***henthan-** *to seize*, and is supposed to be allied to English **hint** *a slight allusion, a thing taken or caught up* (see Skeat 1911:250, 241).

(18a) OT. **üst** upper surface, top
Cag. **üst** above
Uig. **üstün** upper, above (in certain context presumably *north*)
Osm. **üstün** upper, above (Clauson 1972:242)

In expressing the directions, many languages relate *back, rear*, and *behind* with *north* and also relate *north* with *up* or *upper* (and *south* with *down*). Considering this semantic connection, I would like to reconstruct Old Turkic **üst** phonologically and semantically as ***hüstü-** < ***küstü-** *back, rear, behind* for Proto-Turkic. This reconstruction paves the way toward an input to rhotacism/lambdacism in Middle Mongolian, with the goal of better understanding the earliest diffusion of *hinder* in Eurasia. Consider the following data:

(18b) MMo. **qulti-** to fall behind (Poppe 1938-39:445)
Dag. **h^{w}ard-** < ***hurdi-** to sprain one's back
Jur. **ulti**[9] < ***hulti** north < *rear
Orc. **sigdë** < ***hisde** back
ToA. **a:rtak**, ToB. **a:rte** slowly, loose, indifferently
OE. **hinder** < ***hilder** hind, back, rear
Eng. **hinder** (about 1385 **hyndre**) to hold back, impede, prevent, make slow or difficult the progress of
OHG. **hintaro:n**, German **hindern**

(18c) Evk. **hita-/sita-** to be embarrassed, confused; to be struck dumb
Ma. **sita-** to fall behind, to be deficient, to lag, to be slow, to be late (for appointment); **sitabu-** to be delayed; **sitashu:n** behind, lagging behind, late (Cincius 1977:99)
Sib. **sita-** to be late

The Tungusic words in (18c) may be assumed to have been developed from ***hilta-** through loss of the liquid **l**.

5. Concluding remarks. In a highly developed area like English etymology, one of the potential possibilities of enhancing our knowledge is to give a competing explanation of the etymology of *hand, hunt* and *hinder*. The previous studies did not concern themselves with considering Altaic and Indo-European studies as contact areas and with formulating loan correspondence to account for the large-scale presence of Indo-European elements in Altaic basic vocabulary. In this paper I have taken the lead from the loan correspondence to deal with the widespread distribution of the words for *hand*, *hunt* and *hinder*.

The significance of describing the loan correspondence exists between Altaic and Tokharian is to point out that throughout history the two language families were in linguistic interaction and Indo-European exerted fundamental influences on Altaic languages, that can probably smooth the way for a more effective account of what happened to English *hand*, *hunt*, and *hinder* in their earlier stage of existence.

ABBREVIATION

AGy. Armenian dialect of Gypsy
Av. Avestan
Bao. Baoan (a Mongolian language)
Cag. Cagatay (a Turkic language)
Dag. Dagur (a Mongolian language, the author's native language)
Dam. Dameli
Dhp. Ga:ndha:ri: or Northwest Prakrit
Don. Dongxiang (a Mongolian language)
Eng. English
Evk. Evenki (a Tungusic language)
Evn. Even (a Tungusic language)
Gag. Gagauz (a Turkic language)
Got. Gothic
Grk. Greek
Hit. Hittite
IE. Indo-European
Jur. Jurcen (a Tungusic language)
Kho. Khowar
Ksm. Kashimir
Lat. Latin
Ma. Manchu (a Tungusic language)
MMo. Middle Mongolian (thirteen-fourteenth centuries)
Mon. Monguor (a Mongolian language)
Nan. Nanai (a Tungusic language)
Neg. Negidal (a Tungusic language)
NiD. Language of Kharosthi: Inscriptions discovered by Sir Aurel Stein in Xinjiang, China (see Turner 1966)
Nir. Nirla:mi: dialect of Pashai
OE. Old English
OFr. Old Frisian
OHG. Old High German
Orc. Orochi (a Tungusic language)
Ork. Oroki (a Tungusic language)
Osm. Osmanli (a Turkish language)
OT. Old Turkic
Pal. Pali
PGy. Persian dialect of Gypsy

Pkt. Prakrit
PMo. Proto-Mongolian
PTu. Proto-Tungusic
Sak. Saka
Sib. Sibe (a Tungusic language)
Sin. Sinhalese
Skt. Sanskrit
SMa. Spoken Manchu
SMo. Spoken Mongolian
Sol. Solon (a Tungusic language)
Stl. Shutuli dialect of Pashai
ToA. Tokharian A
ToB. Tokharian B
Ude. Ude/Udehe (a Tungusic language)
Uig. Uigur (a Turkic language)
Ulc. Ulcha (a Tungusic language)
WMo. Written Mongolian
WYu. West Yugur (a Turkic language)
Xak. Xakani (an Old Turkic language)

NOTES

1. This paper is a revised version of a paper submitted to Ling 699: Directed Research -- *Tokharian Influences on Altaic Languages* with Professor Byron W. Bender at the University of Hawaii at Manoa. I wish to thank Prof. Bender for valuable comments and suggestions. Of course, any errors or inconsistencies are my own.
2. In my previous papers (see Wang 1990a, b, c) the term "sound correspondence" was used in the sense of non-genetic relationship. To Prof. Bender I owe the introduction of the term "loan correspondence" into my work.
3. **Transcription**: This paper lacks some needed symbols. The following important adaptations are accepted: (a) the colon : replaces the macron used in the original publications; (b) ï and ë are the back vowels corresponding to i and e; (c) the symbol ' after a consonant stands for the palatalization of the consonant in question. Sources: The source indicated in the last entry may (or may not) cover the above data cited. The forms with asterisk, which are not found in the sources cited, are reconstructed by the author of these lines. **Abbreviation** is arranged at the end of the paper.
4. The meaning given before the semicolon is Tokharian, and that given after the semicolon is Dagur. If the meaning is similar or roughly similar, no semicolon is needed.
5. This word is reconstructed with reference to Old Turkic **ordu:**, Written Mongolian **ordu** and Manchu **ordo** *palace*.
6. The Manchu word **mangga** has the meaning of *difficult, hard; expert at, strong in, capable*.
7. Cf. WMo. **nilbusun** *tear*.
8. This word is reconstructed with reference to OE. **quilte** *mattress of woven material with a soft lining*, Old French **cuilte** *mattress, cushion*. Notice that Solon **ulda** < ***hulda** *quilt*, Hezhe (a Tungusic language) **huldza** *quilt*, Monguor **konjilen** < ***köldi-** *quilt* and Dagur **hildë** *floor in a room* < **mattress-like carpet*.

9. This word was transcribed as uliti with the three Chinese characters u-li-ti. Since Chinese characters could not transcribe the consonant l without the following vowel i, we can legitimately restore it as ulti.

REFERENCES AND SOURCES

Adams, Douglas Q. 1988. Tocharian Historical Phonology and Morphology. American Oriental Society. New Haven. Connecticut.

Barnhart, Robert K. ed. 1988. The Barnhart Dictionary of Etymology. The H.W.Wilson Company.

Cincius, V. I. Otvectvennyj redaktor. 1975 & 1977. Sravnitel'nyj slovar' tunguso-man'čžurskix jazykov: materjaly k etimologičeskomu slovarju. I. Leningrad. 1975; II. 1977. Leningrad. Izdatel'stvo "Nauka".

Clauson, Sir Gerard. 1972. An Etymological Dictionary of Pre-Thirteenth-Century Turkish. Oxford University Press.

Klein, Ernest. 1966-67. A Comprehensive Etymological Dictionary of the English Languages. Elsevier Publishing Company. Amsterdam.

Onions, C. T. 1966. The Oxford Dictionary of English Etymology. Edited by Onions with the Assistance of G. W. S. Friedrichsen and R. W. Burchfield. Oxford at the Clarendon Press.

Poppe, N. N. 1938-39. Mongol'skij slovar' Mukaddimat al-Adab. Moscow-Leningrad.

Skeat, Walter W. 1911. Concise Etymological Dictionary of the English Language. Oxford at the Clarendon Press.

Thomason, Sarah Grey and Kaufman, Terrence. 1988. Language Contact, Creolization, and Genetic Linguistics. Berkeley: University of California Press.

Turner, Ralph L. 1966. A Comparative Dictionary of the Indo-Aryan Languages. London: Oxford University Press.

Van Windekens, A. J. 1941. Lexique Etymologique des Dialetes Tokhariens. Louvain: Bureaux du Muséon.

Wang, Penglin. 1990a. Indo-European influences on Altaic languages (abstract). Paper read at the Second Annual Graduate Student Conference, School of Hawaiian, Asian and Pacific Studies, University of Hawaii at Manoa. March 10. Honolulu.

______. 1990b. On the etymology of Altaic words denoting religious beliefs. Paper submitted to the 33rd Annual Meeting of the Permanent International Altaistic Conference. June 24-29. Budapest.

______. 1990c. On the origin of the Middle Mongolian initial h- and the motivation for its loss. Paper presented at the 33rd International Congress of Asian and North African Studies. August 19-25. Toronto.

Wang, William S-Y. 1969. Competing changes as a cause of residue. Language 45.9-25.

Yamamoto, Kengo. 1969. A Classified Dictionary of Spoken Manchu. Tokyo: Tokyo Gaikokugo Daigaku.

On the Structure of the Noun Phrase in Japanese*

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1. Introduction

In the framework of Government and Binding (GB) theory, the hypothesis that the determiner (D) is the head of a noun phrase (i.e., the DP hypothesis) has been put forth to account for certain properties of the English noun phrase, and it has brought many significant consequences to syntactic theory (cf. Fukui (1986), Abney (1987), Bowers (1987), among others).

Concerning the basic structure of the noun phrase in Japanese, two directly conflicting approaches have been proposed in the GB literature. One type of approach is exemplified by Fukui (1986), which postulates no functional category D in the Japanese noun phrase. The other type of approach, contrary to Fukui (1986), assumes that the functional category does exist in the noun phrase in this language as well as in English. Lamontagne & Travis (1987) and Tateishi (1988, 1989), for example, take this stand.

The main purpose of this preliminary study is to examine and compare these two types of approaches, and suggest possible directions of the future research on the structure of the noun phrase. In Section 2, I consider Fukui's arguments for the claim that the functional category D does not exist in Japanese. I conclude, following Tateishi (1988), that Fukui's evidence alone is not decisive enough to determine whether or not Japanese lacks a functional category. Then in Section 3, two sets of data that are crucial to our discussion are introduced. Section 4 discusses, in the light of these data, the two types of approaches, Fukui' analysis on the on the one hand, and Lamontagne & Travis' and Tateishi's on the other. The final section is a brief summary and discussion.

2. On Functional Category in the Japanese Noun Phrase

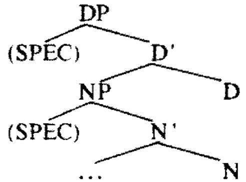
Fukui (1986) argues that Japanese is a language that lacks the functional category D completely. His arguments rest on the following two facts: (i) Japanese does not have articles corresponding to the and a in English. (ii) Japanese demonstratives and genitive phrases behave differently from the English counterparts. The examples in (1) and (2) below illustrate these points.

(1) a. John-ga hon-o katta.
       John-Nom book-Acc bought
    b. *John bought book
(2) a. John-no kono takai hon
       John's this expensive book
    b. Ano John-no takai hon
       that John's expensive book
    c. *John's this expensive book
    d. *That John's expensive book

The Japanese sentence in (1a) is grammatical without any article whereas the corresponding English (1b) is ungrammatical, lacking the or a. Since the English articles are generally assumed to be functional heads, Fukui suggests that the fact that Japanese lacks articles is directly explained if there is no functional category D in this language. As for the second observation, Fukui argues that demonstratives and the genitive 's in English have a property of "closing off" the projection, which is one of the crucial characteristics of functional categories in his model. According to him, once the projection is "closed off", any further modification is prohibited, hence functional categories cannot be iterated as shown in (2c) and (2d). The Japanese demonstratives and genitive phrase do not appear to have this property as the grammaticality of (2a) and (2b) indicates. Fukui accordingly concludes that Japanese demonstratives are not functional heads.

On the basis of these two observations, Fukui hastens to conclude that Japanese lacks the functional category D. Tateishi (1989), however, criticizes Fukui's argumentation and makes an important point. He refers to the fact that Japanese is a consistent head-final language, and points out that we should look for candidates for a functional category in the position following the head noun.[1] In other words, if there is a functional category at all in Japanese, it will be most likely to appear in the final position. Tateishi's point is illustrated in (3) below.

(3)



This point is well-taken, given the strict head-final nature of Japanese. It follows then that we can determine whether or not Japanese lacks the functional category D only if there is no plausible candidate in the final position of the noun phrase. In what follows, therefore, I will focus on the constituent final position to see if we can find plausible candidates for D. Let us first look at what kinds of elements appear in such a position and how they are constrained.

3. Data

This section discusses two sets of facts concerning Japanese nominal constituents. "Nominal constituents" here include a Case-marked noun phrase and a postpositional phrase (PP).

Let us observe the elements that can appear after the head noun within a single nominal constituent.[2/3] Consider (4) and (5) below.

(4) a. John-no gakusei sanjuu-nin minna-ga Tokyo-e itta.
John's student 30-Cl all-Nom Tokyo-to went
'All the thirty students of John's went to Tokyo.'

b. Mary-wa John-no gakusei sanjuu-nin minna-o hometa.
Mary-Top John's student 30-Cl all-Acc praised
'Mary praised all the thirty students of John's.'

(5) a. Mary-wa John-no gakusei sanjuu-nin minna-kara tegami-o moratta.
Mary-Top John's student 30-Cl all-from letter-Acc received
'Mary received a letter (or letters) from all the thirty students of John's.'

b. Mary-wa John-no gakusei sanjuu-nin minna-niyotte nagurareta.
Mary-Top John's student 30-Cl all-by hit-passive
'Mary was hit by all the thirty students of John's.'

In the underlined sequences above, gakusei 'student' is the head noun. The numeral quantifier (NQ), sanjuu-nin, which consists of a numeral sanjuu and a classifier nin appears immediately after the head noun. Then, the strong determiner (SD), minna 'all', in the sense of Barwise & Cooper (1981), follows the NQ. In the final position, there is a Case-marker in the examples in (4) and a postposition in those in (5). The NQ and the SD are optional elements. It should be noted, however, that the head noun, the NQ, and the SD must be in this order if they co-occur. Hence, any other orderings of these elements are not allowed.

(6) a. * John-no sanjuu-nin gakusei minna-ga
John's 30-Cl student all-Nom

b. * John-no sanjuu-nin minna gakusei-ga
John's 30-Cl all student-Nom

c. * John-no gakusei minna sanjuu-nin-ga
John's student all 30-Cl-Nom

d. * John-no minna gakusei sanjuu-nin-ga
John's all student 30-Cl-Nom

e. * John-no minna sanjuu-nin gakusei-ga
John's all 30-Cl student-Nom

The constituency of the underlined sequences in (4) and (5) above can be easily shown by standard constituency tests such as movement, coordination, and pseudo-cleft. Thus, (7a) and (7b) are derived by scrambling of the underlined sequence from (4b) and (5a), respectively.

(7) a. [John-no gakusei sanjuu-nin minna-o]. Mary-wa hometa.
John's student 30-Cl all-Acc Mary-Top praised
'All the thirty students of John's, Mary praised.'

b. [John-no gakusei sanjuu-nin minna-kara]. Mary-wa tegami-o moratta.
John's student 30-Cl all-from Mary-Top letter-Acc received
'From all the thirty students of John's, Mary received a letter (or letters).'

Japanese coordination uses the particle to to conjoin nominal constituents. Note that this coordination particle cannot co-occur with the Case-marker, ga or o. This fact receives a natural account if we assume that the particle to and these Case-markers are members of the same category. In (8a), therefore, the nominative-marker ga cannot appear immediately preceding to. PPs, on the other hand, can be followed by this particle. There is no co-occurrence restriction in this case as can be seen in (8b). Given this much of information, the grammaticality of (9a) and (9b) indicates that the underlined sequences are constituents.

(8) a. [John] to [Mary]-ga kita. 'John and Mary came.'
John and Mary-Nom came
b. [John-kara] to [Mary-kara] tegami-o moratta.
John-from and Mary-from letter-Acc received
'(I) received a letter from John and Mary.'
(9) a. [John-no gakusei sanjuu-nin minna] to [hukei]-ga Tokyo-e itta.
John's student 30-Cl all-Nom and parents-Nom Tokyo-to went
'All the thirty students of John's and (their) parents went to Tokyo.'
b Mary-wa [John-no gakusei sanjuu-nin minna-kara] to [hukei-kara]
Mary-Top John's student 30-Cl all-from and parents-from
tegami-o moratta.
letter-Acc received
'Mary received a letter (or letters) from all the thirty students of John's and (their) parents.'

The pseudo-cleft test also leads us to the same conclusion. The basic form of the Japanese pseudo-cleft construction is "X"-no-wa "Y" da, in which "Y" is the focus position. In (10a) below, John is focused. Note again that the nominative-marker ga cannot appear in the focus position. (10b) shows that an adverbial element kinoo 'yesterday' can be focused. The ungrammaticality of (10c) illustrates that the focus position must be limited to only one constituent. Given this observation, the well-formedness of (11a) and (11b) suggests that the underlined sequences form single constituents.

(10) a. Kinoo gakkoo-e itta-no-wa [John(*-ga)] da.
yesterday school-to went-Comp-Top John(*-Nom) Cop
'It is John who went to school yesterday.'
b. John-ga gakkoo-e itta-no-wa [kinoo] da.
John-Nom school-to went-Comp-Top yesterday Cop
'It is yesterday that John went to school.'
c.* Gakkoo-e itta-no-wa [kinoo] [John] da.
school-to went-Comp-Top yesterday John Cop
(11) a. Kyoo-no kaigi-ni shusseki-suru yotei-na-no-wa
today's meeting-at attend-do plan-Cop-Comp-Top
[John-no gakusei sanjuu-nin minna] da.
John's student 30-Cl all Cop
'It is all the thirty students of John's who are supposed to attend the meeting today.'
b. Okane-o atsumeta-no-wa
money-Acc collected-Comp-Top
[John-no gakusei sanjuu-nin minna-kara] da.
John's student 30-Cl all-from Cop
'It is from all the thirty students of John's that (we) collected money.'

Although there is some restriction on the Case-marker in coordination and pseudo-cleft, the movement test indicates that the Case-marker can be included in the nominal constituent. That is to say, the NQ, the SD and the Case-marker appear after the head noun in a single constituent. What is the exact status of these elements? Are these functional categories?

The second set of data that will be discussed in the following is the contrast between the (a) sentences and (b) sentences in (12) and (13).[4]

(12) a. Koko-kara-ga muzukashii.
here-from-Nom difficult
'Lit. From here is difficult.'
b.* Koko-ga-kara muzukashii.
here-Nom-from difficult

(13) a. Ashita-made-o shimekiri-ni shita.
tomorrow-till-Acc due-as did
'(I) decided that until tomorrow is the due.'
b.* Ashita-o-made shimekiri-ni shita.
tomorrow-Acc-till due-as did

These examples show that there is some restriction on the ordering of the Case-marker and the postposition. The Case-marker can follow a postposition but the postposition cannot follow a Case-marker.

4. The Two Approaches

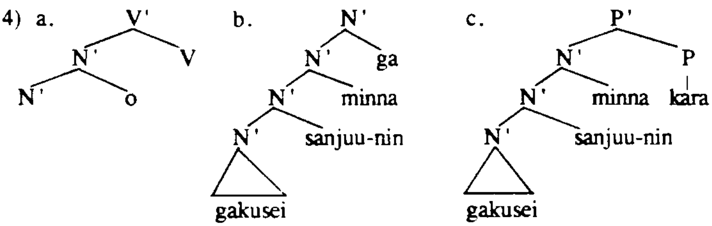
In this section, Fukui (1986), Tateishi (1988, 1989), and Lamontagne & Travis (1987) will be examined in the light of the two sets of data discussed in the previous section.

4.1. Fukui (1986)

As mentioned above, Fukui (1986) claims that the Japanese noun phrase does not have a functional projection at all. It is interesting then to look at how his system deals with the elements that can follow the head noun and the ordering restriction on the Case-marker and the postposition.

His treatment of Case-markers suggests a possible way of accommodating the first set of data in the previous section. In his system, the postposition is an independent lexical category P. The Case-marker (the accusative o in this case), on the other hand, simply right-adjoins to an N' as in (14a), rather than having its own projection. If it is possible to extend this rightward-adjunction mechanism to the NQ and the SD, partial structure of the nominal constituents in (4) and (5) will be given in (14b) and (14c), respectively.[5]

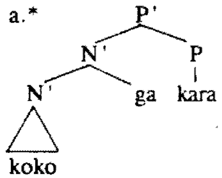
(14) a. b. c.



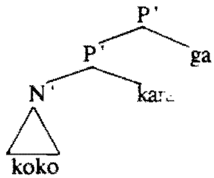
What has to be clarified in this analysis is the exact nature of the rightward-adjunction mechanism since the general syntactic adjunction operation in Japanese is always to the left. The fact that the NQ must precede the SD may be accounted for by requiring the NQ to be c-commanded by the SD, since the SD has scope over the NQ. However, there still remain some questions. For instance, how do we restrict this type of exceptional adjunction? How do we define the set of elements that may undergo this rightward-adjunction? How do we generate these structures?

The second set of data, (12b) and (13b) in particular, may cause some mechanical problem in Fukui's system. It is not obvious why the structure in (15a), for example, must be excluded if a Case-marker can simply right-adjoin to an N' as just mentioned. Some stipulation, therefore, is needed to exclude the ill-formed ordering in (12b) and (13b). The well-formed ordering in (12a) and (13a) requires the structure in (15b) to be allowed. Thus, it must be the case that the Case-marker can adjoin to a P' as well as an N' in Fukui's analysis. This might be explained by allowing the Case-marker to right-adjoin the [-V] categories under the assumption that N is defined as [-V, +N] and P as [-V, -N].

(15) a.*



b.



To sum up, in Fukui's model, the NQ, the SD, and the Case-marker must be allowed to right-adjoin to an N' in the absence of a functional category. The exact characterization of these elements is not entirely clear. The fact that the postposition cannot follow a Case-marker does not follow from his projection system.

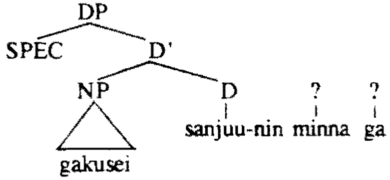
4.2. Lamontagne & Travis (1987) and Tateishi (1988, 1989)

Contrary to Fukui (1986), both Lamontagne & Travis (henceforth, L&T) and Tateishi propose that Japanese Case-markers belong to a functional category. L&T, for instance, attempt to capture interesting parallelism between the Case-marker drop and Comp drop phenomena by hypothesizing that the Case-marker and the Comp are both functional categories. Tateishi (1988) also argues that some effect related to indefiniteness and non-specificity suggests that the Case-marker is a functional category.

L&T and Tateishi, however, are different in some interesting ways. Tateishi (1989) in particular claims that the Case-marker and the NQ are members of a single functional category D. L&T, on the other hand, suggest that the Case-marker is the functional category K, which is distinct from the category D.

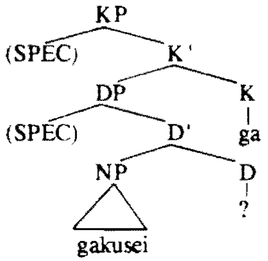
The first set of data above (the examples in (4) in particular) cause some problem for both Tateishi and L&T. For Tateishi, since the NQ and the Case-marker can co-occur in a nominal constituent, it is not clear what status the SD and the Case-marker receive in his analysis.[6]

(16)



In L&T (1987), since no informative characterization of the category D is available, it is not entirely clear how they treat the examples in (4). According to them, the Case-marker goes into the head K position but still the problem is what goes into the D?

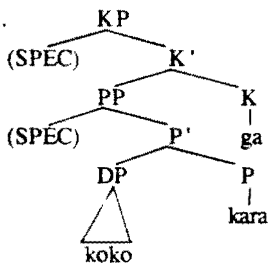
(17)



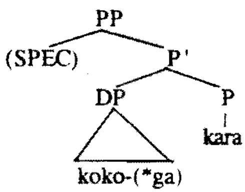
If we consider the NQ and the SD are indeed functional categories, then we need another functional head position in addition to D. If, on the other hand, the NQ and the SD are not taken to be functional categories, their exact status must be clarified. In any case, further explanation is required.

As for the restriction on the ordering of the Case-marker and the postposition shown in (12) and (13), L&T's model can provide a nice account. The fact that the Case-marker can follow a postposition is explained if we assume that K may select a PP as its complement. Thus, (18a) is well-formed. The ungrammaticality of the cases where the Case-marker precedes the postposition (i.e., (12b) and (13b)) follows directly from a natural assumption that P selects a DP rather than a KP as illustrated in (18b).

(18) a.

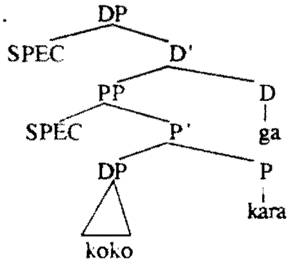


b.

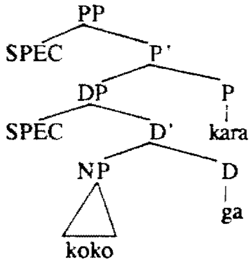


Tateishi's system, however, fails to provide a principled account for this fact. Given the well-formedness of such examples like (5), if the NQ is a functional head as he claims, P must be able to take a DP as its complement. Turning to the fact in (12) and (13), in order to allow the Case-marker to follow the postposition, he must assume that D can take a PP as its complement. This amounts to claiming that the following structure in (19a) is possible. If the structure in (19a) is allowed, there is no obvious way to rule out (12b) and (13b). Since the Case-marker is the D head, why the structure in (19b) should be out is not clear.

(19) a.



b.*



Summarizing the discussion so far, both Tateishi and L&T cannot provide satisfactory characterization of the elements that can appear after the head noun in a nominal constituent. With respect to the ordering restriction on the Case-marker and the postposition, it follows directly from L&T's model. Tateishi's system, however, requires some stipulation just as in Fukui's.

5. Summary and Discussion

In this paper, I examined two major approaches to the Japanese nominal constituent in the light of two sets of data. I discussed first that the question whether or not Japanese lacks a functional category is still open. Under the hypothesis that Japanese is a consistent head-final language, I focused on what kinds of elements appear in the position following the head noun in a nominal constituent. I pointed out that the NQ, the SD and the Case-marker are such elements. It was shown, however, by examining Fukui's model, that the existence of such elements may not directly indicate the existence of a functional category or categories. Although the exact nature of his rightward-adjunction mechanism must be clarified, his model can provide structural description for these elements. In order to answer the ontological question, therefore, more detailed characterization of the syntactic nature of the post-nominal head elements must be provided in the future research.

The fact that there exist elements in the post-nominal head position, nevertheless, is very suggestive. If there is no functional head and projection in this language, why at all it chooses to have some particular elements following the lexical head? Why not to put them in the pre-nominal position uniformly so that the lexical head N ostensively indicates its headness? If we take this point seriously, it is worthwhile to seek for a possible analysis utilizing the functional category. Once this idea is adopted, we cannot maintain Fukui's account of certain differences of

English and Japanese. The crucial parametric difference between the two languages in Fukui's theory is that English has the functional category while Japanese does not. This is no longer available in its strongest form. Postulating the functional category in the Japanese noun phrase, thus, opens up a possibility of discussing the basic structure of Japanese from the view point of universal grammar, as Tateishi (1988) points out. There will be various other theoretical consequences that should be discussed further.

With the assumption that the functional category exists in Japanese, the first set of data in Section 3 further imply that it is necessary to postulate more than one functional category in the Japanese noun phrase. It was pointed out that neither L&T's nor Tateishi's model can readily account for the first set of data. Some extension of L&T, however, might be possible in this regard. That is, we postulate a functional head position for each of the elements that follow the head noun. If this is on the right track, then it follows that there are at least three functional categories in the Japanese noun phrase. In other words, the NQ, the SD, and the Case-marker are heads of their own projections. In fact, this type of extension of the functional category has already been proposed in various languages (cf. Bowers (1989b) for English, Mallen (1989) for Spanish, and Tang (1990) for Chinese, among others). It might be even possible to characterize each functional head in an interesting manner, if the distinction between the NQ and the SD corresponds to the semantic distinction between the weak determiner and the strong determiner in the sense of Barwise & Cooper (1981).[7] Therefore, we might be able to define a set of post-nominal elements exactly.

The second set of data in Section 3 suggested a possible consequence of L&T's KP analysis. The fact that the Case-marker can follow the postposition but not vice versa directly follows from their analysis as we saw above. Given all these considerations, my tentative proposal to provide a principled account for both of the two sets of data is that the NQ, the SD, and the Case-marker are independent functional heads in the noun phrase in Japanese. This approach does not require any exceptional rightward-adjunction mechanism. Once the exact characterization of these elements is provided, there is no such stipulation needed.

Note finally that extension of the functional category in the sentence has been proposed in the recent literature (cf. Chomsky (1986, 1988), Bowers (1989a), and Pollock (1989) to name a few). In fact, various kinds of functional categories have been postulated in the sentence. Remarkable structural parallelism between the noun phrase and the sentence has been observed throughout the history of generative grammar. If this observation has any significance to X-bar theory, then extending the functional category in the way I propose might be plausible.

Notes

*This is a revised version of the paper presented at the 20th annual meeting of Western Conference on Linguistics held at University of Texas at El Paso. I would like to thank Joseph Aoun, John Bowers, Naoki Fukui, Kazuhiko Fukushima, Wayne Harbert, Jim Huang, J.J. Nakayama, John Whitman, and Keiko Yoshida for their invaluable comments on the earlier version of this paper. All errors are my own.

[1]See also Ahn (1988) for a similar claim for Korean.

[2]The following examples roughly mean the same as (4a). The position of a Case-marker appears to be relatively free on the surface as shown in (i) and (ii). Moreover, the numeral quantifier and strong determiner also exhibit relatively free word order as in (iii) and (iv).

(i)	John-no	gakusei-ga	sanjuu-nin	minna	Tokyo-e	itta.
	John's	student-Nom	30-Cl	all	Tokyo-to	went
(ii)	John-no	gakusei	sanjuu-nin-ga	minna	Tokyo-e	itta.
	John's	student	30-Cl-Nom	all	Tokyo-to	went
(iii)	Sanjuu-nin	John-no	gakusei-ga	minna	Tokyo-e	itta.
	30-Cl	John's	student-Nom	all	Tokyo-to	went
(iv)	Sanjuu-nin	minna	John-no	gakusei-ga	Tokyo-e	itta.
	30-Cl	all	John's	student-Nom	Tokyo-to	went

I take these examples as instances of floating quantifiers, and will not discuss them in this paper. See Terada (1987, 1990), Miyagawa (1989) and Fukushima (1990) for some recent treatments and interesting discussions of this phenomenon.

[3]Although the examples in (4) and (5) contain the maximum elements in the constituent final position, the following examples (though somewhat redundant) appear to be acceptable.

(i)	John-no	gakusei	sanjuu-nin	**sorezore**	minna-ga	Tokyo-e	itta.
	John's	student	30-Cl	each	all-Nom	Tokyo-to	went
	'Lit. Each of all the 30 students of John's went to Tokyo.'						
(ii)	John-no	gakusei	sanjuu-nin	**hotondo**	minna-ga	Tokyo-e	itta.
	John's	student	30-Cl	almost	all-Nom	Tokyo-to	went
	'Lit. Almost all of the 30 students of John's went to Tokyo.'						

I cannot discuss these examples in this paper due to the space limitation. Here I just point out that the elements sorezore 'each' and hotondo 'almost' seem to modify only minna 'all' since otherwise the scope relation among the elements in the underlined sequences will be unaccounted for.

[4]Examples similar to these were brought up to my attention by Kazuhiko Fukushima (p.c.).

[5]Since the exact position for the possessor phrase John-no 'John's' does not affect out discussion, I will ignore it completely in the rest of the paper.

[6]In Tateishi (1988, 1989), he argues that there is a unique SPEC position in DP. Since L&T does not discuss the SPEC positions at all, I will put them in parentheses in the discussion of L&T's analysis.

[7]This possibility was pointed out by John Bowers (p.c.).

References

Ahn, H.D. (1988) "Preliminary Remarks on Korean NP," in Eung-Jin Baek ed., Papers from the Sixth International Conference on Korean Linguistics. 1-15, University of Toronto.

Abney, S. (1987) The English Noun Phrase in Its Sentential Aspect, Doctoral dissertation, MIT.

Barwise, J. and R. Cooper (1981) "Generalized Quantifiers and Natural Language," Linguistics and Philosophy 6, 159-219.

Bowers, J. (1987) "Extended X-bar Theory, the ECP and the Left Branch Condition," WCCFL 6, 47-62.

Bowers, J. (1989a) "The Syntax and Semantics of Predication," ms., Cornell University.

Bowers, J. (1989b) "The Syntax and Semantics of Nominals," ms., Cornell University.

Chomsky, N. (1986) Barriers, MIT Press, Cambridge, Massachusetts.

Chomsky, N. (1988) "Some Notes on Economy of Derivation and Representation," ms., MIT.

Fukui, N. (1986) A Theory of Category Projection and Its Applications, Doctoral dissertation, MIT.

Fukushima, K. (1990) "The Adverbial Nature of Floating Quantifiers in Japanese," ms., University of Arizona.

Lamontagne, G. and L. Travis (1987) "The Syntax of Adjacency," WCCFL 6, 173-186.

Mallen, E. (1989) The Internal Structure of Determiner Phrase, Doctoral dissertation, Cornell University.

Miyagawa, S. (1989) Structure and Case Marking in Japanese: Syntax and Semantics 22, Academic Press, New York.

Pollock, J.-Y. (1989) "Verb Movement, Universal Grammar, and the Structure of IP," Linguistic Inquiry 20, 365-424.

Tang, J. (1990) Chinese Phrase Structures and the Extended X-bar Theory, Doctoral dissertation, Cornell University.

Tateishi, K. (1988) "SPEC in Japanese and Universality of X'-theory," ms., University of Massachusetts, Amherst.

Tateishi, K. (1989) "Subjects, SPEC, and DP in Japanese," NELS 19, 405-418.

Terada, M. (1987) "Unaccusativity in Japanese," NELS 17, 619-640.

Terada, M. (1990) Incorporation and Argument Structure in Japanese, Doctoral dissertation, University of Massachusetts, Amherst.

CHONGMING PHRASAL PHONOLOGY

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1. BACKGROUND

This paper is concerned with the trisyllabic tone sandhi (hereafter TS) phenomena of Chongming Chinese, a northern Wu dialect spoken by about 700,000 inhabitants on the island of Chongming located at the mouth of the Yangtze River. According to Zhang (1979, 1980), Chongming has an eight-tone system. We shall refer to it simply as 1-8, as shown in the following table.[1]

(1)

Register	High				Low			
Tone Code	1	3	5	7	2	4	6	8
Tone shape	H	HMH	M	H?	LM	LML	MLM	L?

A historical note is in order. Middle Chinese distinguished four tones as shown in table (2). These split into eight according to the high/low register distinction, which is reflected in the traditional numbering used for the tone code. The four Middle Chinese tones were classified as Even (E) and Oblique (O). The phonetic properties that originally justified the Even vs. Oblique dichotomy have been obscured by historical changes. Nevertheless, we will need to refer to this Even vs. Oblique contrast in stating the synchronic tone sandhi rules.[2]

(2)

middle chinese tones		A	B	C	D
		E	O	O	E
chongming tones	high register	1	3	5	7
	low register	2	4	6	8

Like many other Wu dialects, Chongming has two types of tone sandhi: a) lexical tone sandhi (hereafter LTS); and b) postlexical tone sandhi (PTS). Basically speaking, LTS is the TS that occurs within lexical compounds and PTS is the TS that occurs within clitic groups. Chongming disyllabic TS has already been discussed in Zhang (1990). For convenience's sake, disyllabic TS is resummed up here.

Chongming disyllabic LTS operates according to the schema shown in (3). The leftmost column and the top row represent the base tones (of the first and second syllables respectively); the output sandhi patterns are indicated in the boxes.[3]

(3)

<table>
<tr><td colspan="3">1st \ 2nd</td><td colspan="4">even (E)</td><td colspan="4">oblique (O)</td></tr>
<tr><td colspan="3"></td><td>1 H</td><td>2 LM</td><td>7 H?</td><td>8 L?</td><td>3 HMH</td><td>4 LML</td><td>5 M</td><td>6 MLM</td></tr>
<tr><td rowspan="4">E</td><td colspan="2">1 H</td><td rowspan="4" colspan="4">$-H</td><td rowspan="2" colspan="4">$-n</td></tr>
<tr><td colspan="2">2 LM</td></tr>
<tr><td colspan="2">7 H?</td><td rowspan="3" colspan="4">$-M</td></tr>
<tr><td colspan="2">8 L?</td></tr>
<tr><td rowspan="4">O</td><td rowspan="2">H R</td><td>3 HMH</td><td rowspan="2" colspan="4">HMH-H</td></tr>
<tr><td>5 M</td><td rowspan="2" colspan="4">$-n</td></tr>
<tr><td rowspan="2">L R</td><td>4 LML</td><td rowspan="2" colspan="4">MLM-H</td></tr>
<tr><td>6 MLM</td><td colspan="4">$-M</td></tr>
</table>

Chongming disyllabic postlexical TS (PTS) is sensitive to syntactic domain. It can be divided into four different types according to the syntactic domain it applies to, as shown by (4). In (4), the leftmost column and the top tow represent the base tones (of the first and second syllables respectively); the output sandhi patterns are indicated in the boxes.[4]

(4)

<table>
<tr><td colspan="3">PTS type</td><td colspan="2">PTS-A</td><td colspan="2">PTS-B</td><td colspan="2">PTS-C</td><td colspan="2">PTS-D</td></tr>
<tr><td colspan="3">syntactic structure</td><td colspan="2">NM,VR</td><td colspan="2">MR</td><td colspan="2">VPr</td><td colspan="2">VD</td></tr>
<tr><td colspan="3">1st \ 2nd</td><td>E</td><td>O</td><td>E</td><td>O</td><td>E</td><td>O</td><td>E</td><td>O</td></tr>
<tr><td rowspan="4">E</td><td colspan="2">1 H</td><td rowspan="5">$-H</td><td rowspan="2">$-n</td><td rowspan="4">$-H</td><td rowspan="2">$-n</td><td rowspan="5" colspan="2">$-H</td><td rowspan="4" colspan="2">$-H</td></tr>
<tr><td colspan="2">2 LM</td></tr>
<tr><td colspan="2">7 H?</td><td rowspan="2">$-M</td><td rowspan="2">$-M</td></tr>
<tr><td colspan="2">8 L?</td></tr>
<tr><td rowspan="4">O</td><td rowspan="2">H R</td><td>5 M</td><td></td><td rowspan="2" colspan="2">HMH-M</td><td rowspan="2" colspan="2">HMH-H</td></tr>
<tr><td>3 HMH</td><td rowspan="3" colspan="2">$-M</td><td rowspan="3" colspan="2">$-M</td></tr>
<tr><td rowspan="2">L R</td><td>4 LML</td><td rowspan="2" colspan="2">LML-n</td><td rowspan="2" colspan="2">LML-H</td></tr>
<tr><td>6 MLM</td></tr>
</table>

According to the above table, PTS-A applies to two syntactic structures: number-measure phrase (NM) and verb-resultative complement phrase (VR). Disyllabic PTS-B is applicable only to reduplicated measure words (MR). The only syntactic structure that undergoes PTS-C is the verb-pronoun (VPr). PTS-D is applicable only to syntactic structure of verb plus directional complement (VD).

2. *TRISYLLABIC TONE SANDHI IN CHONGMING*

In Chongming, trisyllabic TS, like disyllabic TS, may also undergo lexical TS or postlexical TS. But since trisyllables involve tree structures, the trisyllabic TS is much more interesting and complex than disyllabic TS.

2.1 *TRISYLLABIC LEXICAL TONE SANDHI*

Chongming trisyllabic LTS is presented in the following table:

(5)

1st		2nd \ 3rd	Even (E) 1 | 2 | 7 | 8	Oblique (O) 3 | 5 | 4 | 6
E		E	$-H-H	$-H-n
E		O	$-M-H	$-M-n
O	High register	E	HMH-H-H	HMH-H-n
O	High register	O	HMH-M-H	HMH-M-n
O	Low register	E	MLM-H-H	MLM-H-n
O	Low register	O	MLM-M-H	MLM-M -n

Based on (5), we propose the following rules for trisyllabic LTS:

```
(6)    T        -    T    -    T
     /   \          / \       / \
    E     O        E   O     E   O
    ↓    / \       ↓   ↓     ↓   ↓
    $   HR  LR     H   M     H   n
        ↓   ↓
      HMH  MLM
```

If the first syllable has an oblique tone, it changes into HMH if it is high register and into MLM if it is low register (cf. 6); if the second and third syllable are both even tones, they all change into H; if both the second and third syllable are oblique tones, the former changes into M and the latter into a neutral tone (cf. 6). The output forms of trisyllabic LTS are decided only by their input forms. They have no connection with the form of disyllabic TS. This phonological process can be considered to be a form of direct mapping . For example:

(7) [[tian-zhu] jiao]
sky god religion
'Catholicism'
BT H-HMH-M
E - O - O
HR-HR-HR
LTS H-M-n (by 6)
ok H-M-n

(8) [zhu [yu-nai]]
'cook taro'
BT HMH-MLM-LML
O - O - O
HR-LR-LR
LTS HMH-M-n (by 6)
ok HMH-M-n (allegro only)

2.2 TRISYLLABIC POSTLEXICAL TONE SANDHI

Chongming trisyllabic PTS is not only sensitive to syntactic categories, but also to tree structures. Tree structure can be divided into two types: a) left-branching, and b) right-branching. We treat the structure involving a disyllable plus a monosyllable as left-branching (9) and the structure containing a monosyllable plus a disyllable as right-branching (10).

(9) [[X X] X]

(10) [X [X X]]

In Chongming, different tree structures will give rise to different phonological modes. The modes for left-branching structures is cyclic, i.e. it applies as schematilated in (11). The rule is formulated in (12).

(11) T - T - T

(12) Rule for left-branching trisyllabic PTS:
[[T - T] T]
↓
H / ... M ___
n / elsewhere

The disyllabic TS rules discussed in section one first apply to the first and second syllables---i.e. to the constituent on the left branch of the structure. The TS form of the third syllable depends on the output form of this operation: if the output form of the second syllalbe is M, the third syllable changes into H; otherwise the third syllable carries a neutral tone. Sample derivations are given in (13).

(13) [[liang-wan] fan]
two bowl rice
'two bowls of rice'
BT LML-HMH-MLM
O - O - O
LR-HR-LR
* MLM-M-n (by trisyllabic LTS; direct mapping)
[LML-M] (by disyllabic PTS-A)
[M-H] (by 12)
ok LML-M-H (cyclic)

(14) [[zan-cheng] yi]
praise O.K. he
'agree with him'
BT M-LM-LM
O - E - E
HR-LR-LR
* HMH-H-H (by trisyllabic LTS; direct mapping)
[HMH-H] (by disyllabic LTS)
[H - n] (by 12)
ok HMH-H-n (cyclic)

With right-branching structures, the mode of PTS is direct mapping. There are three grammatically conditioned subrules, stated as follows.

(15) Rules for right-branching trisyllabic PTS:

(a) T - T - T
E O
↓ ↓
H n
(for PTS-A: number+noun)

(b) T - T - T
↓
n, if initial T = H or LM
H, elsewhere
(for PTS-B: verb+number+CL)

(c) T - T - T
↓
H
(for PTS-C: verb+directional complement)

(d) T - T - T
↓
$ E O
↓ ↓
H M
(for all structures)

Following examples illustrated the operation of (15).

(16) [si [mian-pen]]
'four basins'
BT M-MLM-LM
O - O - E
* HMH-M-H (by trisyllabic LTS)
ok M-M-H (by trisyllabic PTS-A)

(17) [chang [yi-shou]
'sing a song'
BT M-H?-HMH
O - E - O
* HMH-H-n (by trisyllabic LTS)
* M-H-n (by trisyllabic PTS-A)
ok M-H-H (by trisyllabic PTS-B)

(18) [bao [chu-qu]]
carry out DIR
'carry it out'
BT LML-H?-M
O - E - O
* MLM-H-n (by trisyllabic LTS)
* LML-H-n (by trisyllabic PTS-A)
ok LML-H-H (by trisyllabic PTS-C)

(19) [tai[jin-lai]]
lift enter DIR
'carry it in'
BT LM-M-LM
E - O - E
* LM-M-n (by trisyllabic PTS-B)
ok LM-M-H (by trisyllabic PTS-C)

2.3 DISCUSSION OF TRISYLLABIC TONE SANDHI

The description of trisyllabic TS reveals a more complicated picture of the syntax-phonology interface. A cyclic process can account for some of the facts. Specifically, the surface tone of the third syllable in certain left-branching trisyllabic structures (i.e. those containing a clitic group) is determined on the basis of the output form derived by applying the appropriate disyllabic TS rule to the initial disyllable, as seen in (20). But cyclic application fails in right-branching cases like *you mian-jin* 'deep-fried gluten' in (21), whose correct TS form is LM-M-H, derived only by direct mapping. Moreover, right-branching structures in Chongming follow a direct mapping mode, whether they involve lexical compounds, as in (21), or clitic groups, as in (22).

(20) [[kan-hao] yi]
'take care of him'
BT M-HMH-LM
[M-H] (by disyllabic PTS-A)
[H-n] (by 12)
ok M-H-n (cyclic)

(21) [you [mian-jin]]
oil gluton
'deep-fried gluton'
BT LM-MLM-H
[MLM-H] (by disyllabic LTS)
[LM-n] (by disyllabic LTS)
* LM-n-H (cyclic)
ok LM-M-H (by 6; direct mapping)

(22) [mai [wu-bang]]
'buy five pounds'
BT LML-LML-M
[LML-M] (by disyllabic PTS-A)
[LML-n] (by disyllabic LTS)
* LML-n-M (cyclic)
ok LML-M-H (by trisyllabic PTS-B; direct mapping)

Based on the contrast between (20) and (22), we can conclude that Chongming trisyllabic postlexical TS has two modes of application: a) cyclic--- for left-branching structures; and b) direct mapping---for right-branching structures. For lexical compounds, on the other hand, direct mapping is the only mode of application, regardless of the directionality of branching. This is demonstrated in (23-24). Given their left-branching structure, one might expect either cyclic or (equivalently) left-to-right rule application in such examples. However, the only way to derive the correct output is by direct mapping.[5]

(23)=(7) [[tian zhu] jiao]
'Catholicism'
BT H-HMH-M
[H-n] (disyllabic LTS, by 3)
[na]
* H-n-M (cyclic)
ok H-M-n (by trisyllabic LTS; direct mapping)

(24) [[shui-guo] tang]
water fruit sugar
'fruit drops'
BT HMH-HMH-LM
[HMH-M] (by disyllabic LTS)
[HMH-H] (by disyllabic LTS)
* HMH-HMH-H (cyclic)
ok HMH-M-H (direct mapping)

It is clear that what is crucial is the distinction between lexical vs. postlexical tone sandhi. A syntactic word undergoes lexical TS (LTS), which exclusively selects the direct mapping mode of application; clitic groups, on the other hand, undergo postlexical TS (PTS), which adopts different modes of application depending on tree geometry and syntactic structure type:

(25) Left-branching: Cyclic (e.g. 13, 14 & 20).

(26) Right-branching: Direct mapping:
Direct mapping --> [PTS-A, if a number-noun (e.g. 16);
PTS-B, if a verb-number-measure(e.g.17);
PTS-C, if a verb-directional complement (e.g. 18).]

In the following section, our discussion concentrates on the theoretical ramification of this analysis of Chongming TS.

3. CONCLUSION: THEORETICAL ISSUES IN CHONGMING TONE SANDHI

3.1 INTERFACE BETWEEN SYNTAX AND PHONOLOGY

Two questions have been fundamental to the study of the syntax-phonology interface. The first has to do with which specific syntactic properties affect the application of phonological rules. The second has to do with how these syntactic properties should be incorporated into phonology. In response to these two questions, two different theories have been developed separately. One is the Direct Reference Theory by Kaisse (1985), Odden (1987), and Chen (1987a, 1988a); and the other is the Prosodic Theory by Selkirk (1984, 1986), and Hayes (1984). According to the Direct Reference Theory, sentence phonology has direct access to syntactic information and its rules may refer to conditions of a morphosyntactic nature. According to the strongest version of the Prosodic Theory, phonological rules are restricted to various prosodic domains (clitic group, phonological phrase, intonational phrase, etc), but are otherwise syntax-blind.

Although the Prosodic Theory is the most constrained of the competing theories, the Chongming facts suggest that it is untenable in its strongest form. It is clear that Chongming PTS can not be syntax-blind. It is syntax-sensitive in two ways: a) tree structure determines the mode of application (PTS applies cyclically to left-branching structures,[6] while direct mapping of PTS prevails in right-branching structures); b) regardless of whether direct mapping or cyclical application is used, different syntactic structures select different subrules of PTS. Points (a) and (b) have been amply demonstrated in section two. Here are some of the critical examples:

(27) Disyllabic PTS:

PTS-A (for number-measure and verb-resultative):

e.g. si - dun
'four meals'
BT M - M
* M - n (LTS, by 3)
ok M - H (PTS-A, by 4)

PTS-B (for reduplicated measure):

e.g. ci - ci
time time
'every time'
BT M - M
* M - n (by LTS)
* M - H (by PTS-A)
ok HMH - M (by PTS-B)

PTS-C (for verb-pronoun):

e.g. bang-ni
'help you'
BT H - LML
* H - n (by LTS)
ok H - H (by PTS-C)

PTS-D (for verb-directional):

e.g. jin - qu
enter go
'enter'
BT M - M
* M - n (by LTS)
ok HMH - H (by PTS-D)

(28) Right-branching trisyllabic PTS (direct mapping):

PTS-A (for number-noun):

e.g. [si [mian-pen]] (= e.g. 16)
'four basins'
BT M-MLM-LM
* HMH-M-H (by trisyllabic LTS)
ok M-M-H (by trisyllabic PTS-A)

PTS-B (for verb-noun-measure):

e.g. [chang [yi-shou]] (= e.g. 17)
'sing a song'
BT M-H?-HMH
* HMH-H-n (by trisyllabic LTS)
* M-H-n (by trisyllabic PTS-A)
ok M-H-H (by trisyllabic PTS-B)

PTS-C (for verb-directional):

e.g. [bao [chu-qu]] (= e.g. 18)
carry out DIR
'carry it out'
BT LML-H?-M
* MLM-H-n (by trisyllabic LTS)
* LML-H-n (by trisyllabic PTS-A)
ok LML-H-H (by trisyllabic PTS-C)

(29) Left-branching trisyllabic PTS (cyclic):
e.g. [[kan-hao] yi] (=e.g. 20)
'take care of him'

```
BT   M-HMH-LM
 *   HMH-M-H   (by trisyllabic LTS; direct mapping)
 *   M-M-H     (trisyllabic PTS, by 15; direct mapping)
     [M-H]     (by disyllabic PTS-A)
       [H-n]   (trisyllabic PTS, by 12)
     -------------
ok   M-H-n     (cyclic)
```

It is clear that the process of Chongming TS is sensitive not only to prosodic domains and the direction of syntactic branching but also syntactic categories. And its characteristic is: syntactic structures directly exert an influence within prosodic domains. Thus, neither Kaisse's Direct Reference Theory nor Selkirk's Prosodic Theory allows for an adequate account of Chongming TS.

3.2 AGAINST THE STRICT LAYER HYPOTHESIS

Part of what the Prosodic Theory is concerned with is the set of prosodic categories. Hayes (1984) suggests that the following list is sufficient: word, clitic group, phonological phrase, intonational phrase and utterance. A second concern of the theory is the hierarchical nature of prosodic domains. It is generally assumed that a unit at any given level in the hierarchy shown in (30) can never be composed of anything but units at the next lowest level, i.e. recursive structures are assumed not to occur.

```
(30)        U          U = utterence
           / \
          I  (I)       I = intonational phrase
         / \
        P  (P)         P = phonological phrase
       / \
      C  (C)           C = clitic group
     / \
    W  (W)             W = word
```

Hence W may not dominate W, and W may not dominate C, etc. This idea is known as the Strict Layer Hypothesis (Hayes, 1984).

Now let us turn to the prosodic analysis of Chongming. In Chongming, there are quite a lot of data conforming to the SLH and the prosodic domain is such a hierarchy: U > I > P > C > W. Unfortunately, there are also many examples which violate the SLH. Examples of W > C are shown in (31).

```
(31)  (a)    W                (b)      W
            / \                        / \
           C   \                      C   \
          / \   \                    / \   \
         W  W   W                   W  W   W
        si jiao she                si yan gou
        |_____|     PTS            |___|     PTS
        |__________| LTS           |_________| LTS
       four foot snake            four eye dog
          'lizard'                'myopia'(a curse)
```

Since both are words, (31a) and (31b) only allow trisyllabic LTS. But the clitic groups in (31) will be disyllabic PTS if they are read alone. Part of the SLH must be falsified, so that C can dominate W and W can dominate C. Sometimes, W in Chongming dialect can be recursive.

As the discussion above shows, Chongming TS poses these paradoxes to current phonological theory: a) the application of postlexical rules can be both cyclic and non-cyclic; b) phonology does not operate directly on syntactic structure, as Kaisse claims, but nevertheless it is sensitive to a considerable amount of syntactic information, contrary to Selkirk's theory: in Chongming there is syntactically based selection of TS rules within prosodic domains; c) a domain at a given level in the prosodic hierarchy is sometimes composed of categories other than a unit at the next lower level.

NOTES

1. 1) Tones 7 & 8 cooccur only on 'checked' syllables (i.e. syllables ending in an obstruent, which is represented here by /?/). 2) Tone shapes are symbolized by means of tone letters (H,M,L = High,Mid,Low). 3) High register tones occur only on syllables with voiceless initial consonants while low register tones occur with voiced initial consonants.

2. E = Even (including tone 1,2,7,8), O = Oblique (including tone 3,4,5,6). The Even/Oblique distinction is pervasive, coming up time and again for rule statement.

3. 1) $ = base tone form is kept in TS. 2) n = neutral tone. 3) HR = high register; LR = low register.

4. 1) PTS-A = postlexical tone sandhi type A (similarly for PTS-B, PTS-C and PTS-D). 2) NM = number-measure/classifier; VR = verb-resultative complement; MR = reduplicated measure; VPr = verb-pronoun; VD = verb-directional complement.

5. na = no rules can be applied.

6. This fact also argues against Kiparsky's claim (1982): lexical rules are those which apply cyclically; non cyclic rules are postlexical.

SELECTED BIBLIOGRAPHY

Chen, M. Y. 1986a. An Overview of Tone Sandhi Phenomena across Chinese Dialects. Conference on the Languages and Dialects of China, Oakland, California. To appear in the Proceedings.

------ 1987. The Syntax of Xiamen Tone Sandhi. *Phonology Yearbook* V.4.

------ 1988. What must Phonology Know about Syntax? Phonology-Syntax Connection Workshop, Stanford Univ.

Chen, M. Y. & Zhang. H. M. 1990. Lexical and Postlexical Tone Sandhi in Chongming. Submitted to *Study of Chinese Phonology*. Foris.

Hayes, B. 1984. The Prosodic Hierarchy in Meter. To appear in P.Kiparsky & G. Youmans(eds), Proceedings of the 1984 Standford Conference on Meter. MIT Press.

Huang, J. C. T. 1984. Phrase Structure, Lexical Integrity, and Chinese Compounds. *Journal of Chinese Language Teachers Association* V.4.

Hyman, L., F. Katamba & L. Walusimbi. 1987. Luganda and the Strict Layer Hypothesis. *Phonology Yearbook* V.4.

Kaisse, E. 1985. *Connected Speech: the Interaction between Syntax and Phonology* Academic Press.

Kiparsky, P. 1982. From Cyclic Phonology to Lexical Phonology. In Harry van der Hulst & Norval Smith (eds.) *The Structure of Phonological Representations* V.1. Foris.

Mohanan, K. P. 1986. *The Theory of Lexical Phonology* Reidel.

Nespor, M. & I. Vogel. 1986. *Prosodic Phonology* Foris.

Pulleyblank,D. 1983. Tone in Lexical Phonology. Ph.D.dissertation, MIT.

Selkirk, E. O. 1984. *Phonology and Syntax: the Relation between Sound and Structure* MIT Press.

------ 1986. On Derived Domain in Sentence Phonology. *Phonology yearbook* V.3.

Shih, C. L. 1986. The Prosodic Domain of Tone Sandhi in Chinese. Ph.D. dissertation, UCSD.

Yip, M. J. W. 1980. The Tonal Phonology of Chinese. Ph.D. dissertation,MIT.

Zhang, H. M. 1990. Syntactic Domain or Prosodic Domain? --- Notes on Chongming Tone Sandhi. To appear *Proceeding of Mid-America Linguistics Conference*, Kansas.

Zhang, H. Y. 1979. Chongming Fangyan de Liandu Biandiao (Tone Sandhi in Chongming). *Fangyan* (Dialect), V.4, Peking.

------ 1980. Chongming Fangyan Sanzi Zu de Liaodu Biaodiao (Trisyllabic Tone Sandhi in Chongming). *Fangyan* V.1, Peking

The Structure of Mad Magazine Sentences and Unmarked Accusative Case

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0. Introduction

0.1. Mad Magazine sentences

Akmajian (1984) discusses a class of sentences in English, called Mad Magazine sentences (MMs) and illustrted as in (1), which he characterizes as having an exclamatory function -- that is, they are characteristically used to express surprise, disbelief, skepticism, scorn and so on.

(1) a. What, me worry?! Never.
b. Her call me up?! Sure
c. My boss give me a raise?! Ha!
d. You get a job at IBM?! Fat chance!
Akmajian (1984, 2)

He proposes that this class of exclamative sentences have the same structure as imperatives, generated by the PS rule -- $S_{(MM, Imp)}$ -> (NP) V^{max}. His proposal is based on the similarities between MMs and imperatives, shown in (2): both allow optional subjects (2a,a'), lack tense (2b,b') or modal elements (2c,c'), and are incompatibile with sentential adverbs(2d,d').

(2) **MMs**
a. (You/him/her) get a job at IBM?
b. *Him gets a job at IBM?!
c. *Her might/will call me up?! Never?!
d. *Me unfortunately lose my job?!

Imperatives
a'. (You) open the door!
b'. *Are careful!
c'. *Might/will wait for me!
d'. *Certainly drive the car!

He then concludes that (i) the above phenomenon is simply an instance of one sentence type having two distinct pragmatic functions, -- imperatives and MMs share the same formal structure (except for the intonation that distinguishes them), and that (ii) the initial NP in MMs is a subject bearing the unmarked accusative Case, for nominative Case on a subject is possible only in tensed expressions.

0.2. Organization

In this paper, I present arguements to show that Akmajian's claim is inadequate and propose a structure of MMs that is parallel to Left-Dislocation (LD) constructions. I show that the proposed structure for MMs and LDs has a consequence regarding the Abstract Case assignment in the framework of Government and Binding theory (Chomsky 1981, 1986). Section 1 is a brief discussion of the inadequate claim of Akmajian that MMs and imperatives have the same formal structure. Section 2 is my proposal of the structure of MMs and the justification of my proposal regarding the syntactic behavior of certain constituents in MMs in topicalization and binding of anaphoric pronouns. Section 3 is the parallel structure drawn between MMs and LD constructions and the theoretical implication regarding Abstract Case assignment.

1. Dissimilarities between Imperatives and MMs

1.1. English

Despite the above mentioned similarities between MMs and imperatives, there exist many dissimilarities -- crucial differences sufficient enough to separate them (see Zhang 1989 for details). First, MMs can have subjects of any grammatical person. Imperatives, however, allow only second person subjects (including quantified NPs such as *somebody/anybody/everybody/nobody*). Second, subjects precede the negator not in MM as in (3a), whereas the subject must follow the negator in an imperative as in (3b).

(3) a. What! Mary not clean the room?! Nonsense.
b. Don't you make a mess in the room!

Third, MMs and imperatives use different negators, not for the former as in (3a) and (4a,b), *don't* or *do not* for the latter as in (3b) and (4c).[1]

(4) a.What! Not leave early?! That is unthinkable.
b.What! *Don't leave early?! That is unthinkable.
c.Stay where you are! Don't/Do not move!

The fact that the predicate of MMs can be negated by not shows that the predicate is a VP in (4a), as VP can be negated by not, as in (5).

(5) a. What he did was [not leave early].
b. What he will do is [not get here on time].

Imperatives like *Leave early!* and *Get here on time!* are not simply VP's, since they are not possible imperatives if negated by *not*, as in (6)

(6) a.*Not leave early!
b.*Not get here on time!

Fourth, imperatives are compatible with the element do whereas MMs are not:

(7) a. What! Him not leave early?!
b. What! *Him do leave early?!
c. What! *Him don't leave early?!
d. What! *Him do not leave early?!

1.2. Other languages

As shown above, MMs are identifiable in English on both formal and functional grounds. The formal properties are: MMs are AUX-less and require an accusative NP subject; the functional property is: MMs are being used in a heavily-discourse-oriented context to express surprise, disbelief, skepticism, scorn, and so on at some situation or event. In other languages, MMs are also identifiable and distinct from imperatives as well.

The Latin MM construction has a subjunctive rather than infinitival verb form, named by Latin grammarians as a special category -- "subjunctive protest".[2]

(8) Ego tibi irascar?
1sg:Nom 2sg:Dative angry
'Me be angry at you?!'

In French, the MMs construction has the formal structure in (9), where the initial NP is in the accusative case if it is a pronoun and the verb in its infinitive form. The relevant examples of MMs are provided in (10), contrasting with the inflected verbs in the imperative construction, as shown in (11).

(9) $[NP_{Acc}\ [_{INF}\ VP\ ]]$

(10) a. Moi, me faire des soucis?!
me ref:1st do these worriness
'Me worry?!'
b. Toi, pleurer?! Jamais.
you cry never
'You cry?! Never'

(11) a. (Tu) pleure!
(you) cry!
b. (Vous) pleurez!
(you) cry!

Both French and Latin have imperative constructions in which the verb inflects for appropriate morphological form. But, in the above, the Latin MMs construction is in the subjunctive form and the French MMs are in the infinitival. Neither of them are formally related to imperative constructions.

The German MMs provide interesting formal properties, the structure of which, according to Lambrecht (1990), does not resemble any known construction. The sentences in (12) are German MMs, and (13) is the abstract structure for them proposed by Lambrecht (1990).

(12)
a. Ich und mir Sorgen machen?!
I-NOM and me-DAT worries make-INF
'Me worry?!'
b. Mein Chef und mir eine Gehaltserhöhung geben?!
my-NOM-MASC boss and me-DAT a-ACC-FEM raise give-INF
'My boss give me a raise?!'
c. Der und einen Smoking anziehen?
that.one-NOM and a-ACC-MASC tuxedo put.on-INF
'Him wear a tuxedo?!'
(Lambrecht 1990)

(13) [NP<Nom> und VP<inf>]

The structure in (13) consists of an NP in the nominative case immediately followed by the conjunction *und*, and a bare infinitival phrase. The structure in (13) shares no properties with the imperative construction in German. German verbs, for example *sagen* (to say) as in (14), inflect for person and number in imperatives but verbs in (12) do not.

(14)

	INF	PRESENT	PAST	IMP
2SG familiar	sagen	sag-st	sagte-st	sag
2PL familiar	sagen	sag-t	sagte-t	sag-t
2SG/PLpolite	sagen	sag-en	sagt-en	sag-en

Structure (13) has a unique property: the initial NP cannot be characterized as "subject", since in German subjects cannot be separated from their predicates by a conjunction and non-tensed verb phrases cannot have subjects. However, according to Akmajian (1984)'s prediction, the NP should be the subject of the MMs. In German, imperatives usually do not allow syntactic subjects to appear. Only with special circumstances such as emphasis do they permit subjects (only after the verb) and be obligatorily in the polite plural form, as in (15c), but they never allow a conjunction like und to follow the subject.

(15) a. Geh (du) nach Hause!
go (you/sg) home
'Go home'

b. Geht (ihr) nach Hause!
go (you/pl) home
'Go home'

c. Gehen Sie nach Huase!
go you-polite home
'Go home' (polite form)
(Schmerling 1975)

The above evidence from outside English suffices to show that MMs and imperatives cannot be classified as having the same structure. Thus, we may conclude that the proposal of Akmajian (1984) that MMs are simply syntactically equivalent to imperative constructions in English is inadequate. The next issue is what the structure and analysis are for MMs in English and how they differ abstractly from imperatives.

2. The Structure of MMs

2.1. A proposal

I propose that MMs form an independent sentence type of their own having the structure in (16), where it is an instance of S' (i.e. CP) rather than S (i.e. TP) with the initial NP base generated as an adjunction to S'(CP) and co-indexed with a null subject PRO inside S (TP).

(16) $[_{S'(CP)}\ NP_i\ [_{S'(CP)}\ [_{S(TP)}\ PRO_i\ [\ VP\ ]]]]$

This proposal is based on arguments given below from considerations of the non-subjecthood of the initial NP, the syntactic behavior of the constituents in MMs in the topicalization and binding of anaphoric pronouns, and case-marking properties.

2.2. The non-subject status of NP

One test for subjecthood in English involves the use of idiom chunks and pleonastic elements, since some idiom chunks and the dummy expressions (i.e. pleonastic pronouns) are restricted to occurring as the subjects of clauses:

(17) a. The chips are down.
b. The cat is out of the bag.
c. It is likely that Mark is sick.
d. There were a few seats left.

Notice that exceptional subject-taking infinitives, as in (18) and (19), allow both idiom chunks and pleonastic pronouns to be in the subject positions.

(18) a. I believe [*the chips* to be down]
b. I've never known [*the fur* to fly so quickly]
c. They reported [*the cat* to be out the bag]
d. I consider [*the shit* to have hit the fan]

(19) a. I expect [it to rain tomorrow].
b. He reported it to be likely that Mark'd quit school].
c. I believe [there to be few linguistic positions].
d. I've never known [there to be no more beer left].

If MMs are like infinitives with accusative subject NPs, one expects that MMs would also allow subject oriented idiom chunks and dummy expressions in the position occupied by the optional NP. But they do not. As in (20) and (21), pleonastic pronouns *it* and *there* are never accepted in MMs.

(20) a. Damn! There's no more beer left.
b. What! *There be no more beer left?!
c. It's false that the world is flat.
d. What! *It be false that the world is flat?!
(21) a.Those clouds make it look like it might rain again.
b.What! *It rain again?! Oh, no.
(Akmajian 1984, 7f)

MMs are ungrammatical with subject oriented idiom chunks, as in (22). Interestingly, non-subject oriented idiomatic phrases are freely allowed, as in (23).[3]

(22) a.*The chips be down?!
b.*The cat be out of the bag?!
c.*/?The shit hit the fan?!

(23) a.John keep tabs on Mary?!
b.Me take care of this baby?!
c.*Tabs be kept on Mary?!

Chomsky (1981,1986) assumes that the subject-oriented idiom chunks have inherent thematic role; therefore, like expletives, they can occupy non-theta-marked argument positions and be subjects. The fact that idiom chunks and pleonastic pronouns are not allowed in MMs suggests a significant mark of MMs: the Spec of TP position in (16) occupied by the NP is not a regular "subject" position, and the NP which has been taken to be the subject by Akmajian is not a subject.

2.3. Topicalization

The second argument against treating the initial NP in MMs as subject comes from facts in topicalizations. First of all, the initial NP of MMs is not a topic phrase, since the NP can be a quantified NP such as *no one* or *nobody* in (24). as pointed out by Akmajian (1984, 4), a type of NP that cannot serve as a topic, shown in (25):

(24) a.What! No one eat this wonderful cake?! Impossible.
b.What! Nobody like going to the colloquium on Friday?!
(25) *As for no one, he/she likes the movie.

If the NP is not a topic phrase, it cannot be adjoined to S (TP) structurally, given topicalization as a process of adjunction to S (TP) (Lasnik & Saito 1990). Thus, we conclude that the NP has to be an element outside S (TP), as in (26).

(26) [NP...[$_{TP}$ Top [$_{TP}$ Subj [VP]]]]

Secondly, if an XP undergoes topicalization in MMs, i.e, moves into the S(TP)-adjunction site Top, this XP must follow the initial NP but not precede it. For example, movement of the verb's internal argument in MMs to the left of the NP is impossible, whereas movement to the S (TP)-adjunction site is possible. This is shown by the contrasts in (27)-(29):[4]

(27) a. Us [read that trashy novel by tomorrow] ?!
b.*[That trashy novel] [us] [read by tomorrow]?!
c. [Us] [that trashy novel] [read by tomorrow]?!

(28) a. The first-year students [read that book by next week]?!
b.*[That book] [the first-year students] read by next week?!
c.?[The first-year students] [that book] read by next week?!

(29) a. Them [read that book by next week]?!
b.*[That book] [them] read by next week?!
c. [Them] [that book] read by next week?!

This fact tells us that the initial NP in MMs is higher than the S(TP)-adjoined position in the tree, again pointing to the conclusion that the NP is structurally outside S (TP). Given that the initial NP of MMs must be outside S(TP), it can be concluded that the NP cannot be the subject. Therefore, the real subject must be null.

The conclusion that the NP is not the subject provides explanations to the two peculiar morphosyntactic properties noticed of MMs, i.e. the optionality of the initial NP and the accusative-marking on the NP: the NP does not need to be marked nominative, nor does it need to be obligatorily present. This is because only subjects in main clauses in English are obligotarily present and marked nominative (except imperatives, Zhang 1990). Furthermore, provided with the fact a topicalized XP must follow the initial NP. the structure in (26) predicts that, without the occurrence of the initial NP, topicalization should be grammatical, which is exactly the case.

(30) a. That trashy novel, read by tomorrow?!
b. This box of books, sell to the students?!

Note that there are three positions available for the NP preceding S (TP): Comp, Spec of CP and the position Y created by adjunction to CP, as in (31), since we know that the NP position must be higher than the adjunction to TP, ie. TOP.

(31) [$_{CP}$ Y [$_{CP}$ Spec [$_{C'}$ Comp [$_{TP}$ **TOP** [$_{TP}$ SUBJ...[VP]]]]

The NP -- an Xmax category -- cannot be in Comp, a position which only allows an X^0 element such as complementizer *that*. The NP can be in either Y and Spec of CP position in (31). I suggest that the NP not be in the Spec of CP -- a position usually for moved WH-elements -- for the clear reasons that the NP is not a WH-element and that no movement is assumed for the formation of MMs (see later discussion). I propose that the NP is in the adjunction position to CP, ie. Y position in (31).

2.4. Binding anaphoric pronouns

What needs to be discussed next is the null subject in MMs. We need to maintain that the initial NP in CP-adjoined position is structurally able to trigger reflexives, since MMs allow anaphoric pronouns to appear inside the VP, as shown in (32).

(32) a. Him [hurt himself/*herself again]?! Oh, no.
b. Us [control ourselves/*yourselves at the party]?! Oh, sure.
c. Me [cut myself/*himself]?! Possibly.

This seems contradictory, given that the binding domain is S (TP) and the NP is outside S (TP). How could the NP be simultaneously inside S (TP) to meet the binding condition and outside the domain of S (TP) to satisfy the structure given in (26)? The binder position for the anaphor in a structure like (26) is the structural subject position, i.e. Spec of S(TP), which is open and may block the reflexivization if it is not coindexed with the initial NP. This requires that Spec of S (TP) be occupied by a null element coindexed with the initial NP. This null element as the structural subject cannot be a WH-trace or an NP trace, since no movement is assumed to take place in the formation of MMs. MMs lack an AUX. They are tenseless and like imperatives. However, imperatives are restricted to second person subjects and there is an AGR which identifies pro in imperatives (see Zhang 1990). The fact that MMs do not restrict the features of the subject indicates that MMs are not able to identify pro. Therefore, the null subject cannot be pro. What it must be then is PRO, which is allowed to be in the structural subject position of a [-finite] clause. Thus, the coindexation between the NP and PRO allows PRO to bind the anaphors in the VP.

(33) Him_i [TP PRO_i [VP hurt himself_i /*herself/*yourself again]]?!

As the structural subject, PRO is obligatory and controlled by the initial NP. When the initial NP is absent, PRO cannot have a controller. As a result, PRO has the arbitrary interpretation to be fixed in context. This is exactly the case with respect to the MMs in (34).

(34) a. PRO not eat Peking Duck in Chinatown?!
b. PRO leave at three o'clock in the morning for Phoenix?!

In addition, the PRO subject predicts that anaphoric pronouns are banned except the arbitrary *oneself(ves)* when the initial NP does not appear. This prediction is fulfilled, as shown below.

(35) a. PRO not get oneself hurt in a car accident?!
b. PRO kill oneselves in a stupid war?!
c.*PRO cut himself with that knife?!
d.*PRO control yourselves at the party?!

All these facts support the analysis of PRO as the null subject in MMs. Thus, we have the structure (36) (=26).

(36) $[_{CP}$ Y $[_{CP}$ Spec $[_{C'}$ Comp $[_{TP}$ TOP $[_{TP}$ PRO...[VP]]]]

3. Case-marking and Left-Dislocation

The remaining question is why and how the initial NP, adjoined to S'(CP) (in position Y in (31) and (36)), is marked accusative. I will provide an answer based on a parallel analysis of left-dislocation constructions (LD).

3.1. Left-dislocation (LD) and MMs

The structure I take for LD constructions in (37) is given in (37), in which LD is a base-generated construction with the left-dislocated element as adjoined to S'(CP).

(37) a. This room, it really depresses me.
b. John's sister, she won't do anything rash.
c. These clams, I buy them right at the shore.
d. This movie, I said you wouldn't like it much.
(Emonds 1976, 32)

(38) $[_{CP}$ NP$_i$ $[_{CP}$ Spec $[_{C'}$ Comp $[_{TP}$ ... Pronoun$_i$ ...]]]

Left-dislocation was introduced by Ross (1967) and treated, similar to topicalization, as a process of movement of NP which is followed by the replacement of the NP with an appropriate pronoun (Ross 1967, Emonds 1970, 1976).[5] However, there is ample evidence for taking LD sentences to be a base-generated construction and distinct from topicalization. Topicalization leaves a gap within S (TP) and involves WH-movement (Chomsky 1977; see Jaeggli 1982 for PRO movement), whereas dislocation does not. LD seems to involve a predication rule that relates an element in the sentence to the element outside the sentence (Chomsky 1977). One convincing argument, taken from Radford (1988, 531), is in relation to case-marking facts.

A WH-moved NP is assigned the case appropriate to the position it occupied prior to the movement. As in (38), the accusative case-marked WH-word is not allowed after the movement if it is from a subject position (38a), but no such restriction is placed on the element from an object position (39b).

(39) a. Who/*Whom are you sure t would admire George Bush?
b. Who/Whom are you sure George Bush would admire t?

However, for LD, the dislocated element must always be marked accusative irrespective of the case assigned to the referential pronominal expression within the S (TP).

(40) a. Me/*I, (everyone knows) I don't like Japanese food.
b. Him/*He, no one likes to invite him to the party.

In (40), the dislocated elements bear the accusative forms even if the pronominal expression I is in the subject position. If movement is taken to be preserving case-marking, it is quite obvious that LD does not involve movement and is base-generated.

Given that the dislocated constituents are base-generated in the position they occupy at surface structure, the appropriate position for them is the adjunction site to CP, as shown in (41) where the Spec of CP is taken by the moved WH-word.

(41) a. Snow peas, $[_{CP}$ what $[_{TP}$ can you cook them with]]?
b. This kind of furniture, $[_{CP}$ where $[_{TP}$ can you find it in town]]?

3.2. Unmarked accusative case

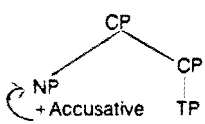
Notice that the data on case-marking of dislocated elements not only provides arguments for no-movement but also show the similarity between LD stucture in (38) and the proposed structure for MMs in (26) or (36). In both constructions, the initial NP is in the accusative form, which must be coindexed with a pronoun or PRO inside the sentence.

But why must the dislocated NP have the accusative form? In strict GB Case-theory, there is no Case-assigner for the dislocated constituent, since it is not governed by any X0 category. Therefore, the accusative case on the dislocated element is completely independent of the Case-assigning mechanisms outlined in Chomsky (1981, 1986). The same is true with the case-marking of the initial NP in MMs. In MMs constructions, it is argued that the initial NP is not the subject and must appear to the left of the domain of S (TP). It is further noted that the NP should not be in the Spec of CP, as in (36). The only structural position available is the adjunction site to CP. Therefore, it is sensible to assume that the accusative case is the unmarked form for sentence-initial pronouns in English. But it is evident that not every sentence-initial NP gets the accusative case. The appropriate generalization about these two constructions seems to be that the initial NP is an extra-sentential element, adjoined to S'(CP).

To formally implement this, I propose that extra-sentential elements, i.e. elements base-generated as adjoined to S' (CP), receive the unmarked acccusative form by virtue of the phrase-structural position they occupy.

(42) a. Assign +accusative to the NP in the configuration

b.



In (42), the NP occupies the position adjoined to CP; hence, it receives the accusative case.

4. Conclusion

In this paper, by examining tenseless exclamatives, imperatives and left-dislocation (LDS) constructions, I have provided an analysis of MMs, arriving at the the following conclusions.

(i). MMs form an instance of S' (CP) with PRO subject, parallel to LDS, rather than to imperatives. Imperatives are structurally distinct from MMs, although they all share uninflected verb forms. Imperatives are analyzed as an instance of S (TP) with pro subject in Zhang (1990). Hence, there should not be a conflation of MMs and imperatives into one tenseless clause.

(ii). Certain NPs such as the extra-sentential CP-adjoined elements are Case marked not by virtue of head government or inherent relations but by virtue of their phrase-structural position. These extra-sentential constituents receive the unmarked Case in English, in this case, Accusative Case.[6]

Notes

1. Sentences like (4b) are acceptable to some speakers with an echoci and emphatic effect. According to Akmajian (1984), (4b) is ungrammatical if used as a MMs.

2. The examples are form Lambrecht (1990). Fillmore, Kay & O'Connor (1988) refer to Mad Magazine sentences as Incredulity Response Constructions, a term adopted by Lambrecht (1990) to avoid language specific connotations in discussing similar sentences outside English.

3. Without the verb *be*, the sentences are acceptable but are understood only in the literal interpretation: *the cat out of the bag?!* meaning a specfic cat got out the bag (Andrew Barss, personal communication). Akmajian (1984,8) notes that MMs allow idiom chunks to oocur in the following manner, which he believes to be subjects:

(i) a. What?! *No headway* made on this problem yet?!
your are fired, idot.
b. Oh? *The hatchet* buried so soon?! My, my, will wonders never cease?

But these examples cannot be accepted as testing for subjecthood, since the presence of the verb *be* before the participial forms results in ungrammatical strings:

(ii) a. *What?! *No headway* be made on this problem?!
b. *Oh? *The hatchet* be buried so soon?!

The question of why there is a difference is left to the future research.

4. The less perfect (28c) seems to suggest that MMs perfer the pre-predicate NP to be a pronoun rather than a full NP. This can be explained in regard to the nature of MMs. MMs are exclamatory sentences used to respond to a foregoing utterance in a heavily discourse-dependent context. The use of a pronoun indicates that the person is old information. When the initial NP becomes longer, the acceptability seems to decrease:

(i) a. The president of the U.S want to visit China next week?!
b.?[China], [the president of the U.S] [want to visit next week]?!
c.*[The president of the U.S] [China] [want to visit next week]?!

5. Corresponding to left-dislocation, there are also right-dislocation (Emonds 1976).

(i) a. It really bothers me, John's cigar.
b. I buy them right at the store, these clams.

Non-transformational proposal in regard to left-dislocation was first suggested by van Riemsdijk & Zwarts 1974 (cited from Emonds 1976), which treats them as base construction.

6. Unmarked Case does not have to be Accusative. In German and Swedish, it is Nominative; and in French and Spanish, it is Accusative. It is beyond the present discussion to provide an analysis of Unmarked Case, but the point is simply CP-adjoined NPs are marked accusative in English.

References

Akmajian, A. (1984) "Sentence types adn the form-function fit", *Natural Language and Linguistic Theory*, 2, 1-23.

Chomsky, N. (1977) "On Wh-movement", in Culicover, P. et al eds. *Formal Syntax*, Academic Press.

Chomsky, N. (1981) *Lectures on Government and Binding*, Foris, Dordrecht.

Chomsky, N. (1986) *Knowledge of Language: its nature, origin and use*. Praeger, New York.

Emonds, J. (1970) *Root and Structure-preserving transformations*, Doctoral dissertation, MIT.

Emonds, J. (1976) *A Transformational Approach to English Syntax*, Academic Press, New York.

Fillmore, C., P. Kay and C. O'Connor (1988) "Regularity and idiomaticity in grammarical constructions", *Language* 64, 501-38.

Jaeggli, O. (1982) *Topics in Romance Syntax*, Foris, Dordrecht.

Lambrecht, Knud (1990) "What, me worry? -'Mad Magazine sentences'revisited" in 1990 *BLS proceedings*.

Radford, A. (1989) *Transforamtional Grammar*, Cambridge Unveristy Press.

Ross, J. (1967) *Constraints on Variables in Syntax*, Mimeo. IULC.

Schmerling, S. (1975) "Imperative subject deletion and some related matters", *Linguistic Inquiry* 6, 501-510.

Zhang, S. (1989) "Formal and Functional Sentence Types: a look at impeatives", in Wendy Wilkins et al (eds) *Western Conference on Linguisitcs*, Vol 2. 370-81.

Zhang, S. (1990) *The Status of Imperatives in Theories of Grammar*, Doctoral dissertation, University of Arizona.

TWO TYPES OF NOUN PHRASES AND NOMINAL STRUCTURES[1]

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In this paper, I examine two types of English noun phrases and their nominal structures, and discuss licensing conditions for their specifiers and complements under a DP analysis. I will show that the DP analysis also applies to the corresponding two types of Chinese noun phrases. In order to draw a cross-linguistic generalization about the English and Chinese noun phrases, I claim that the Chinese measure noun, unlike its English counterpart, can assign Case to its complement without the help of an **of**-like preposition.[2] This hypothesis is independently motivated by the Head-final Parameter, θ-marking Parameter and Case-marking Parameter proposed by Koopman (1983), Travis (1984) and Li (1985).

1. TWO TYPES OF ENGLISH NOUN PHRASES

1.1. Two Types of English Noun Phrases and Structures

Selkirk (1977) claims that English noun phrases can be divided into two types according to the syntactic characteristics of the quantifier and determiner elements specifying the head noun. The first type consists of simple noun phrases and pseudopartitives:

(1) Simple Noun Phrases:
   a) **an objection** b) **three chapters**
   c) **many women** d) **little water**
   Pseudopartitives:
   e) **a group of students** f) **a pound of stew meat**
   g) **a dozen eggs** h) **a number of objections**

The second type of noun phrase is called partitive, and differs from pseudopartitives in that the former has a determiner or genitive in the **of**-PP while the latter does not:[3]

(2) Partitives:
a) **three of the chapters** b) **many of these people**
c) **a group of the students** d) **a pound of the stew meat**
e) **a dozen of those daffodils**
f) **a number of her objections**

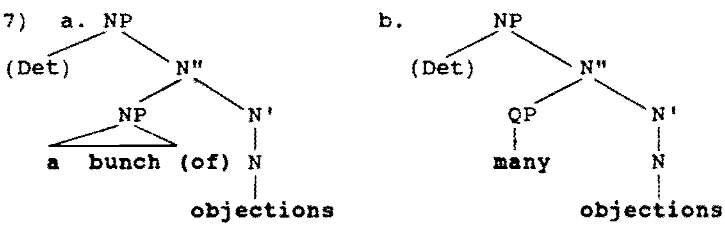
Selkirk (1977) gives a lot of empirical evidence for such a division, the most important of which involves extraposition:[4] i) The first type of noun phrase allows the PP complement to be extraposed, while the second type does not:

(3) a. **How many answers t have been found to this classical mechanical problem?**
b.***How many of the answers t have been found to this classical mechanical problem?**
(4) a. **A bunch of objections t soon emerged to these kinds of tactics.**
b.***A bunch of the objections t soon emerged to these kinds of tactics.**

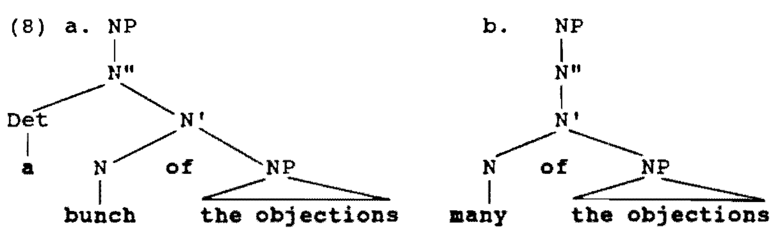
ii) Extraposition may apply to the **of**-PP phrase in the second type of noun phrase, but not to its counterpart in the first type:

(5) a. **How many pounds t did you buy of those apples?**
b.***How many pounds t did you buy of apples?**
(6) a. **They devoured 7 boxes t last night of your fudge.**
b.***They devoured 7 boxes t last night of fudge.**

In order to distinguish these two types of noun phrases, Selkirk (1977) proposes different nominal structures for them at the deep structure: i) In the first type of noun phrase, the measure noun functions as a specifier of N":[5]

(7)


ii) In the second type of noun phrase, the measure noun functions as a lexical head, taking the following noun phrase as its complement:[6]

(8)


The difference between (7) and (8) offers an explanation for the distinction between the two types of noun phrases, especially with respect to extraposition.

That is to say, the extraposition of the PP complement in (3b) and (4b) violates the subjacency condition, because it crosses two NP bounding nodes:

(3b') *$[_{NP}$ **How many of $[_{NP}$ the answers t]] have been found to this classical mechanical problem?**

(4b') *$[_{NP}$ **A bunch of $[_{NP}$ the objections t]] soon emerged to these kinds of tactics.**

But extraposition in (3a) and (4a) only crosses one bounding node, so there is no subjacency violation:

(3a') $[_{NP}$ **How many answers t] have been found to this classical mechanical problem?**

(4a') $[_{NP}$ **A bunch of objections t] soon emerged to these kinds of tactics.**

The extraposition of the **of + NP** sequence in (5a) and (6a) is allowed because **NP** is a maximal projection. But the extraposition of the **of + N'** sequence in (5b) and (6b) is not permitted because **N'** is neither a maximal projection nor a head:[7]

(5a') $[_{NP}$ **How many pounds t] did you buy of those apples?**
of + NP

(6a') $[_{NP}$ **He devoured 7 boxes t] last night of your fudge**
of + NP

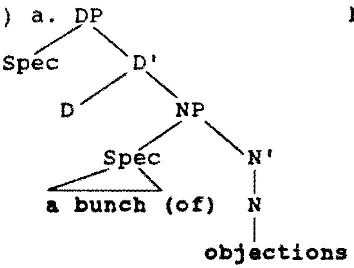
(5b') *$[_{NP}$ **How many pounds t] did you buy of apples?**
of + N'

(6b') *$[_{NP}$ **He devoured 7 boxes t] last night of fudge.**
of + N'

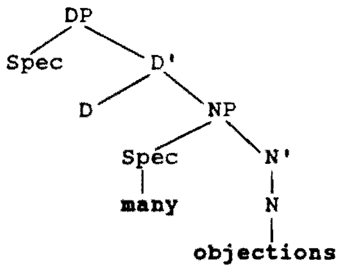
1.2. A DP Analysis of Two Types of English Noun Phrases

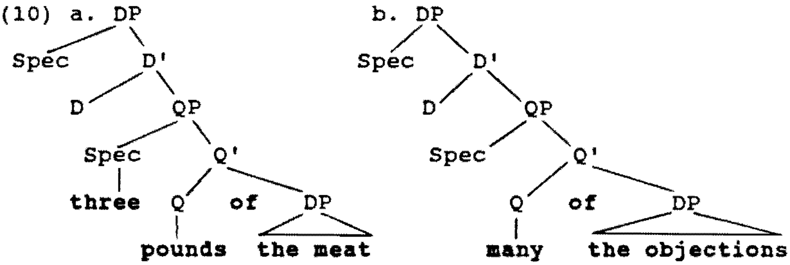
The two types of English noun phrases can be captured in a two-bar version of X' theory if we assume a DP analysis (see among others, Abney (1987), Bowers (1987) and Fukui & Speas (1986)):[8]

(9) a.



b.



(10)


Now the question concerning us is the following: how are the specifiers and complements in (9) and (10) licensed if we want to keep the X' theory restrictive enough to render phrase-structure rules superfluous. This question is actually related to the Principle of Full Interpretation proposed by Chomsky (1986) to keep Universal Grammar as a virtually rule-free system.[9] Following Abney's (1987) and Chomsky's (1986) analyses, we specify the licensing conditions for the specifiers and complements in (9) and (10) as follows:

i) The specifier of **D'** is licensed by being assigned a θ-role by **NP** or **QP** and Case-marked by the nominal AGR in the **D**-node.[10]
ii) **NP** and **QP** are licensed through functional selection by **D**.
iii) The measure noun phrase in the specifier position of **N'** and the numeral noun phrase in the specifier position of **Q'** are licensed by being assigned a θ-role and Case-marked by **N** or **Q** under the Uniformity Condition.
iv) The lower DP in (10) is licensed by being θ-marked by **Q** and Case-marked by **of**.

This DP analysis not only covers the noun phrases in (1) and (2) but also accounts for the well-formed English noun phrases exemplified below:

(11) a.	**John's**	**many**	**objections**	b.	**the**	**many**	**objections**
	Spec1	Spec2	N		D	Spec	N
(12) a.	**John's**	**three**	**friends**	b.	**those**	**three**	**friends**
	Spec1	Spec2	N		D	Spec	N
(13) a.	**John's**	**two dozen**	**eggs**	b.	**those**	**two dozen**	**eggs**
	Spec1	Spec2	N		D	Spec2	N
(14) a.	**John's**	**two bunches** of	**flowers**				
	Spec1	Spec2	N				
b.	**Those**	**two bunches** of	**flowers**				
	D	Spec2	N				

(15) a. John's three copies of Chomsky's books
Spec1 Spec2 N DP
b. those three copies of Chomsky's books
D Spec N DP
c. John's three copies of the books by Chomsky
Spec1 Spec2 N DP
d. those three copies of the books by Chomsky
D Spec N DP

(16) a. John's three pounds of Mary's sausages
Spec1 Spec2 Q DP
b. those three pounds of Mary's sausages
D Spec Q DP
c. John's three pounds of the sausages from the store
Spec1 Spec2 Q DP
d. those three pounds of the sausages from that store
D Spec Q DP

2. TWO TYPES OF CHINESE NOUN PHRASES

If the analysis of the two types of noun phrases in English is correct, the null hypothesis is to assume that other languages may also have the two types of noun phrases. As a matter of fact, Chinese does have the two types of noun phrases, as observed by Huang (1982):

(17) a. **Zhangsan-de sanben shu**
Zhangsan's three book
'Zhangsan's three books'
b. **sanben Zhangsan-de shu**
three Zhangsan's book
'three of Zhangsan's books'

(17b) implies that Zhangsan has more than three books, but (17a) does not carry such an implication. In other words, only (17b) has a partitive reading. The two types of Chinese noun phrases are further evidenced by the data examined below.

2.1. Chinese Simple Noun Phrases and 'Pseudopartitives'

A Chinese noun phrase may consist of a quantifier and a head noun, or consist of a numeral/quantifier, a classifier (CL) and a head noun. Its surface order is either quantifier plus head noun, or numeral/quantifier, classifier plus head noun:

(18) a. **wo mai le xudo shu /*shu xudo**
I bought ASP many book/*book many
'I bought many books.'
b. **wo yao san ben shu /*ben san shu**
I want three CL book /*CL three book
'I want three books.'

According to Li & Thompson (1981:105-106), the choice of a classifier is determined by the head noun, and any noun denoting a measure or quantity can be a classifier. So the classifier is actually a measure noun.[11] The following are some other examples of Chinese noun phrases of this type:

(19) a. **shi bang rou**
ten pound meat
'ten pounds of meat'

b. **liang zu xuesheng**
two group students
'two groups of students'

c. **qi da jidan**
seven dozen egg
'seven dozen eggs'

d. **wu ping jou**
five bottle wine
'five bottles of wine'

Like their English counterparts, these Chinese noun phrases can be preceded by a possessive or a determiner:[12]

(20) a. **Wangwu-de xudo pengyou**
Wangwu's many friends
'Wangwu's many friends'

b. **Zhangsan-de/na shi bang rou**
Zhangsan's/that ten pound meat
'Zhangsan's/those ten pounds of meat'

c. **Zhangsan-de/na liang da jidan**
Zhangsan's/that two dozen egg
'Zhangsan's/those two dozen eggs'

d. **Lisi-de/zhei wu ping jou**
Lisi's/this five bottle wine
'Lisi's/these five bottles of wine'

Unlike their English counterparts, these Chinese noun phrases can be preceded by both possessive and determiner:

(21) a. **Zhangsan-de na shi bang rou**
Zhangsan's that ten pound meat
'those ten pounds of meat of Zhangsan's'

b. **Zhangsan-de na liang da jidan**
Zhangsan's that two dozen egg
'those two dozen eggs of Zhangsan's'

c. **Lisi-de zhei wu ping jou**
Lisi's this five bottle wine
'these five bottles of wine of Lisi's'

Comparing the Chinese noun phrases in (18)-(20) with the English counterparts, we can find their similarities in structure. The noun phrases in (18a) and (20a) share the same structure with the English simple noun phrases. The noun phrases in (18b), (19abcd), (20bcd) are organized in the same way as the English pseudo-partitives, except that no **of**-like preposition appears before the head noun in the Chinese noun phrases. Let us put this difference and the noun phrases in (21) aside for a moment, and classify the noun phrases in (18a) and (20a) as Chinese simple noun phrases, and the noun phrases in (18b), (19abcd) and (20bcd) as Chinese pseudo-partitives.

2.2. Chinese 'Partitives'

Besides the simple noun phrase and pseudo-partitive, we can also form a Chinese noun phrase in the following ways:

(22) quantifier + possessive + noun:
xudo Wangwu-de zazhi
many Wangwu's magazine
'many of Wangwu's magazines'

(23) quantifier + determiner + measure noun + noun:
xudo na zhong zazhi
many that kind magazine
'many of that kind of magazines'

(24) numeral + measure noun + possessive + noun
san ben Zhangsan-de zazhi
three copy Zhangsan's magazine
'three copies of Zhangsan's magazines'

(25) num. + measure noun + det. + measure noun + noun
san ben na zhong zazhi
three copy that kind magazine
'three copies of that kind of magazines'

Like their English counterparts, these Chinese noun phrases can be preceded by a possessive or a determiner:

(26) a. **Lisi-de xudo Wangwu-de zazhi**
Lisi-de many Wangwu's magazine
'Lisi's many of Wangwu's magazines'

b. **Lisi-de/na san ben Zhangsan-de zazhi**
Lisi's/that three copy Zhangsan's magazine
'Lisi's/those three copies of Zhangsan's magazines'

c. **Lisi-de/zhei san ben na zhong zazhi**
Lisi's this three copy that kind magazine
'Lisi's/these three copies of that kind of magazines'

Unlike their English counterparts, the Chinese noun phrases in (24) and (25) can be preceded by both possessive and determiner:

(27) a. **Lisi-de na san ben Zhangsan-de zazhi**
Lisi's that three copy Zhangsan's magazine
'Lisi's three copies of Zhangsan's magazines'

b. **Lisi-de zhei san ben na zhong zazhi**
Lisi's this three copy that kind magazine
'Lisi's three copies of that kind of magazines'

Since the noun phrase complement of quantifier or measure noun can have both possessive and determiner, we can form very complex Chinese noun phrases, as shown by the following examples:

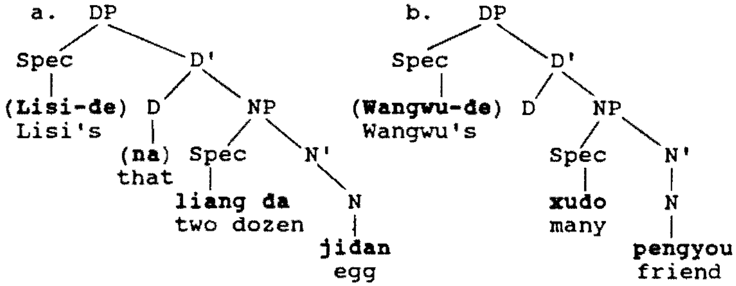
(28) a. **Lisi-de xudo Wangwu-de zhei zhong zazhi**
Lisi-de many Wangwu's this kind magazine
'Lisi's many of Wangwu's magazines of this kind'
b. **Mali-de/zhei san ben Lisi-de na zhong zazhi**
Mary's/ this three copy Lisi's that kind magazine
'Mary's/these three copies of Lisi's magazines of that kind'
c. **Mali-de zhei san ben Lisi-de na zhong zazhi**
Mary's this three copy Lisi's that kind magazine
'Mary's three copies of Lisi's magazines of that kind'

Comparing the Chinese noun phrases in (22)-(26) with the English partitives, we find an exact structural parallelism between them, except that no **of**-like preposition appears after the quantifier or measure noun in the Chinese noun phrases. Let us again put this difference and the noun phrases in (27) and (28) aside for a moment, and classify these noun phrases as Chinese partitives.

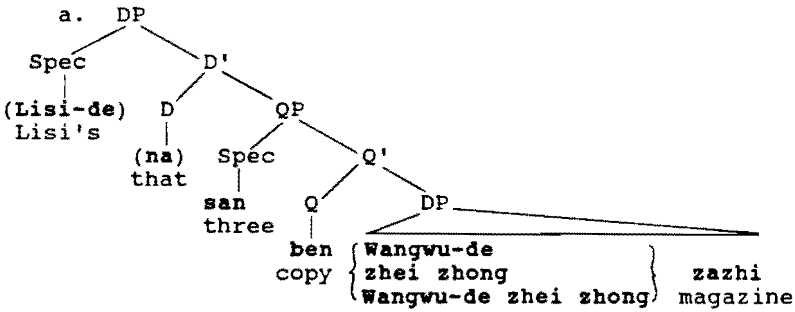
2.3. A DP Analysis of Two Types of Chinese Noun Phrases

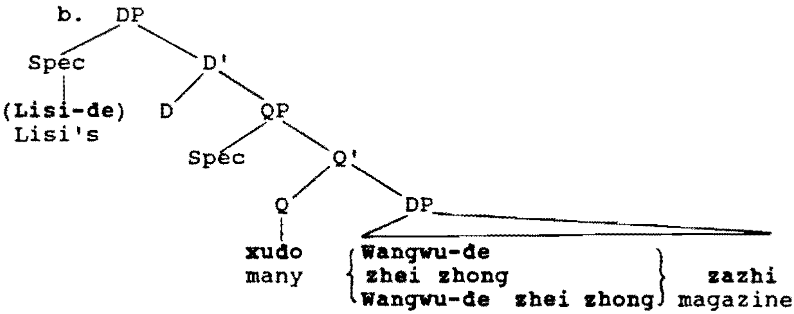
If the classification of Chinese noun phrases into simple /pseudopartitive noun phrases and partitives is correct, then these two types of noun phrases should be captured by the DP analysis presented in Section 1.2. --another null hypothesis. This is exactly what we have expected, and the only cost for such a DP analysis is to hypothesize that the Chinese measure noun, unlike its English counterpart, can assign Case to its complement without the help of an **of**-like preposition. This is illustrated by the following nominal structures suggested for the two types of Chinese noun phrases:

(29) **Structure for Chinese Simple/Pseudopartitive Noun Phrases:**



(30) **Structure for Chinese partitives:**





The nominal structure in (30) is exactly the same as the one in (10) except that the latter has an **of**-preposition between **Q** and its complement **DP** while the former does not. This difference is explained under the above hypothesis that the Chinese measure noun, unlike the English measure noun, can assign Case to its complement. Thus, the **DP** complement in (30) is licensed by being θ-marked and Case-marked by **Q**, while the **DP** complement in (10) is only θ-marked by **Q** but gets Case from the inserted preposition **of**, which is a semantically empty Case-marker allowing the DP to be licensed (Chomsky 1986:192). As for the nominal structure in (29), it is exactly the same as the one in (9), and no further discussion is necessary.[13]

3. AN ARGUMENT FOR CASE-MARKING OF CHINESE MEASURE NOUNS

Following Koopman's (1983) θ-marking and Case-marking parameters and Travis's (1984) head initial/head final parameter, Li (1985) argues that Chinese is basically head-final unless required by Case assignment. In Chinese θ-roles are assigned leftwards, Case is assigned rightwards under government and adjacency, and all Chinese noun phrases obey the Case filter. Take the DP complement of a verb for example. It is base-generated to the left of the verb at D-structure, given the Head-final parameter. This position is both a θ-position and Caseless position under the θ-marking and Case-marking parameters. In order to satisfy the Case requirement, this DP complement has to move to the post-verbal position to get Case from the verb at S-structure, as shown below:[14]

(31) D-Structure:
Ta [$_{VP}$ [$_{V'}$ [$_{DP}$ **Zhangsan-de di-di**] [$_{V}$ **da--le**]]]
he Zhangsan's brother hit ASP
S-Structure:
Ta [$_{VP}$ [$_{V'}$ [$_{V}$ **da--le**] [$_{DP}$ **Zhangsan-de di-di**]]]
he hit ASP Zhangsan's brother
'He has hit Zhangsan's brother.'

In (31), the DP **Zhangsan-de di-di** is base-generated to the left of the verb **da-le** at D-structure and receives a θ-role there from the verb. Since the pre-verbal position is a Caseless position in Chinese, the Case-filter forces the DP **Zhangsan's di-di** to move to the post-verbal position to get Case from the verb **da-le**, which only assigns Case to the right under the Case-marking parameter.

If Li's analysis is correct, it should apply cross-categorically to the subcategorized complement of the measure noun under X'-theory --- a third null-hypothesis. This is also what we expect, and actually is required by the Head-final parameter since the Chinese noun phrase is always head-final (cf. Li 1985). Thus, it is legitimate to claim that in Chinese the DP complement of a measure noun is base-generated to the left of the measure noun at D-structure and receives a θ-role there from the measure noun. Since the prenominal position is a Caseless position in Chinese, the Case-filter forces the DP complement to move to the post-nominal position to get Case from the measure noun, which only assigns Case to the right under the Case-marking parameter:

(32) D-structure:
Lisi-de [$_{QP}$ san [$_{Q'}$ [$_{DP}$ Zhangsan-de shu] [$_{Q}$ ben]]]
Lisi's three Zhangsan's book copy
S-structure:
Lisi-de [$_{QP}$ san [$_{Q'}$ [$_{Q}$ ben] [$_{DP}$ Zhangsan-de shu]]]
Lisi's three copy Zhangsan's book
'Lisi's three copies of Zhangsan's book'

(32) is exactly parallel to (31). Thus, the Case-marking ability of Chinese measure nouns is independently motivated by the Head-final parameter, θ-marking parameter and Case-marking parameter, without stipulating any new mechanism in the theory.

There does remain, however, an unanswered question about the DP analysis of Chinese noun phrases: how to account for the co-occurrence of possessive and determiner in (21), (27) and (28). I have no better solution than assuming that in the Chinese noun phrase either the nominal AGR occupying the empty D-node or the determiner can assign Case to the possessive in the specifier position of D'. This parameter may just have to be stipulated if the DP analysis above is correct.

4. CONCLUSION

In this paper, I have examined two types of noun phrases in English and their structures, and discussed the licensing conditions for their specifiers and complements under a DP analysis. I have argued that the same two types of noun phrases also exist in Chinese, and their structures can be captured under the same DP analysis. Two important issues have been addressed in the paper: the parallel relation between the two types of English and Chinese noun phrases, the Case-marking ability of Chinese measure nouns. First, I have shown the exact parallelism between the two types of English and Chinese noun phrases in syntactic structures. Second, I have proposed that Chinese measure nouns can assign Case to their complements without the help of an **of**-like preposition. This hypothesis is independently motivated by the Head-final parameter, θ-marking parameter and Case-marking parameter. Although there are still certain residual problems and loose ends in the analysis, it is, at least, a plausible attempt to account for the properties and structures of noun phrases cross-linguistically.

NOTES

1. I am grateful to Joseph Aoun, Robert Belvin, Audrey Li, Barry Schein, Dingxu Shi, Jean-Roger Vergnaud & Maria-Luisa Zubizarreta for their valuable comments. Naturally, all errors are my own.

2. The term **'measure noun'** used here includes not only measure nouns, but also quantifiers, group nouns, semi-numerals and any other nouns denoting quantity or measure.

3. Jackendoff (1977:113) proposes a constraint to distinguish between partitives and pseudopartitives, i.e. **"In an of-N''' construction interpreted as partitive, the N''' must have a demonstrative or genitive specifier".**

4. The other evidence includes different interpretations of nonrestrictive relative clauses in association with the two types of noun phrases, the possible absence of **of** from pseudo-partitives and obligatory presence of **of** in partitives, etc..

5. The reason that Selkirk adopts the 3-bar version of X-bar theory is to accommodate the two nominal specifiers which may occur in the English noun phrase:

i. **John's** **many** **objections** (John's = Spec1, many = Spec2)

ii. **those** **three** **weeks** (those = Spec1, three = Spec2)

iii. **John's** **rather large number** **of objections** (John's = Spec1, rather large number = Spec2)

6. For the convenience of illustration, I use the partitive structure suggested by Jackendoff (1977) rather than Selkirk's own, though the two structures are logically equivalent.

7. According to Selkirk (1977), **of** is inserted before **NP** and **N'** in (5) and (6). The same analysis is also assumed by Akmajian and Lehrer (1976).

8. Abney (1987:296) claims that both partitives and pseudo-partitives share the same structure $[_{DP}$ **D** $[_{NP}$ **N** $[_{PP}$ **of DP]]]**, and their distinctions in extraposition can be accounted for by non-structural differences in the of-PP's. See Mallen (1989) for arguments against this analysis.

9. According to the Principle of Full Interpretation, every element in a well-formed structure must be licensed, e.g. the non-maximal projection is licensed internally by X' theory and the maximal projection must be licensed externally by the conditions imposed by grammatical principles (cf. Chomsky 1986).

10. In order to avoid the co-occurrence of possessive and determiner, we adopt Abney's (1987) proposal that the presence of a determiner in the D-node rules out the presence of the nominal AGR under the doubly-filled D filter. Since a possessive in the specifier position of D' gets Case only from the nominal AGR, its absence will render the co-occurrence of possessive and determiner ill-formed.

11. There is independent evidence for the noun status of classifier, i.e. when a classifier appears outside a noun phrase, it behaves exactly like a noun rather than an adjective:

i) **ta shihu <u>hen xing</u>** ***ta shihu <u>yi ben (shu)</u>**
it seems very new it seems one CL (book)
'It seems very new.'

ii) **you <u>yi ben (shu)</u> zai nali** ***you <u>hen xing</u> zai nali**
have one CL (book) over there have very new over there
'There is a copy (of book) over there.'

12. However, a quantifier cannot be preceded by a determiner in the Chinese noun phrase:

***<u>na xudo</u> shu dou you jihao**
that many book all have mark

13. One may wonder why **of** occurs in the specifier position of N' in (9a) since it is not followed by an NP or DP that needs Case-marking. In fact, this preposition is optional and can often be absent from pseudopartitives, as pointed out by Selkirk (1977):

i) **She bought him <u>a dozen daffodils</u>.**
ii) **Can I borrow <u>a couple sheets</u> of paper**?
iii) **A pound cake is <u>one pound butter</u>, <u>one pound sugar</u>, <u>one pound eggs</u> and <u>one pound flour</u>.**

But **of** is never allowed to be absent from partitives:

iv) ***She bought him <u>a dozen the daffodils</u>.**
v) ***Can I borrow <u>a couple the sheets</u> of the paper**?
vi) ***A pound cake is <u>one pound the butter</u>, <u>one the pound sugar</u>, <u>one pound the eggs</u> and <u>one pound the flour</u>.**

14. However, Li (1985) claims that Chinese nouns do not assign Case to their complements, so they must occur in prenominal position either with a preposition or in the specifier position of N'. Although this claim is correct with respect to Chinese nouns which do not subcategorize complements, it is falsified by the Chinese nouns which do subcategorize complements, such as measure nouns and deverbal nouns. See Zou (forthcoming) for discussion.

REFERENCES

Abney, S. (1986) "Functional Elements and Licensing" Talk presented at GLOW, Gerona, Spain.

Abney, S. (1987) **The English Noun Phrase in its Sentential Aspects**, MIT Dissertation.

Akmajian, A. & Lehrer, A. (1976) "NP-like Quantifiers and the Problem of Determining the Head of an NP" LINGUISTIC ANALYSIS 2, 395-413.

Bowers, J. (1987) "Extended X-bar Theory, the ECP and the Left Branch Condition", WCCFL.

Chomsky, N. (1986) **Knowledge of Language: Its Nature, Origin and Use**, New York, Praeger.

Fukui, N. & Speas, M. (1986) "Specifiers and Projection" MIT Working Papers 8, Cambridge, Massachusetts.

Huang, C.-T. (1982) **Logical Relations in Chinese and the Theory of Grammar**, MIT Dissertation.

Jackendoff, R. (1977) **X' Syntax: A Study of Phrase Structure**, MIT Press, Cambridge, Massachusetts.

Koopman, H. (1983) **The Syntax of Verbs: from Verb Movement in the Kru Languages to Universal Grammar** McGill University Dissertation.

Li, Y. H. (1985) **Abstract Case in Chinese**, USC Dissertation.

Li, C. & Thompson, S. (1981) **Mandarin Chinese -- A Functional Reference Grammar**, UC Press.

Mallen, E. (1989) **The Internal Structure of Determiner Phrase**, Cornell University Dissertation.

Selkirk, E. (1977), "Some Remarks on Noun Phrase Structure", in Akmajian, A. & Culicover, P, & Wasow, T. (eds), **Formal Syntax**, Academic Press.

Travis, L. (1984) **Parameters and Effects of Word Order Variation**, MIT Dissertation.