

# High Desert Linguistics Society



Proceedings of the Third Annual  
High Desert Linguistics Society  
Conference  
April 7-9, 2000

Albuquerque, New Mexico

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K. Aaron Smith and Dawn Nordquist

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The HDLS was proud in 2000 to continue the tradition of the annual High Desert Linguistics Society Conference with its third meeting, held from April 7<sup>th</sup> through the 9<sup>th</sup> on the University of New Mexico campus. The HDLS conference began as a coordinated effort of the graduate student body in the linguistics department at the University of New Mexico. The conference was begun “to provide a forum in which students and other presenters meet to exchange ideas, research, and criticism in the spirit of collegiality and support”.

An academic conference comes together only through the effort of many individuals. The HDLS would like to thank John Haiman and Colette Grinevald for their high-quality and thought-provoking keynote talks during the conference. We also extend our thanks to the chair of the Linguistics Department at the University of New Mexico, Joan Bybee, for her on-going support of the HDLS and for her efforts this year in arranging for our keynote speakers. Additionally, we would like to thank the faculty of the linguistics department, and especially the faculty advisor to the HDLS, Caroline Smith, for their support in our efforts to organize and carry out the conference. Thanks are also due to the officers of the HDLS, President, K. Aaron Smith, Vice President, Dawn Nordquist, and Treasurer, Catie Berkenfield. We offer a special thank-you to Catie Berkenfield for organizing the end-of-conference party for which she welcomed participants and discussants into her home. The HDLS would also like to thank Barbara Shaffer for organizing the interpreting. We also wish to acknowledge the abstracts committee: Barbara O’Dea, Dawn Nordquist, Anna Vogel Sosa, Catie Berkenfield, and K. Aaron Smith.

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# PHONOLOGICAL REDUCTION IN FREQUENCY-BASED CONSTITUENTS: THE ALTERNATION OF ENGLISH 'OF'

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## 1. INTRODUCTION.

What are constituents in language, and what are the mechanisms by which these constituents are formed? Can two-word collocations or larger phrases be stored holistically in memory? It has been suggested that language use (as opposed to syntactic structure) determines constituency (Bybee and Scheibman 1999). According to this view, frequency is the mechanism which facilitates cohesion and the development of storage and processing units. Furthermore, certain phonological processes provide evidence for the holistic nature of these processing units.

This paper focuses on the deletion of the coda consonant /v/ in the very frequent English function word *of*.<sup>1</sup> It is obvious through casual observation that this consonant is often deleted, resulting in forms such as 'kinda' and 'sorta'. In fact, the reduced forms 'kinda' and 'sorta' are listed in the OED and defined as colloquial shortenings of the adverbial uses of these phrases. This reduction results in an alternation between the reduced and the full variants.<sup>2</sup>

The goal here is to investigate this alternation in order to establish factors contributing to the maintenance or loss of the final consonant. Specifically under investigation is the role of various collocational effects on the deletion of the coda consonant of *of*. That is, is the reduction of *of* affected by the fact that it precedes, follows, or is surrounded by specific lexical items? The word *of* in English is a very frequent function word. Like other frequent grammatical morphemes in English (*the, a, it, to* etc.), its presence is dictated by the syntactic structure of the utterance. These words occur in fixed grammatical constructions and provide little, if any, semantic content. In a sense, they are merely phonological material associated with specific constructions (Bybee to appear: 148). While these frequent function words maintain full or basic forms that can be used in specific linguistic and contextual situations, they have a tendency to display a wide range of phonetic variability. Specifically, they are very likely to undergo phonological reduction. The reductive tendencies of these frequent function words as well as their high degree of phonetic variability are characteristics they share with word-internal morphemes. In many ways these function words, which are for the most part maintained as independent items in the orthography of English, behave more like morphemes in morphologically complex words than they do like phonologically independent words.

In general, words tend to have only a small range of phonetic variation, while individual morphemes in morphologically complex words often exhibit a great deal of variability from word to word (Bybee to appear). Compare, for example, the realization of the root morpheme in pairs such as *loaf/loaves* and *decide/decision*, or the phonetic variation apparent within the negative prefix /in/ in the following words: *impossible, independent, infamous, and incomplete*. As these words demonstrate, individual morphemes can have very different pronunciations depending on the various constructions (in this case words) in which they occur. This characteristic is shared by frequent function words, leading to the hypothesis that these function words, as they occur in frequent collocations and phrases, are in fact comparable to the individual morphemes of morphologically complex words. Furthermore, these collocations and phrases of which *of* is constituent may, depending on frequency of use, be stored in memory as single, holistic units. Within these storage units, certain 'word-level' phonological processes

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<sup>1</sup> According to Francis and Kučera (1982), *of* is one of the ten most frequent words in the English language.

<sup>2</sup> Of course, there is a great deal more variation possible than just the deletion or maintenance of the final consonant.

Jurafsky, Bell, Fosler-Lussier, Girand and Raymond (1998) list [★], [⊕], [⊖], [✕], [⊗] as possible vowel variants. This variation, however, will not be considered here.

are likely to occur. The likelihood of phonological reduction within the unit increases with frequency of use as the production becomes routine and automated. This association between frequency of use or *string frequency* (Krug 1998), holistic memory storage and phonological reduction form the basis for Hypothesis 1.

**Hypothesis 1: The coda consonant of *of* is more likely to be deleted in the most frequent collocations involving *of*.**

## 2. METHODS.

In order to test this hypothesis, a very large corpus of spoken American English was consulted. The Switchboard corpus of telephone conversations, available via the Internet from the Linguistic Data Consortium at the University of Pennsylvania, was the source for all data in this study. The corpus contains 2430 telephone conversations between strangers. The participants are both male and female; all are adults; and they are from various geographical regions of the United States. The conversations average six minutes each for a total of about 3 million words. Unless otherwise specified, frequency counts were achieved using a tagged corpus search of the entire Switchboard database.

Fourteen conversations, totaling about 100 minutes, were selected from the database for this study. Tokens of *of* were taken from 28 different speakers. The age and geographical association of the speakers is not known. Each utterance containing *of* was downloaded in MicrosoftWAV format and coded using the Speech Analyzer computer program for PC's. Both the waveform and the spectrogram were used to determine whether the final consonant was present or not. To test the first hypothesis 201 tokens of *of* were used. Each token was coded as reduced or non-reduced; the overall duration or quality of the vowel was not considered.

## 3. RESULTS.

Table 1 shows the pattern of reduction for the 201 tokens in the initial sample. Additionally, Table 1 divides the tokens into three categories: (1) preceding a word starting with a consonant segment, (2) preceding a word with an initial vowel segment and (3) those which were followed immediately by a pause. All pauses were at least 50ms in duration. Overall 92 tokens, or 46% of all the tokens, were reduced. Before consonants, 89 tokens (68%) were reduced. Before vowels, 3 tokens (6%) were reduced. Before a pause, there were no reduced forms in the data.

	REDUCED	NON-REDUCED	TOTAL
<b>Before C</b>	89 (68%)	42 (32%)	131
<b>Before V</b>	3 (6%)	47 (94%)	50
<b>Before pause</b>	0	20 (100%)	20
<b>TOTAL</b>	<b>92 (46%)</b>	<b>109 (54%)</b>	<b>201</b>

TABLE 1: NUMBER AND PERCENTAGE OF DELETION OF CODA CONSONANT BEFORE CONSONANT, VOWEL AND PAUSE.

Table 2 lists the six most frequent collocations with *of* and gives their token frequency in both the present data set and the entire Switchboard corpus. The two most frequent collocations in both the present data and the Switchboard corpus were *kind of* and *lot of*.<sup>3</sup> In the present data, there were an additional five collocations with token frequency above 3 (*sense of*, *type of*, *all of*, *most of*, *invasion of*), but none had frequency above 10 and all had frequency below 500 in the entire Switchboard corpus.

<sup>3</sup> *Lot of* occurred primarily in the larger construction, *a lot of*.

	PRESENT DATA	SWITCHBOARD
<b>kind of</b>	26	3,592
<b>lot of</b>	34	3,223
<b>one of</b>	11	1,307
<b>out of</b>	4	1,057
<b>sort of</b>	6	973
<b>some of</b>	3	887

TABLE 2: TOKEN FREQUENCY IN PRESENT DATA AND ENTIRE SWITCHBOARD CORPUS OF COLLOCATIONS WITH SWITCHBOARD TOKEN FREQUENCY ABOVE 500.

In the present data, 81 different words preceded *of* and 92 different words followed *of*. The most frequent item to follow *of* was *the*, which occurred 4,103 times in the entire corpus and 19 times in the coded data. The next most frequent items to follow *of* were *a*, *it* and *them* (often pronounced with a vowel initial segment, ‘em’). The Switchboard token frequency of these items is 1002, 917 and 784, respectively.

Table 3 gives the rates of reduction for the two most frequent collocations, *kind of* and *lot of*. The coda consonant of *of* was deleted in 18 out of 26 tokens of *kind of*, an overall reduction rate of 69%. In the collocation *lot of*, *of* was reduced in 21 out of 34 tokens for a deletion rate of 62%. Before consonants the reduction rate was 95% for *kind of* and 80% for *lot of*.

		REDUCED	NON-REDUCED	TOTAL
<b>kind of</b>	before C	18	1	19
	before V	0	4	4
	before P	0	3	3
	<b>TOTAL</b>	<b>18 (69%)</b>	<b>8 (31%)</b>	<b>26</b>
<b>lot of</b>	before C	20	5	25
	before V	1	3	4
	before P	0	5	5
	<b>TOTAL</b>	<b>21 (62%)</b>	<b>13 (38%)</b>	<b>34</b>

TABLE 3: DELETION OF CODA CONSONANT IN TWO MOST FREQUENT COLLOCATIONS WITH ‘OF’.

	REDUCED	NON-REDUCED
<i>kind of</i> and <i>lot of</i>	65% (N=39)	35% (N=21)
all other collocations	38% (N=55)	62% (N=88)

TABLE 4: CROSS-TABULATION OF REDUCTION IN TWO MOST FREQUENT COLLOCATIONS VS. ALL OTHER INSTANCES OF *OF*. *Difference is significant (p<.001)*

#### 4. DISCUSSION.

The prediction made in hypothesis 1 is supported by the present data. Table 4 shows that the coda consonant of *of* was deleted at an overall higher rate in the two most frequent collocations (65% reduced), than it was in all other occurrences (38% reduced). This difference is significant (T-test, one-tailed;  $p<.001$ ). The hypothesis was also supported when looking at reduction only in the environment before consonants. Before words beginning with a consonant, *of* was reduced 86% of the time in *kind of* and *lot of* and only 59% of the time in all other collocations. The difference in this environment was also significant (T-test, one-tailed;  $p<.001$ ).

The data support the influence of a frequency effect on the reduction of *of* in natural conversation. It is reduced more in the most frequent collocations, indicating that these frequent strings are present in storage as holistic units. These cohesive units behave like words; they are subject to word-level phonological processes such as reduction. Not only is the coda consonant of *of* frequently deleted, but



other reductive processes occur within these units as well. Flapping occurs between *lot* and *of* and the alveolar stop /d/ is frequently deleted in *kind of*, resulting in the frequent pronunciation [kɪndə].<sup>4</sup>

Even greater than the effect of collocational frequency, however, is the effect of the following segment. Looking at Table 5, we see that 97% (N=89) of the reduced forms occurred before a consonant, while only 3% (N=3) occurred before a vowel, and there were none before a pause. Obviously, the conditioning environment for this reduction is a following consonant-initial word. These findings are consistent with the results of a study by Jurafsky, Bell, Fosler-Lussier, Girand and Raymond (1998), in which they found that the coda consonant of *of* was 17 times more likely to be retained before a vowel than before a consonant. Their conclusions were based on the analysis of 586 tokens of *of*, also from the Switchboard corpus of American English.

	REDUCED	NON-REDUCED
<b>Before C</b>	89 (97%)	42 (39%)
<b>Before V</b>	3 (3%)	47 (43%)
<b>Before pause</b>	0	20 (18%)
<b>TOTAL</b>	<b>92 (100%)</b>	<b>109 (100%)</b>

TABLE 5: NUMBER AND PERCENTAGE OF REDUCED AND NON-REDUCED FORMS BEFORE CONSONANT, VOWEL AND PAUSE.

Given the overwhelming effect of the following segment on the reduction of *of*, it is tempting to consider an environmentally conditioned allomorphic account of the alternation in question. Such an account is often given to describe the variation in the realization of the English definite article. It is frequently noted by phoneticians and prescribed by English teachers that the English definite article *the* has two variants, one with a full vowel [ðe] and one with a reduced vowel [ðə] (Keating et al. 1994). The reduced variant is used before a word beginning with a consonant while the full variant occurs before words beginning with a vowel. This distribution has long been noted anecdotally and is supported by the findings of Keating et al. (1994), in which they analyzed tokens of *the* taken from the TIMIT database of spoken American English.<sup>5</sup> They found that the quality of the vowel was highly dependent on the initial segment of the following word. Before a word beginning with a vowel segment, the definite article was pronounced [ðe] approximately 93% of the time. The reduced vowels [ə] and [ɪ] were the most common vowels before words beginning with consonants; they occurred approximately 85% of the time in this environment.

An allomorphic account of the [ðə]/[ðe] alternation, conditioned by the initial segment of the following word, goes a long way in explaining the observable variation. Certainly it accounts for the 94% retention rate of the coda consonant in the pre-vocalic position and the 100% retention rate before a pause. This type of account, however, does not contribute to the explanation of the variation found in the pre-consonantal position. In this environment, the coda consonant is deleted only 68% of the time, implying that it is frequently retained (in 42 out of 131 tokens) even when it precedes a word beginning with a consonant. This variation suggests that the deletion of /v/ in *of* is perhaps a change in progress and that other factors are influencing the progression of this deletion. Given that the prediction made in hypothesis 1 is supported, it seems that any thorough account of this alternation must consider both the phonetic environment as well as the possibility that the alternation is conditioned in part by lexical frequency factors.

The observation that *of* is reduced more in the most frequent collocations leads to the prediction that deletion of the coda consonant might spread to instances of these phrases which occur outside of the conditioning environment, that is to say in pre-vocalic and pre-pausal positions. Assuming an exemplar

<sup>4</sup> In these cases, the deletion of /d/ in *kind of* is occurring pre-vocalically, which is not the usual environment for word-final *t/d* deletion. Usually the conditioning environment for final *t/d* deletion is between two consonant segments (Neu 1980: 45).

<sup>5</sup> The OED makes the distinction, listing [ðə] as the proper pronunciation before consonants and [ðe] as the pronunciation before vowels.

model of lexical representation in which each token of the phrase is stored in memory, this spread to other environments would be encouraged by the fact that both *kind of* and *lot of* occur with greater frequency preceding a consonant than they do preceding a vowel (Bybee to appear). Table 3 shows that a consonant is more than five times as likely to follow these collocations than is a vowel (44 tokens before a consonant vs. only 8 tokens before a vowel). Given that *of* is frequently reduced before a consonant in *kind of* and *lot of* and that these phrases occur much more often before consonants, the reduced variants would likely be the most frequent variants and therefore have a stronger lexical representation than the non-reduced variant. Due to the strength of the representation and the ease of recall, the reduced variant of these frequent collocations may come to be used in all environments. This, however, does not appear to be the case for these collocations. The coda consonant of *of* is reduced only once preceding a vowel in these two frequent collocations.<sup>6</sup>

Since the reduction of these phrases does not appear to have spread to instances of the collocation before a vowel or before a pause, perhaps these frequent collocations have not one, but two mental representations, one variant [ɛ̃ɔ̃ɛr■ɔ̃★] before a consonant and another [ɛ̃ɔ̃ɛr■ɔ̃★❖] before a vowel. If this were the case, one would expect a situation with very stable alternation in these most frequent collocations.

**Hypothesis 2: The most frequent collocations involving *of* will exhibit a more stable alternation pattern, with the non-reduced variant occurring exclusively before a vowel or before a pause.**

In order to investigate this hypothesis, additional tokens of seven different collocations, with a range of token frequencies, were downloaded and coded. Tokens of *kind of*, *lot of*, *out of*, *sort of*, *lots of*, *rid of* and *all kinds of* were included in this analysis. They are listed here in order of descending token frequency as taken from the entire Switchboard corpus. Table 6 shows the pattern of deletion of the coda consonant of *of* for these collocations before a consonant and before a vowel. Consistent with the previous data set, there were no reduced variants occurring before a pause. The bolded lines show the rate of reduction in the environment before a consonant. The Switchboard token frequency of each collocation is listed in parentheses below the phrase.

		<b>REDUCED</b>	<b>NON-REDUCED</b>
<b>kind of</b>	<b>before C</b>	<b>95%</b> (N=42)	<b>5%</b> (N=2)
(3592)	before V	9% (N=1)	91% (N=10)
<b>lot of</b>	<b>before C</b>	<b>67%</b> (N=40)	<b>33%</b> (N=20)
(3223)	before V	1 (13%)	7 (86%)
<b>out of</b>	<b>before C</b>	<b>59%</b> (N=16)	<b>41%</b> (N=11)
(1057)	before V	0	100% (N=7)
<b>sort of</b>	<b>before C</b>	<b>35%</b> (N=8)	<b>65%</b> (N=15)
(973)	before V	14% (N=2)	86% (N=12)
<b>lots of</b>	<b>before C</b>	<b>72%</b> (N=21)	<b>28%</b> (N=8)
(172)	before V	0	100% (N=5)
<b>rid of</b>	<b>before C</b>	<b>50%</b> (N=4)	<b>50%</b> (N=4)
(113)	before V	0	100% (N=5)
<b>all kinds of</b>	<b>before C</b>	<b>93%</b> (N=14)	<b>7%</b> (N=1)
(101)	before V	0	100% (N=3)

TABLE 6: PERCENT REDUCTION OF *OF* BEFORE C AND BEFORE V IN 7 COLLOCATIONS INVOLVING *OF*.

The most frequent collocation, *kind of*, displays very stable alternation; the coda consonant of *of* is regularly reduced before a consonant (95% of the time) and is maintained before a vowel (91% of the time). This pattern suggests, as was hypothesized, that speakers have two representations for *kind of* stored in the lexicon, one variant [ɛ̃ɔ̃ɛr■ɔ̃★] for the pre-consonantal environment and another variant [ɛ̃ɔ̃ɛr■ɔ̃★❖] used before vowels and pauses. This supports an allomorphic account of the

<sup>6</sup> This reduction occurs in the utterance, “a lot of allergies”.

alternation based on phonetic environment, but for the alternation between *kinda* and *kind of* rather than for *of* as an independent unit.

The other collocations, however, do not display the predicted pattern. The other three frequent phrases, *lot of*, *out of*, and *sort of*, do not exhibit a stable pattern of alternation; the coda consonant of *of* is not deleted regularly in the environment before a consonant (only 67%, 59% and 35%, respectively). Also, the relatively infrequent collocation *all kinds of*, exhibits a stable alternation pattern similar to *kind of*, with regular reduction (93%) before a consonant. With the exception of *kind of* there does not appear to be a correlation between token frequency of the collocation and a pattern of stable and consistent alternation.

Interestingly, while coding these tokens it became apparent that the nature of the reduction was often different in the *kind of* and *all kinds of* collocations. The tokens of these two phrases were very easy to code; it was usually quite evident that the /v/ was in fact deleted before a consonant and retained before a vowel. On the other hand, it was sometimes difficult to determine whether the /v/ was deleted or not before a consonant in the other collocations. This suggests to me that in the other tokens, the perceived deletion of /v/ before a consonant was frequently due to the effect of acoustic masking caused by the reduction in magnitude and overlapping of the articulatory gestures (Browman and Goldstein 1992). That is, the /v/ was physically present, but acoustically covered up due to phonetic processes of rapid, casual speech. In *kind of* and *all kinds of*, however, the coda consonant appeared to be entirely absent before a consonant, not just covered up by the following gesture. This further suggests that for these collocations there are in fact two mental representations, one with and one without a final fricative. This observation about the nature of the reduction in these phrases is of course impressionistic. It would, however, be possible to confirm this impression by measuring the formant values at the offset of the vowel of *of* in order to determine if the acoustic effect of a transition to a labial consonant is present. Although I was not able to conduct this experiment for the present study, I believe that experimental results would confirm this observation.

The stable alternation pattern exhibited by the most frequent collocation with *of* (*kind of*) and a closely related phrase (*all kinds of*) lead me to conclude that these collocations are stored in memory as single units, and furthermore that they each possess two representations. Given that *all kinds of* occurs relatively infrequently, it seems possible that its stable pattern of alternation is due to a close phonological and semantic association with the very frequent and highly similar collocation, *kind of*.

Previous research has found that the predictability of occurrence of a particular word can affect its production. Jurafsky et al. found that, "In general, greater predictability increases the likelihood of reduction." (Jurafsky et al. 1998: 3) Specifically they found a significant effect of predictability on the deletion of the coda consonant of *of*. If *of* is highly predictable in a certain context, this implies that it frequently occurs in that environment. For example, if *of* is highly predictable after *kind*, we can assume that *of* frequently follows *kind*. As we have seen, this is in fact the case. In the Switchboard corpus *kind* occurs 3,708 times and *of* follows it 3,592 of these times. In other words, given *kind*, 97% of the time *of* will be the next word. It seems likely, that items that occur together with this degree of predictability are probably chunked, and stored as cohesive units. And in fact, this is exactly how Jurafsky et al. (1998) explain the significant effect of predictability on the deletion of the coda consonant of *of*: in terms of frequent collocations and constructions. They too find that the /v/ is more likely to be deleted in phrases such as *kind of* and *lots of*, suggesting to them that this type of construction, which they refer to as the partitive construction, may be stored as a mental routine. Considering the great deal of variation that I found between different examples of this type of phrase (specifically the large difference in reduction between *kind of* and *sort of*), I am not inclined to argue for the storage of the partitive construction as a whole, as suggested by Jurafsky et al. (1998), but rather for each collocation individually.

The low rate of reduction in *sort of* requires additional explanation. This collocation has relatively high string frequency (973) and *of* is highly predictable after *sort* (occurring 94% of the time) yet the reduction rate in the environment before a consonant is quite low (35%). Additionally, its discourse function is almost identical to that of *kind of*. Both phrases are used primarily as parenthetical qualifiers expressing hesitation on the speaker's part or adverbially meaning "somewhat" or "to some

extent". Neither contributes much in the way of semantic content. Some typical examples of utterances with *kind of* and *sort of* are provided here:

<i>sort of</i>	<i>kind of</i>
She sort of went bananas...	I kind of pull for Dallas...
...they sort of give up hope...	We kind of want a 4-door...
I sort of had planned to ...	I was kind of wondering...
I'm just sort of acclimated...	...was kind of interesting...

Two possible explanations include the effect of the following environment and perhaps an historical argument. At least in the present data, *sort of* occurred with much more frequency before a vowel than did *kind of*. *Sort of* was followed by a vowel-initial word 38% of the time, while *kind of* occurred before a vowel only 15% of the time. The strength of the exemplars of *sort of* which retain the coda consonant due to their pre-vocalic position perhaps inhibits the reduction of this collocation in the environment before a consonant.

Another possible explanation stems from the fact that *sort of* is a much younger form than *kind of*. *Sort* comes into English from Old French and is first attested in this construction with this meaning in 1703 (OED, 2<sup>nd</sup> Edition). *Kind*, on the other hand is a very old form stemming from Proto-Germanic and is first attested in this construction in 1400. *Kind of* has had longer to undergo reductive processes allowing the phonetic variants to become entrenched in the different environments in which they occur. Additional investigation would be necessary in order to substantiate this argument. One conclusion is possible; for whatever reason, *sort of* does not have dual lexical representation as *kind of* appears to.

## 5. CONCLUSION.

The results presented here indicate that the collocational frequency of *of* and the item immediately preceding it has a significant effect on the deletion of the final consonant of *of*. *Of* is significantly more likely to be reduced in the collocations in which it occurs most frequently, *kind of* and *lot of*. These findings support the hypothesis that these frequent collocations form linguistic units and are stored holistically in memory. Additionally, for the most frequent collocation (*kind of*), a very stable alternation between reduced and non-reduced variants conditioned by the following segment suggests dual representation for this phrase. This investigation provides further evidence that not only may morphologically complex words be stored holistically (Losiewicz 1992), but so too may certain frequent phrases, constructions and collocations.

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# INCORPORATION: AGREEMENT, DISCOURSE AND THETICITY

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## 1. INTRODUCTION.

The phenomenon of ‘noun incorporation’, illustrated in (1b) (from Baker 1996), occurs when an argument of a predicate appears morphologically fused to the predicate itself. In this example, from Mohawk, the direct object of the verb ‘*whar* ‘meat’ is incorporated into the verb *nut* ‘feed’. The unincorporated form is shown in (1a). There are some well-known restrictions on which arguments may appear incorporated into the verb. First, subject arguments, most notably agents, resist incorporation (2). Direct objects allow incorporation quite freely.

- (1) a. O-'wahr-u i-hse-nut ne erhar  
NsO-meat-NSF 0-2sS-feed NE dog  
Feed the dog some meat.
- b. Se-'wahr-a-nut ne erhar  
2sS-meat-0-feed NE dog  
Feed the dog some meat.
- (2) \*Ye-wir-nuhwe-s ne ka-nuhs-a  
3FS/3N-baby-like NE PRE-house-SUF  
The baby likes the house.

Interestingly, indirect objects do not allow incorporation (3). What makes this restriction so curious is that the indirect object takes on many of the formal characteristics of the direct object. For example, verbs show agreement with direct object except in the double object construction; here, the verb agrees with the indirect object, as in example (4). The verb shows agreement with the first person indirect object and not the third person direct object.

- (3) \*O-'wahr-u se-nahskw-a-nut  
NsO-meat-NSF 2sS-pet-0-feed  
Feed the pet some meat!
- (4) Wa-hak-u-  
FACT-MsA/1sO-give-punc  
He gave it to me.

I claim that in order to understand the restriction on incorporation with indirect objects, we need first to understand the thematic/categorical distinction in judgement forms. I will show that incorporated objects share many of the syntactic, semantic and discourse properties of thematic subjects.

## 2. THE THETIC/CATEGORICAL DISTINCTION.

The thematic/categorical distinction comes from the nineteenth century philosophers Brentano and Marty. Sentences are considered to express either of two kinds of judgment forms. With a categorical judgment, the subject is singled out, providing a predication base. A property is then ascribed to this subject. Since this singling out and subsequent property ascription

involves two acts, this judgment is often called the double judgement form (for more discussion, see Sasse 1987; Lambrecht 1994). In the following sentences from a variety of languages, we see sentences which express a categorical judgment that are replies to the context question ‘How’s your neck?’. Because the context question sets up ‘neck’ as a topic of conversation, it is this item which is singled out. These examples come from Lambrecht (1994).

- (5) How’s your neck?
- a. My neck HURTS.
  - b. Il collo mi fa MALE (Italian)
  - c. Kubi wa ITAI (Japanese)

In English, the categorical judgment form has the predicates accented and the subject without an accent; Italian is similar in this respect. For Japanese, the subject has the ‘wa’ marker and the predicate is accented.

With athetic judgment form, the subject is not singled out. Here, the clause expresses the existence of an event or state in which the subject is introduced as a participant. Because there is only one cognitive act, that of recognizing an event or state, this judgment form is also called the single judgment form (Sasse 1987; Lambrecht 1994). In the following sentences, we see the thetic counterparts to the categorical forms expressed above. Here, the context question does not set up any presupposed constituent that would qualify as the topic of conversation.

- (6) What’s the matter?
- a. My NECK hurts.
  - b. Mi fa male il COLLO (Italian)
  - c. KUBI ga ITAI (Japanese)

The thetic judgement forms have a rather different formal expression than the categorical sentences. In English, instead of accenting the predicate with no accent on the subject, we see the reverse; the subject is accented and the predicate is unaccented. The subject remains preverbal, however. In Italian, we see a different word order; although the subject is accented it appears to the right of the verb. Lastly, in Japanese we see ‘ga’ marking on the subject, as well as accenting on the subject and predicate.

It should be noted that only sentences expressing categorical judgment forms correspond to the Aristotelian bipartite subject/predicate distinction, in which the subject is traditionally considered to be what the sentence is about and the predicate is what is said about the subject. Because of this, I will also use consider the distinction to be a distinction in predication forms. Likewise, categorical judgment forms correspond to topic-comment sentences, with the subject providing the topic. With the thetic judgment form, on the other hand, the subject is not a topic; in fact, such sentences have also been considered to be ‘topicless’ providing ‘all new’ information (Sasse 1987; Lambrecht 1994).

With this background in the thetic/categorical distinction, we can now turn to incorporation and see how thetic subjects are similar to incorporated objects.

### 3. PARALLELS BETWEEN THETIC SUBJECTS AND INCORPORATED OBJECTS.

There are several syntactic, semantic and discourse parallels between thetic subjects and incorporated objects. From the perspective of information packaging in the discourse, we see that thetic subjects have a similar relationship to the event described by the verbal predicate as incorporated objects. Recall that in a thetic predication form, the subject noun phrase is not singled out from the event; the subject and verbal predicate are presented as an unanalyzed, single unit. The hearer's attention is drawn to the event or state itself. Similarly, with incorporated objects, the object is also not separated out. Mithun (1984) and Hopper and Thompson (1980) consider that nouns which are incorporated are less individuated with respect to event described by the verb. Mithun (1986) states that incorporated nouns are often "parts of complex verbs denoting conceptually unitary activities."

Secondly, there is a distinction in agreement between thetic and categorical subjects. Sasse (1987) discusses several ways in which languages can mark the lack of a predication between the subject and predicate in a thetic form. One of these ways is through agreement or lack of agreement. While categorical forms show agreement between the subject and the verb, thetic forms can show a lack of agreement. This can be illustrated with English 'there' existential constructions, which express only a thetic predication. While such constructions also show an inversion of the finite verb and subject that so often characterizes the thetic form, in some dialects they can also show a lack of agreement between the subject and the finite verb. The following sentence is grammatical in some dialects of English.

(7) There's some birds in the yard.

Here, the subject is plural and located postverbally. We see that the finite verb which has undergone contraction is 'is', a singular verb form.

Likewise, in languages which show object agreement and incorporation, when the object incorporates, the verb does not necessarily agree with its object. The following examples are from Mohawk (Baker 1996). In the (a) example, the object is not incorporated and the verb shows object agreement; the portmanteau morpheme 'shako' indexes both the third person masculine subject and a third person plural object. In the (b) example, the object has been incorporated, and there is no longer any verb-object agreement. Here, we see the morpheme 'ra', which indexes only the subject.

- (8) a. Shako-nuhwe'-s (ne owira'a)  
 MsS/3pO-like-HAB NE babies  
 He likes them (babies).
- b. Ra-wir-a-nuhwe'-s  
 MsS-baby-0-like-HAB  
 He likes babies.

Of course, there is some cross-linguistic variation in this regard. Baker (1996) shows that in some languages, the verb still agrees with the incorporated object. But this does not detract from the argument made here, because it is not required that thetic subjects do not show agreement; the above examples of thetic clauses from a variety of languages do show agreement with the verb. The point to be made here is that when there is a formal difference between incorporated and unincorporated clauses, these parallel those differences that also show up with categorical and thetic forms.

Third, there is sometimes a semantic difference between thetic and categorical subjects. Categorical subjects, as topics, are usually familiar, referential and specific. Nonreferential, nonspecific subjects cannot be the subject of a categorical predication; in these cases, we have a



thetic predication. Though it is not the case that a thetic predication must contain a nonspecific, nonreferential subject (cf. the above examples of a thetic predication involving the definite ‘my neck’ as a subject), in some constructions involving a thetic predication, we do see such a requirement. Turning again to ‘there’ existentials in English, we see that here, the subject is required to be nonspecific; a specific, definite subject is awkward here (Milsark 1974).

(9) There is a bird/?the bird in the yard.

In many languages, incorporated nouns also show a tendency towards nonreferentiality. In some languages, this is a requirement. Thus, in West Greenlandic, the incorporated object must receive an indefinite or nonreferential reading; it cannot be interpreted as a definite noun phrase. This data comes from Bittner (1994) and van Geenhoven (1998).

(10) Juuna            allagar-si-v-u-q  
 Juuna.abs        letter-get-IND-[-tr]-3sg  
 Juuna got a letter/letters.

Again, though, we do not see this requirement in all cases of incorporation. Baker (1996) shows that Mohawk does not have such a definiteness requirement on incorporation; the incorporated noun can get either a definite or indefinite reading. But like the agreement facts discussed above, this does not detract from the claim. Not all thetic subjects receive an indefinite reading, only in certain cases of thetic predication do we see such a requirement. Likewise, not all incorporated objects receive an indefinite reading; only in certain cases of incorporation do we see such a requirement.

Lastly, and most importantly, we do see cases where incorporation of the subject gives a thetic clause. While in general subjects do not incorporate, especially if the verb is transitive, there have been instances of incorporated subjects involving intransitive verbs. Baker (1987, 1996) considers that these cases of incorporated involve ‘unaccusative’ verbs, in which the surface subject is generated as an underlying object. Sasse (1987) observes that when a subject incorporates, there is a thetic predication. He presents the following sentences from the West African language Boni. In the first sentence, there is no focus particle and the sentence expresses a thetic judgment. This sentence can be used as a reply to the question ‘what happened? (máa siríí?). Sasse states that this sentence ‘presents a state of affairs as a compact piece of information-‘there was the event of my father’s dying’-exactly equivalent to English my FATHER died...’(Sasse 1987: 546). In the (b) sentence, there is a focus particle on the subject noun phrase, showing that the subject is separate from the verb. Sasse (1987) considers this sentence to express a categorical judgement. Finally, in (c), with a focus particle on the verb, again there is a categorical judgment form.

(11) a.        áddigéeê                    juudi  
           father-my                    died  
           My FATHER died.

      b.        áddigéeê-é        juudi  
           father-my-NF    dies  
           It is my father that died.

      c.        áddigée                    á-juudi  
           father-my                    VF-died  
           My FATHER DIED.

Sentences which lack focus particles as in (a) are used in typicalthetic contexts, such as answers to the question ‘What happened?’ but also in weather expressions, presentational and existential sentences and descriptions of situations. Although these sentences are not canonical cases of noun incorporation, in that the noun phrase argument and verbal predicate do not form one morphological unit, there are certain indications that the subject and the verb form a tight unit. As Sasse (1987) explains, in these cases there are certain phonological changes that take place between the subject and verb that occur between clitic particles verb that do not occur elsewhere. Second, the subject and verb form a prosodic unit.

Sasse (1987) extends this correlation between subject incorporation andthetic judgement forms to other languages that exhibit more canonical incorporation. Thus he states that “most examples of ‘subject’ incorporation in Iroquoian are cases in which the existence or presence, absence, beginning, end, appearance or disappearance of an object or an event is described” (pg. 548). Again, these cases are typicalthetic contexts.

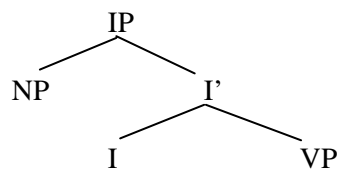
So we see that when subjects incorporate, we have athetic judgment form. This highlights the correlation between incorporation andtheticity, but what still remains unexplained is why such a correlation exists; why are incorporated objects behaving likethetic subjects? If thethetic/categorical distinction is something that matters only at the level of the entire clause, as a difference in predication or judgement forms, then it is unclear why objects are patterning like subjects.

My claim will be that thethetic/categorical distinction should be applied to objects as well as subjects. In the next section, I will show how to support such a claim.

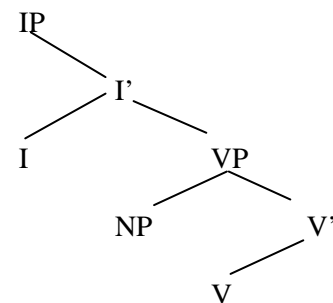
#### 4. FORMAL APPROACHES TO THE THETIC/CATEGORICAL DISTINCTION AND ITS EXTENSION TO OBJECTS.

The syntax ofthetic and categorical clauses has also been claimed to be different. Drawing from work by Diesing (1992) and Kratzer (1988), a number of authors posit that with athetic predication, the subject is generated within the VP projection, while with a categorical predication, the subject is generated outside the VP, within the functional projection IP (Ladusaw 1994; Moore in press). Thetic subjects are specifiers of VP, whilethetic subjects are specifiers of IP. The base structure of each clause would look as follows.

(12) Categorical



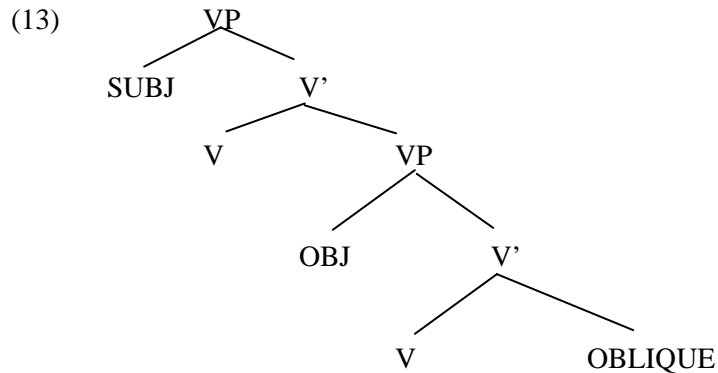
Thetic



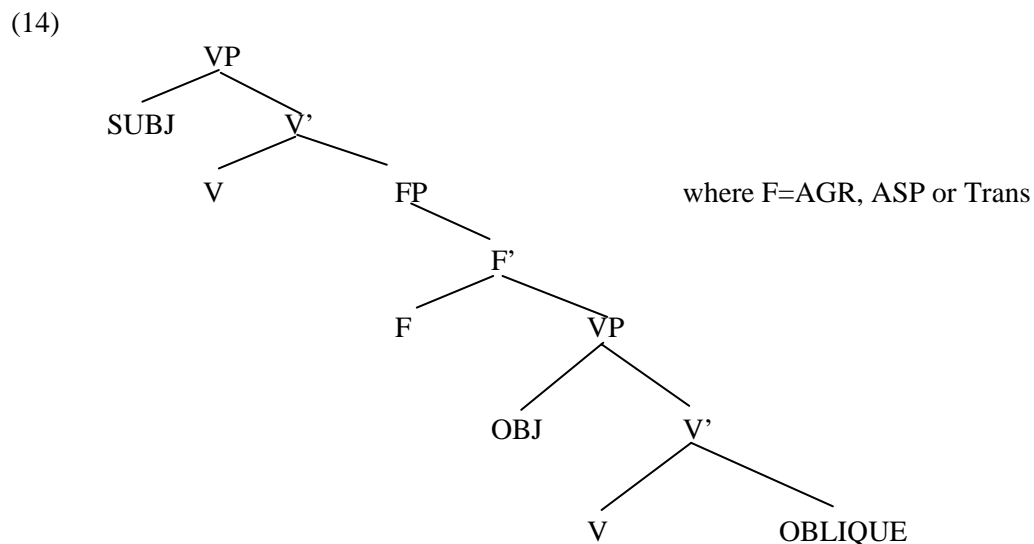
In some languages, such as English, thethetic subject would be required to raise into the specifier of IP.

This distinction in position can also be extended to objects in the following way. First, we must adopt the VP shell representation of Larson (1988). In this work, Larson suggests that

objects are ‘inner’ subjects of an ‘inner’ predication composed of the verb and any oblique complements. The object noun phrase is generated as the specifier of a lower VP and the subject is generated as the specifier of an upper VP. The verb is generated within the lower VP and raises up to the head position of the upper VP.



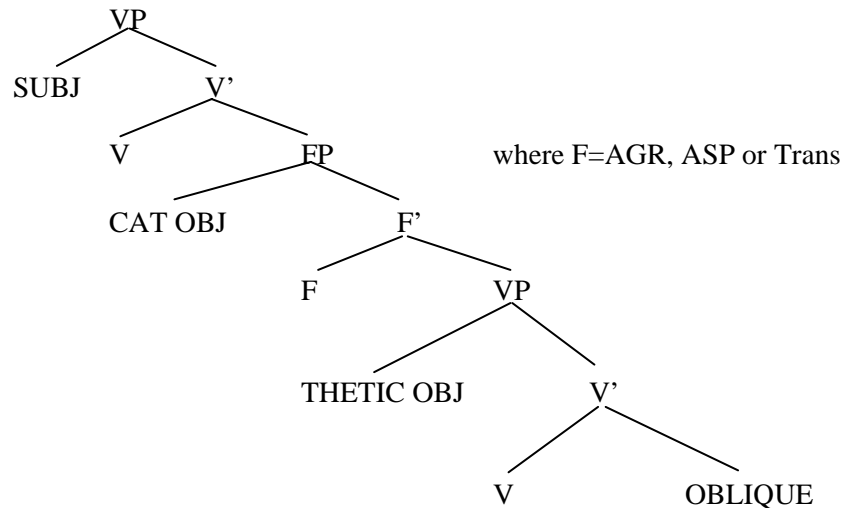
Second, we must also adopt the ‘Split VP’ Hypothesis (Travis 1991; Koizumi 1993; Ramchand 1997; Basilico 1998). Here, the upper VP does not dominate the lower VP directly; instead, there is a functional projection in between the two VP shells. The object is generated within the lower VP, and, in some cases, moves to the specifier of the functional category. Authors disagree as to the exact content of this functional category; some consider it to be an agreement projection, others an aspectual projection while in previous work I consider it to be a Transitivity Projection.



We can now put this all together to make a proposal about object position and the thematic/categorical distinction. If objects are ‘inner’ subjects of an ‘inner’ predication, as Larson (1988) suggests, I have argued in previous work (Basilico 1998) that we can extend the thematic/categorical distinction in predication forms to this level. Some objects participate in an ‘inner’ categorical predication, in which the object is singled out from the event itself. Like

categorical subjects, this object will be generated not within the VP but within a functional projection, the functional projection that is located in between the two VPs. On the other hand, some objects participate in an ‘inner’thetic predication, in which the object is not singled out from the event itself. Likethetic subjects, this object will be generated within the VP; here, the object will be generated within the lower VP of the VP shell.

(15)



## 5. BACK TO INCORPORATION.

Incorporated objects are behaving likethetic subjects because objects, too, participate in different predication forms. Incorporated objects arethetic objects which are generated within the VP shell. Note that once we begin to look at incorporated objects in this way, as objects which are generated within the VP, we can explain why incorporated objects in some cases do not agree with the verb. If we consider agreement to involve a relationship between a functional projection and a noun phrase within the specifier position of that functional projection, then if incorporated objects are generated within the VP, they would not be in the proper structural configuration to induce agreement.

But now we must answer the question of why onlythetic objects, and not categorical objects, can incorporate. The representations above allow us to explore syntactic treatments of this restriction. To begin this discussion, let us turn to Baker's (1988) syntactic treatment of incorporation. His account of the restrictions on subject incorporation is based on the Empty Category Principle- the idea that traces must be properly governed. Incorporation involves head movement of the incorporated noun into the verb, adjoining the nominal head into the verbal head. This movement will leave a trace behind that must be properly governed. Movement from object position leaves behind a trace that can be properly governed by the verb. Movement from subject position leaves behind a trace that is not properly governed; at the time, Baker (1988) considered all subjects to be generated at the IP level. When the subject incorporates, the subject will not be able to c-command its trace, and consequently the trace will not be governed.

Recently, however, within the Minimalist Program (Chomsky 1995), the ECP has become suspect as a theoretical principle and has largely been abandoned in favor of derivational approaches to the restrictions on movement that it was first intended to capture. Because of this, we need to seek new explanations for the lack of subject incorporation.

Within the Minimalist Program, movement occurs as a result of attraction by a strong feature associated with a specific head. This strong feature, once introduced into the representation, will immediately attract a certain category and be eliminated from the representation. Also, this feature must be immediately checked or the derivation will be canceled (Chomsky 1995). Essentially, this means that a feature introduced by a head H must be checked within a projection of that head.

Turning to incorporation, if movement is driven by feature, and incorporation is an instance of movement, then we would expect that verbs must have a feature that attracts the head noun, a [+N] feature. When the verb is introduced into the syntactic computation, it will be merged with the object noun. Since the feature associated with the verb must be eliminated at this point, before another element is introduced and merged in the computation, the head noun must move into the verb to check and eliminate the feature associated with the verb. Then the computation can proceed, because the strong [N] feature associated with the verb has been eliminated.

Note that a categorial object will not be allowed to incorporate, because it is introduced too late into the representation to check the strong feature associated with the verb. If the verb is introduced into the computation with its strong [N] feature, the next step of the computation will be the merger of the verb with the head of the functional head which is located between the two VPs. At this point in the computation, it is the functional head which will project; the resulting syntactic object is FP, not VP. Because the strong [N] feature of the verb must be eliminated within a projection of the VP, the derivation will cancel because this feature has not been checked immediately. The categorial object is introduced too late; it is only introduced after the functional head merges with the verb and by this time the derivation has been canceled.

In effect, what this analysis captures is that objects that can incorporate must have a tight relationship with the verb; they must be introduced at the same time in the computation as the verb itself. Thetic objects, which are within the VP, are introduced at this point. Categorial objects are outside of the VP, structurally higher than the thetic object and c-commanding the VP and everything inside it. These objects do not have as tight a relationship with the verb, and consequently, they cannot incorporate.

#### 6. WHY CAN'T INDIRECT OBJECTS INCORPORATE? INDIRECT OBJECTS AS CATEGORIAL OBJECTS.

We are now in a position to explain why the indirect object cannot incorporate into the verb. In previous work, I have argued that these arguments are categorial objects; that is, in a double object construction such as (16), the first postverbal NP participates in an 'inner' categorial predication.

(16) The teacher gave the student a book.

There are several arguments which suggest that the indirect object is somehow 'topical' (Erteschik-Shir 1979) and thus is behaving as an 'inner' categorial subject. First, it is well known that there are interesting restrictions on the scope of quantified NPs in the double object construction. The indirect object must take scope over the direct object.

(17) The teacher gave a student every book.

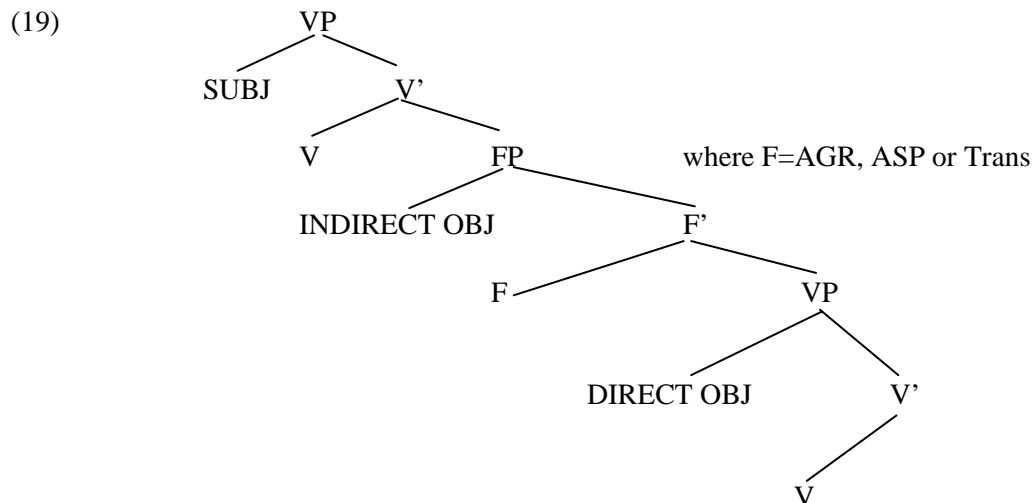
Here, we only get the reading in which there is one student and that student gets every book from the teacher; we do not get the reading where for each book, there is a student such that the teacher gives that student a book.

This restriction can be explained if we follow several authors (Erteschik-Shir 1997) who conclude that topical elements must take widest scope. If we consider that the indirect object is an inner categorical subject, then it is essentially the topic of that inner predication, or what that predication is about. As the topic, it should take wide scope over everything within that ‘inner’ predication, including the direct object.

Finally, if the indirect object is actually an inner categorical subject, then it will be located within the functional projection between the two VP shells. The direct object will be within the inner VP. If this is correct, then we would expect that agreement would not be with the direct object, as in a typical transitive clause which has only one NP, but with the indirect object. This is exactly what occurs. In the Mohawk double object construction, it is the indirect object which agrees with the verb, not the direct object. In the following example from Baker (1996), the verb agrees with the first person singular indirect object, and not the third person plural direct object.

- (18) Wa-hak-u-‘  
Fact-MsA/1sO-give-PUNC  
He gave me it.

Given these arguments, I posit the following formal representation for double object constructions:



Since indirect objects are categorical objects, they will be located outside the VP within the functional projection that is located in between the two VP shells. As we discussed above, such objects cannot incorporate because they are merged into the representation too late to check the strong [N] feature associated with the verb.

## 7. FURTHER IMPLICATIONS.

The approach argued for here in the context of incorporation has wide ranging implications. We have distinguished two types of object positions and have shown how it can explain certain restrictions on incorporation. Hopper and Thompson (1980) distinguish between high transitivity clauses and low transitivity clauses. Now, clauses with incorporation are low transitivity clauses. This suggests that low transitivity clauses are associated with thematic objects and high transitivity clauses are associated with categorical objects. If this is correct, then we

should see similar syntactic, semantic and discourse properties between high transitivity clauses and categorical clauses and low transitivity clauses andthetic clauses. Further constructions to look at include the antipassive, which has been argued to be a low transitivity clause, and the perfective/ imperfective distinction, which has also been characterized in terms of a high transitivity/low transitivity distinction.

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# PHONOLOGICAL VARIATION\*

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## 1. PHONOLOGICAL VARIATION: YEISMO IN AREQUIPA, PERÚ.

Every language comprises different varieties whose features identify them as unique or belonging to a certain region. The Spanish language is no exception to this. Within every Spanish-speaking country in Latin America there are many dialect varieties. Sometimes though, there are certain phenomena that may affect a language as a whole and every dialect may ultimately feel those effects. The phenomenon of *yeísmo* is an example of such. *Yeísmo* is the neutralization of the opposition of /y/ ~ /ɲ/ in favor of the former (Lipski 1994) thus creating phonological variation in the language. For example, with the minimal pairs *maya* and *malla*, both words may be pronounced in some dialects using [y], i.e. as homophones, while other dialects may retain the distinction. The phenomenon of *yeísmo* is the focus of the present paper. I deem it important for investigation since the process is not complete in the language, and recording its spread or lack thereof can be valuable for the field of Spanish linguistics in the future. Also, *yeísmo* may serve as a feature for distinguishing Spanish dialects (Escobar 1978). In the present study I have analyzed the speech of 24 natives of the city of Arequipa, the second largest city in southern- coastal Peru (see map, Appendix A), in order to see whether *yeísmo* has spread and reached that part of Peru. If indeed it has, the factors that determine the use of one variant over the other will be studied. I will be accounting for social and stylistic as well as linguistic factors in predicting which linguistic variant, /y/ or /ɲ/, a speaker belonging to a certain social group is likely to use (cf., e.g., Labov 1972).

## 2. REVIEW OF THE LITERATURE.

Speech variation occurs primarily in lexis and phonology rather than in the syntax of regional varieties of a language (D'Introno, Guitart, and Zamorra 1988). Non-linguistic variables such as age, social class and, gender, can influence the use of linguistic features in these regional varieties, thereby resulting in a variation in the language. Non linguistic variables of this nature are referred to as sociolinguistic variables. According to Labov (1970), the correlation between society and language can be analyzed and quantified and thus used to predict which linguistic variants a speaker belonging to a certain social group may use. Variation in lexis and phonology may also be based on style of use or register. In this sense, linguistic variation can be stylistically as well as socially stratified.

In a study done in the speech of New Yorkers, Labov (1966), found that the speech of most New Yorkers did not vary in a random or unpredictable manner. The variation was, instead, affected by socio-linguistic factors, and these were used to predict the use of one variant over the other. This did not mean, however, that the researcher could predict which variant the speaker would use at one point or another. Instead, it showed that if the speakers belonged to a certain social class, age, or sex, they would tend to use one or another variant at predictable levels of

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\* This study could not have been written without the help, wise guidance and support of my two advisors: Dr. Beverly Flanigan and Dr. Scott Jarvis. My gratitude also goes to Juan Guillermo Carpio, who awakened my interest in this phenomenon of phonological variation in the Spanish spoken in Arequipa, Perú, to Alberto Arredondo who helped me in the design of the data collection, to professors Ana Maria Escobar, Susana de los Heros, Carol Klee and John Lipski who offered me many helpful comments and suggestions, and to all of my Arequipan participants.



frequency. For example in New York, the researcher could predict that a speaker belonging to a certain class, age, or gender would be likely to pronounce 'car' as [ka] instead of the variant [ka $\square$ ]. In this sense the variant that a certain speech community chose to use appeared to be predictable (cf. Trudgill 1995).

Another study, conducted by Cedergren (1979) on the phonological variation of syllable final /s/ of 79 speakers in the Spanish spoken in Panama, showed that the effect of socio-economic status marked the difference between the upper class and other groups when it came to /s/ elision. In terms of age older speakers often omitted /s/, whereas younger speakers (20-35 years old) were more conservative in this respect. When it came to gender, although not so strong a correlation existed, males seemed to omit /s/ more than females. Finally, it was found that speakers not born in the city of Panama omitted /s/ the most.

Phonological variation arises in any language where one dialect merges two phonemes into one, thus creating two allophones of one phoneme, as in the case of the merging Spanish phonemes / $\diamond$ / ~ /y/. As I mentioned earlier, this phonological merger is called *yeísmo*. Speakers who merge both phonemes opting for the [y] pronunciation in words that contain the grapheme {ll} are called by many linguists *yeístas*, whereas those who make the distinction are called *lleístas* (Zumarra and Guitart 1982). *Yeísmo* is explained phonetically by D'Introno, Del Teso and Weston (1995) as a consequence of the process of lateral disassociation. Instead of including lateral and palatal articulations, the phoneme / $\diamond$ / has merged with the phoneme /y/, yielding a simple palatal articulation where conservative dialects have a lateral/palatal articulation.

Dialects that favor one variable over another, in this case the use of /y/ ~ / $\diamond$ /, can aid us in distinguishing different dialect varieties present in the Spanish of Latin America as well as peninsular Spain. *Yeísmo* is a feature that many authors claim is a characteristic of Latin American Spanish. In truth, however, one can still find *lleísta* regions in Peninsular Spain. *Lleísmo*, the retention of the opposition of / $\diamond$ / ~ /y/, can be found particularly in rural or isolated regions of Spain and Latin America (D'Introno et al. 1988). *Lleístas* maintain the [ $\diamond$ ] pronunciation in initial or medial position in words such as *llave* [ $\diamond$ ave] or *caballo* [kaba $\diamond$ o], whereas *yeístas* pronounce *llave* as [yave] and *caballo* as [kabayo].

*Lleísta* speakers pronounce [ $\diamond$ ] when they encounter grapheme {ll} in written discourse but not when the word is spelled with {y}, e.g. *yema* is [yema], not [ $\diamond$ ema] (initial position). But there have been cases where *lleístas* use the [ $\diamond$ ] pronunciation when the word contains a {y} grapheme either initially or medially (Zamorra-Mune and Guitart 1982). These are not consistent and thus it is difficult to postulate a rule for the variation in pronunciation of certain words. But it may be that this occurs as a kind of hypercorrection. That is, people who think they must always use / $\diamond$ / to be "correct" extend it even to words where the standard pronunciation does not allow for it. They may think that the particular grapheme represents a sound that 'should' be pronounced differently.

Research shows that the use of *yeísmo* was already taking place at the end of the sixteenth century (Escobar 1978). Lipski (1994) points to Canfield (1979) as a scholar who views the differences in Latin American Spanish as following changes that were taking place in the Spanish of southern Spain. The first stages of *yeísmo*, according to Canfield, can be traced back to the chronology of sound changes which occurred in Spain from the 15th century to the 18th century. Moreover, the delateralization of / $\diamond$ / is a "general Romance phenomenon" (Lipski 1994: 43), which has taken place in many vernacular varieties of Portuguese as well as in regional varieties of French and Italian. The process of *yeísmo* is indeed found in all Spanish dialects, even the Andalusian Spanish of Spain (from which some claim that many Latin American dialects have stemmed), but the process is by no means complete.

Based on this evidence one may infer that when Spanish immigrants to South America brought with them their dialects, some of these dialects exhibited some degree of the palatal delateralization. Escobar (1978) has found that three big cities in Latin America seem to have been the first where *yeísmo* began to diffuse; these are Lima, Mexico City, and Buenos Aires.

If *yeísmo* was already present three hundred years ago in Lima, Peru, why hasn't the change spread throughout the whole country? According to Escobar (1978), and Godenzi (1991) the / $\text{ɲ}$ /~/y/ distinction is still widely retained in the southern Andean regions of Peru in Latin America (see Map, Appendix A). It is important to mention that in the Andean region, Quechua/Spanish bilinguals make up a large proportion of the population and it has been the Quechua language in the area that has influenced the phonology, morphosyntax, and lexicon of Spanish among the bilingual population (Greet-Cotton and Sharp 1988). Thus many scholars agree that this is due to Quechua, which also makes the distinction between /y/ and / $\text{ɲ}$ / (Greet-Cotton and Sharp 1988). De los Heros supports this claim and further asserts that the distinction between /y/ and / $\text{ɲ}$ / exists in the dialect of Arequipa, the most 'prestigious' region in Southern Peru. However, she points out that in certain Andean regions of Peru, the phoneme / $\text{ɲ}$ / is probably undergoing delateralization, especially among younger speakers, due to their frequent contact with the *yeista* dialect, which is perceived as being of greater prestige.

Escobar (1978) asserts that *yeísmo* distinguishes two different types of the Spanish spoken in Peru. He proposes that Spanish speakers of the Andean region (see map, Appendix A) retain the opposition /y~/ $\text{ɲ}$ /. He classifies this dialect as type 1. In the type 2 dialect, Spanish speakers do not make a distinction between /y/ and / $\text{ɲ}$ /. This dialect is spoken in the coastal region, which extends from northern Arequipa along the eastern coast up to Tumbes (see map, Appendix A). He calls this type the 'non Andean dialect'.

In a study by Godenzi (1991), it was found that people with Quechua and Aymara origins born in Puno (in southern Andean Peru, see map, Appendix A) retain the opposition between the two phonemes. Godenzi's study further shows that people who come from other Peruvian regions like Arequipa or Tacna retain, for the most part, the opposition between the two phonemes, but instances of *yeísmo* can still be found. In the case of people from Lima or the northern coast, the opposition has been lost in favor of [y]. Furthermore, when / $\text{ɲ}$ / occurs intervocally and is preceded by /i/ or /e/ it often becomes reduced and disappears, as in *billete* → *biete*, *cuchillo* → *cuchio* (e.g. Greet-Cotton and Sharp 1988).

In an investigation of the / $\text{ɲ}$ / variation in the in the Spanish spoken in Cuzco (Andean region, see Map, Appendix, A ), De los Heros (1998), found that / $\text{ɲ}$ / is frequently used by upper class speakers as a whole in the city of Cuzco. This is true especially in between vowels, before or after [i] and in words of Quechuan origin. However, she has found that women who belong to the middle and upper classes in the city of Cuzco do not use the palatal lateral but instead use the palatal glide [y]. On the other hand, women from rural areas try to imitate the regional dialect spoken in the city of Cuzco, which they perceive to be prestigious. In both instances De los Heros believes that this is probably due to the women's desire to migrate to other places where they can have better employment opportunities. Middle and upper class women's desire is to migrate to the coast, whereas women from rural areas wish to migrate to the city of Cuzco. The result is that upper class women try to imitate the prestigious national dialect spoken in Lima (coastal region), and rural women try to imitate the regional Cuzco dialect. De los Heros concludes by stating that in Cuzco, gender is a stronger factor than social class in people's preference for one phoneme over the other.

If indeed Godenzi and De los Heros are right about the existence of *yeistas* and *lleistas* in Arequipa, then it is important to find out who is retaining the opposition between the two phonemes and who is merging them. The following research questions will be asked in my study: Which Arequipans distinguish between the /y/ phoneme and the / $\text{ɲ}$ / phoneme in their speech, and which do not? What are the relative effects of age, social class, and gender? Does the /y~/ $\text{ɲ}$ / merger vary according to the formality of the context?

### 3. RESEARCH DESIGN.

#### 3.1 PARTICIPANTS.

Twenty-four people ranging in age from 7 to 77 participated in my study. All of my participants were born and raised in the city of Arequipa (see map, Appendix A). The variables that I have actively investigated in my study are age, sex, place of birth, educational level, social class, and whether or not they had lived somewhere else besides Arequipa.

Table 1 shows the way my participants have been divided into three age groups: Group I comprises 9 people ranging in age from 5 to 20. Group II includes ages 21 to 40 and comprises 8 people. Group III is made up of 7 participants over the age of 41. Each age group contains people of different social classes and both sexes. The rationale behind dividing them into different groups is to analyze the effects, if any, that education and access to the media and technological innovations have had on the usage of one linguistic variant over the other. Group I, being the youngest, has had exposure to technological advances such as the internet or cable television all or most of their lives. This type of technology allows for global communication and thus I suspect may have an influence on the speakers' language.

Age groups	# of participants
Group I: (younger) 7– 20	9
Group II: (middle) 21– 40	8
Group III: (older) 41 +	7
Total # of participants =24	

TABLE 1: CONSTITUENCY OF THE INFORMANT GROUPS.

In Arequipa, one way to determine which social class an individual belongs to is by the school he or she has attended or is now attending. Usually, people of low- income levels attend public schools; the higher one's income, the more expensive and prestigious the school they attend. I have divided my participants into the following three social classes: working class, middle class and upper class.

For the purposes of this paper, working class people are defined as those who are attending or have attended a public school but never went to college, and in some cases did not finish secondary school. Middle class people are those individuals who attend or have attended a private school, although not a very expensive or prestigious one, own a home, but have no country club memberships or vacation homes. Upper class people are those who have attended or are now attending prestigious private schools, have gone to college, own various properties, travel abroad frequently, have cable access and have domestic help at home.

The grouping of my participants by age, social class and gender is as follows: Group I is the younger group, which consists of four males (working class = 2, middle class = 1 and upper class = 1). Group I also includes six females: (working class = 2, middle class = 1, and upper class = 3). The middle group, or group II, consists of seven males: (working class = 2, middle class = 1, and upper class = 4); and two females: (middle class = 1 and upper class =1). The last group, group III or the older group, consists of four males: (working class = 1, middle class = 2); and three females: (working class = 1, middle class =1, and upper class =1).

### 3.2 ELICITATION OF DATA.

Following Milroy and Milroy's (1992) social network data elicitation design I selected my participants in the following ways: To gather data from young working- class girls, I went to an all-girls public high school. To get data from young participants of other social classes, I went to prestigious private schools and not so prestigious private schools and the city center, where I asked passers-byes for their cooperation. For middle and upper class participants, I went to different mini grocery stores and asked the owners for their help, I also sought participation from

people I knew, the people that these people knew and people who worked for these people.

For the elicitation of my data, I adopted Labov's (1966) interview technique, with some modification to fit my specific study. His approach sought to minimize the formality of face-to-face interviews and to obtain data in different styles such as casual speech and formal speech. Hence, I used the following three approaches: a semi-casual interview, the reading of a short story, and two different word lists (Labov 1972).

During the interview I asked my participants where they were born and raised, the school they attend or attended, their profession, age, and whether they had lived somewhere else besides Arequipa. I also asked the younger participants where their parents were born and raised. The informants were engaged in friendly talk before the actual interview began, and this allowed them to relax and forget that they were being taped. As a native speaker of Peruvian Spanish, I conducted the entire interview in Spanish, and I tape-recorded the conversation. It is important to note that none of my participants were aware of the linguistic feature I was listening for. In the semi-casual interview I asked my participants six simple questions which required answers that contained one of the two phonemes in question, /ɰ/ or /y/ (see Appendix B). For example, I asked them (in Spanish) what one would use to open a lock, where the answer is *una llave* (a key), which might be pronounced with [ɰ] or [y], or how one calls a female horse, with the expected answer *una yegua* (a mare) pronounced with initial [ɰ] or [y].

After they had answered the six simple questions, I asked my participants to read a short story that I had made up (Appendix C). In it are numerous words that could have either the phoneme /ɰ/ or /y/. The name of the story is *La historia de Trujillo Villanoya*. My aim here was to see how they pronounced each of the graphemes in certain words, and what they did when one word potentially contained both phonemes, as in the name *Villanoya*, where the difference between the two might or might not occur depending on environment.

The third part of my data elicitation consisted of two separate word lists that the participants were asked to read. One of the lists contained words that had one of the two phonetic variants ([ɰ] or [y]) either word initially or medially (Appendix D). The second word list that my participants were asked to read contained minimal pairs or near-minimal pairs, for example, words like *maya* and *malla*, or *hoya* and *olla* (see Appendix E).

With the latter data collected, I was able to investigate which of the participants merged the two phonemes and which made the distinction, and whether their style of speaking affected their choice. For example, would a participant read a word containing one of the spellings and give it the 'right' pronunciation (i.e. distinguish between /ɰ/ and /y/) or utter it spontaneously and merge it to /y/? I was then able to see if this phonological variation could be correlated with social factors such as age, class, and gender.

#### 4. RESULTS.

Raw frequency counts and percentages for each participant's total use of [y] over potential use for each of the four interview styles were tabulated (see Table 2, Appendix F). The results were then analyzed for significance using the General Linear Modeling (GLM) of SPSS for windows 10.0. with the four different interview styles as the dependent variables. GLM provides an analysis of variance for both univariate and multivariate designs, and in the present case was used to perform a multiple analysis of variance using the Hotelling's Trace procedure. Hotelling's Trace is a multivariate test of significance based on the sum of eigenvalues. This test, in the present study indicates the significance level for each of three main effects (one for each independent variable: age group, gender and class) and for the interaction effect with the dependent variable of style. The factors that proved to be significant are age- group and social class. Gender proved to be significant only when in combination with the latter two variables, age-group and class. The combination of variables that proved to be significant were, in order,

age-group and class; age-group; class and gender; and lastly class and gender. (See Table 3, Appendix G).

In order to determine how important the difference is between the significant variables, we must measure their *strength of association*. The measure of strength of association is called *eta squared* (Hatch and Lazaraton 1991). (See Table 4, Appendix H).

The eta squared test shows that 87.4% of the variability of the sample can be accounted for by class alone. And 82.4% of the variability can be accounted for by age. Class and age together show a very strong association, with 91.6% of the variability of the sample accounted for by a combination of these factors. Gender did not prove to be a significant factor, but together with age and class it shows an association of 88.1%, and grouped with age alone, it shows a strength of association of 87.7%.

A closer analysis of the results shows that in all styles, the younger participants used [y] more frequently than the two older groups of participants did. Group 2, which comprises participants ranging in age from 21-40, used [y] more frequently than the participants in the older group (ages 41+). (See Table 5, Appendix I).

In terms of social class and speech in all styles, middle class participants of all ages made the distinction between the two phonemes more than the other two classes, with upper class participants showing the lowest tendency to distinguish between the two phonemes. (See Table 6, Appendix, J).

By analyzing the compiled means of [y] usage for each of the three main age-groups (younger 7-20, middle 21-40, and older 41+) in four different styles (semi-casual interview, short story, two different word lists), we can see that the more formal the style becomes the less the speakers tend to merge the two phonemes. This is true of speakers who merge the two phonemes in some instances but in retain the opposition between /ɔ̃/ and /y/ in others, such as younger speakers (age 7-20) of the working and middle class, speakers age 21-40 of working, middle, and upper class and older speakers (age 41+) of working class. For example, middle class participants age 21-40, merge the phonemes /ɔ̃/ and /y/ 50% of the time during the casual interview (casual style), but during the reading of minimal pairs (formal style) they maintained the opposition between the two phonemes 100% of the time. This shows that style does shift with the formality of the context. The two groups of speakers that showed no shift in style are middle class and upper class participants belonging to the older group (ages 41+). These two older groups of participants do not merge the two phonemes as the style becomes more formal, instead the merger remained constant at 50% of the time in the case of middle class speakers and 0% in the case of upper class speakers. The older upper class participants always retained the opposition between the two phonemes (/ɔ̃/ and /y/) and thus the formality of the style (from semi-formal to formal) did not have an effect in the usage of one phoneme over the other for upper class older speakers. (See Table 7, Appendix, K).

## 5. DISCUSSION.

The analysis of the data has revealed which Arequipans distinguish between the /ɔ̃/ phoneme and the /y/ phoneme in their spoken production, and which do not. Extralinguistic factors such as age and social class show an effect on the merger of /ɔ̃/ and /y/ and the merger appears to vary according to the formality of the context for those speakers that make the distinction between /ɔ̃/ and /y/ sometimes but merge the two other times.

In terms of class, middle class speakers of all ages seem to be retaining the opposition between the two phonemes /ɔ̃/ and /y/ more than the other two classes, but the degree of their shift does vary depending on the formality of the context. This accords with Labov's (1972) findings which showed that in the dialect of New York, middle class speakers were the ones who used the 'prestige' forms the most.

In terms of age, it is the younger speakers of all classes who are merging the two

phonemes, but especially younger speakers belonging to the upper class. It is important to note that even in the case of speakers who are leading the change into *yeísmo*, style does make a difference in whether or not phonemes /y/ and /ɣ/ merge or are kept distinct. For example, in more formal contexts, such as minimal pair readings, the younger speakers tend to merge the two phonemes less frequently.

Among the upper class there seems to be a split. Upper class speakers belonging to the first age-group (ages 7-20) and second age-group (ages 21- 40) are almost entirely *yeístas*. On the other hand, upper class speakers belonging to the older age-group (ages 41+) retain the opposition between the two phonemes in all styles. This may be due to the fact that retaining the opposition was considered a prestigious feature of the Arequipan dialect until very recently (Alberto Arredondo, p.c.). I was informed by my older participants that when they were in school, their teachers made a point of teaching them that the ‘right’ way of pronouncing the two phonemes was to follow the classical Spanish spoken in Spain, as it was considered the ‘prestige’ dialect. This may explain why older speakers of both genders and those belonging to the ‘educated’ upper class made the distinction 100% of the time in all four styles. According to Juan Guillermo Carpio (p.c.), a well known Arequipan historian and sociologist, younger people are now merging the two phonemes due to the influence of the dialect of Lima, which uses only the [y] and is now considered the ‘prestige dialect’. Another reason why the younger generation, but especially the upper classes, are no longer distinguishing between the two phonemes may be because of their frequent contact with other *yeísta* dialects as they travel quite often, have family in other areas, especially Lima, and have access to cable television.

This study supports Godennzi’s (1991) claim that in the city of Arequipa, some people retain the opposition between the two phonemes, /ɣ/ and /y/ but instances of *yeísmo* can be found as well. My findings show that the distinction between /ɣ/ and /y/ is retained the most by older speakers, but the trend seems to be that *yeísmo* is spreading more forcefully in the speech of younger speakers.

This study also shows that the extralinguistic factors that proved to be significant in the use of the phoneme /ɣ/ and /y/ in the Spanish spoken in Arequipa are social class and age. This is contrary to De los Heros’ (1998) findings that in the Cuzcoan dialect, gender is a stronger factor than social class in the use of one phoneme over the other.

Escobar (1978) and Godennzi (1991) have claimed that the distinction between /ɣ/ and /y/ is still widely retained in the southern Andean regions of Peru, where one can find a large bilingual population of Quechua/Spanish speakers (Green-Cotton and Sharp 1988). Recently, there has been a very large wave of immigration of people from the Andean regions (where Quechua is spoken) to the city of Arequipa. These people have migrated to Arequipa in search of better employment opportunities and a better life style. They are not part of the upper class and if they were to pick up the /y/ merger in their spoken production of Spanish it would show the diffusion of /y/ throughout all classes, thus making *yeísmo* a permanent change.

## 6. CONCLUSION.

The phenomenon of *yeísmo* is an ongoing phonological variation process that has affected and still is affecting all Spanish dialects. Claims have previously been made that in the Spanish spoken in the city of Arequipa one can find instances of *yeísmo*, but the retention of the opposition between /ɣ/ and /y/ can be found as well. In this study I have investigated who is merging the two phonemes in the Spanish spoken in Arequipa and who is retaining the opposition. I have examined the relative effects of extralinguistic factors including age, social class and gender in accounting who is merging the two phonemes and who is not, and whether the merger varies according to the formality of the context.

My findings indicate that it is the younger speakers (age 7-20), of all classes, but especially the upper classes, who are leading the change into *yeísmo* in Arequipa. In the middle

age-group (age 21-40) it is the working class and middle class speakers (not the upper class) who are retaining the opposition between the two phonemes; and the older generation (41+), the upper class speakers are also retaining the opposition. In this sense, there is a split in terms of the upper class speakers; while upper class younger (7-20) and mid age-group speakers (21-40) merge the two phonemes, upper class older speakers (41+) retain the opposition between the two phonemes. Thus, I have found that age strongly affects the merger to /y/, and it appears that the merger spreads from the upper class in the two youngest age groups (7-20 and 21-40).

Within the groups that retain the opposition between the two phonemes (/ɰ/ and /y/), it is important to note that the variation shifts according to the formality of the context, with /y/ most common in informal speech but with /ɰ/ retained for more formal usage.

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APPENDIX A: MAP OF PERU



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APPENDIX B

Interview questions (these require answers with words that contain both [ɲ] and [y].

1. Que sitios de veraneo existen alrededor de Arequipa? (where can people go to the beach around the city of Arequipa?) **Mollendo**
2. Que es lo que uno usa para abrir un candado? (what does one usually use to open a lock?) **llave** (key)
3. Aparte de la vicuña y de la alpaca que otros auquenidos existen? Besides the Alpaca and the Vicuna, what other *auquenidos* exist? **Llama**
4. Como se llama el macho de la yegua? (what does one call the male of the mare?) **caballo** (horse)
4. Como se llama la parte central de un huevo y de que color es? (what is the name of the central part of an egg and what color is it? **Yema, amarillo** (yolk, yellow)
5. Que ocurre usualmente cuando hay nubes en el cielo? (what happens usually when the sky is cloudy? **Llueve** (rains)

## APPENDIX C

## La Historia de Trujillo Villanoya

Un día soleado y caluroso, Yosi Llamosas fué al campo a visitar a su abuelita Yanina. En el camino se encontró con un niño que lloraba llamado Trujillo Villanoya. Este llevaba tres llamas y una alpaca. Yosi le preguntó: Por qué lloras? Trujillos Villanoya le contestó que había perdido a su yegua llamada Callona y que además iba a llover muy pronto y el estaba lejos de su casa. Para hacerlo sentir mejor, Yosi sacó de su lliclla amarilla una botella de yogurt y un bocadillo de pollo que regaló al niño Trujillo. Es ese momento la yegua Callona apareció y el niño Trujillo, las tres llamas, la alpaca, la yegua y Yosi siguieron su camino rapidamente antes de que comience a llover.

**Translation**

## Trujillo Villanoya's story

One sunny and hot day, Yosi Llamosas went to the forest to visit her grandmother Yanina. On her way she found a boy named Trujillo Villanoya who was crying. He had with him three llamas and one alpaca. Yosi asked him: Why are you crying? Trujillo Villanoya told her that he had lost his mare named Callona and soon it would rain and he was far away from home. To make him feel better, Yosi took out of her yellow *lliclla* (Andean traditional fabric) a bottle of yogurt and a chicken sandwich which she gave to the boy. Right then, Callona the mare appeared. The boy Trujillo, the three alpacas, the mare and Yosi hurried home before it started to rain.

APPENDIX D

Word List

llaga	yaba
llamada	yamoo
llave	yanilla
llegada	yedra
llena	yegua
llevador	yema
lliclla	yira
llorar	yoqui
llover	yogurt
lloque	yoga
lluvioso	yubarta
llueca	yuca
lluvia	yunque

## APPENDIX E

## Minimal pairs and similar pairs

ballena	bayeta
bayover	va llover
ballenato	bayoneta
hoya	olla
pollo	hoyo
Maya	malla
valle	bayer

## APPENDIX F

7	younger	7	male	uc	6/6 100%	24/24 100%	15/15 100%	7/7 100%
8	younger	14	female	uc	6/6 100%	24/24 100%	15/15 100%	7/7 100%
9	younger	11	female	uc	5/6 83.3%	24/24 100%	15/15 100%	7/7 100%
10	middle	31	male	w c	2/6 33.3%	6/24 25%	4/15 26.6%	1/7 14.2%
11	middle	27	male	w c	1/6 16.6 %	2/24 8%	7/15 46.6%	2/7 28.5%
12	middle	22	male	mc	5/6 83.3%	20/24 83.3%	7/15 46.6%	0/7 0%
13	middle	30	female	mc	1/6 16.6%	2/24 8%	0/15 0%	0/7 0%
14	middle	24	male	uc	6/6 100%	24/24 100%	15/15 100%	7/7 100%
15	middle	22	male	uc	6/6 100%	24/24 100%	15/15 100%	7/7 100%
16	middle	20	male	uc	5/6 83.3%	22/24 91.6%	15/15 100%	7/7 100%
17	middle	22	female	uc	6/6 100%	24/24 100%	15/15 100%	5/7 71.4%
18	older	77	male	w c	2/6 33.3%	4/24 16.6%	9/15 60%	2/7 28.5%
19	older	78	female	w c	2/6 33.3%	3/24 12.5%	12/15 80%	0/7 0%
20	older	67	male	mc	0/6 0%	0/24 0.0%	0/15 0.0%	0/7 0.0%
21	older	46	female	mc	6/6 100%	24/24 100%	15/15 100%	7/7 100%
22	older	54	male	uc	0/6 0%	0/24 0%	0/15 0%	0/7 0%
23	older	53	male	uc	0/6 0%	0/24 0%	0/15 0%	0/7 0%
24	older	53	female	uc	0/6 0%	0/24 0%	0/15 0%	0/7 0%

TABLE 2: RAW FREQUENCY COUNTS AND PERCENTAGES OF EACH PARTICIPANTS' TOTAL USE OF THE PHONEME /Y/ OVER POTENTIAL USE IN EACH OF THE FOUR INTERVIEW STYLES.

## APPENDIX G

Effect-	Hotelling's trace value	F	Df	Sig. p< .05
age-group	9.364	4.682	8.000	.021 *
Gender	.503	.628	4.000	.663 (N.S.)
Class	13.933	6.966	8.000	.006 *
age-group and gender	14.220	7.110	8.000	.006 *
age-group and class	43.345	9.482	16.000	.000 *
gender and class	3.406	1.703	8.000	.234 (N.S.)
age-group, gender and class	14.769	7.385	8.000	.005 *

TABLE 3: MULTIVARIATE TEST OF SIGNIFICANCE FOR EACH OF THE THREE MAIN EFFECTS; AGE-GROUP, GENDER AND CLASS.

\* = variables that are significant.  
(N.S.) = variables that are not significant.

APPENDIX H

<b>Independent variable (Hotelling's Trace)</b>	<b>Sig. p&lt;.05</b>	<b>Eta squared</b>
Class	.006	.874
age group	.021	.824
age group and class	.000	.916
age group, gender and class	.005	.881
age group and gender	.006	.877

TABLE 4: ETA SQUARED, STRENGTH OF ASSOCIATION OF SIGNIFICANT INDEPENDENT FACTORS.

## APPENDIX I

**Casual Possible [y] = 6**

Age group	Mean
group 3 = (41 +)	1.42
group 2 = (21-40)	4.00
group 1 = (7-20)	4.66

**Short story Possible [y] = 24**

Age group	Mean
group 3 = (41 +)	4.42
group 2 = (21-40)	15.50
group 1 = (7-20)	17.66

**Word list possible [y] = 15**

Age group	Mean
group 3 = (41 +)	5.14
group 2 = (21-40)	9.75
group 1 = (7-20)	11.11

**Minimal pairs possible [y] = 7**

Age group	Mean
group 3 = (41 +)	1.28
group 2 = (21-40)	3.62
group 1 = (7-20)	4.00

TABLE 5: THE FOLLOWING MEANS REPRESENT THE OCCURRENCE OF [Y] IN / $\diamond$ / CONTEXTS. THE HIGHER THE MEAN THE MORE TIMES THE GROUP MERGED THE TWO PHONEMES OPTING FOR [Y].



## APPENDIX J

**Casual Possible [y] = 6**

Class	Mean
middle class	3.00
working class	3.22
upper class	4.00

**Short story Possible [y] = 24**

Class	Mean
middle class	9.80
working class	11.00
upper class	16.60

**Word list Possible [y] = 15**

Class	Mean
middle class	4.80
working class	9.44
upper class	10.50

**Minimal pairs Possible [y] = 7**

Class	Mean
middle class	1.40
working class	2.22
upper class	4.70

TABLE 6: MEANS OF SOCIAL CLASS GROUPS IN HOMOGENEOUS SUBSETS. THE HIGHER THE MEAN OF THE GROUP, THE MORE TIMES THE GROUP MERGED THE TWO PHONEMES OPTING FOR [Y].

## APPENDIX K

Age group	Social class	Style			
		Casual	Story	Word list	Min. pairs
Younger (7- 20 years old)	Working class	22/30 = <b>73.3%</b>	84/120 = 70%	53/75 = 70.6%	16/35 = <b>45.7%</b>
	Middle class	3/6 = <b>50%</b>	3/23 = 13 %	2/15 = 13.3 %	0/7 = <b>0%</b>
	Upper class	17/18 = <b>94.4%</b>	72/72 = 100%	45/45 = 100%	21/21 = <b>100%</b>
Middle (21 to 40 years)	Working class	3/12 = <b>25%</b>	8/48 = 16%	11/30 = 36.6%	3/14 = <b>21.4%</b>
	Middle class	6/12 = <b>50%</b>	22/48 = 45.8%	7/30 = 23.3%	0/14 = <b>0%</b>
	Upper class	23/24 = <b>95.8%</b>	94/96 = 97.9%	60/60 = 100%	24/28 = <b>85.7%</b>
Older (ages 41 +)	Working class	4/12 = <b>33.3%</b>	7/48 = 14.5%	13/30 = 43.3%	2/14 = <b>14.2%</b>
	Middle class	6/12 = 50%	24/48 = 50%	15/30 = 50%	7/14 = 50%
	Upper class	0/18 = 0%	0/72 = 0%	0/45 = 0%	0/21 = 0%

TABLE 7: COMPILED MEANS OF [Y] USAGE FOR EACH OF THE THREE MAIN AGE-GROUPS IN THREE DIFFERENT STYLES



# TOWARDS A SIMPLICITY-BASED INTERACTIVE MACHINE TRANSLATION SYSTEM FOR CONVERSATIONAL DOMAINS

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## 1. INTRODUCTION.

Natural languages use thousands of general and specific words and a wide range of constructions. However, the core vocabulary and grammar necessary to convey many concepts is surprisingly small and simple (Ogden 1930). This observation is exemplified by students of a foreign language, who can generally communicate well through rudimentary means. Simpler language can be particularly effective for machine translation systems, which tend to choke on the vast expressiveness of complex, unrestricted language (Arnold et al. 1994). It also lends itself well to the KISS principle (*keep it simple, stupid*), which machines often find more manageable.

The goal of this work is to demonstrate a proof-of-concept English-to-Russian machine translation system that takes advantage of simpler aspects of these languages. It is based on public-domain resources available on the Internet and assembled without major investment in time and effort. As each component of the system could warrant a paper of its own, only an overview is provided here.

The notion that simpler language is simpler to process is demonstrated by numerous multinational corporations that mandate the use of so-called *simplified* or *controlled language* by their technical writers (see <http://www.aecma.org/senglish.htm>). The motivation is that restricted grammar, style, and vocabulary reduce ambiguity, improve readability, and facilitate translation. Within the realm of simplified language, this system further restricts the input to conversational text. Its reoccurring narrative themes offer a reasonably consistent, generally predictable structure, which further reduces complexity (Kay 1997).

## 2. ARCHITECTURE.

The goal of all machine translation systems is to translate text from one language into another. Like most systems, this one consists of two main stages. The *analysis* stage dissects English text in a variety of ways and represents its countless details in machine-friendly linguistic data structures. The *generation* stage reorganizes these structures into corresponding Russian structures with appropriate Russian words, grammar, syntax, etc.

### 2.1 INTERACTIVE APPROACH.

Humans can generally play three roles in machine translation (Hutchins and Somers 1992). In *fully automatic machine translation*, the human is a passive observer. In *machine-aided human translation*, human translators use machine resources like on-line dictionaries, grammar checkers, etc. In *human-aided machine translation*—the approach chosen for this work—the human interactively guides the machine through the translation process (Nirenburg et al. 1992:36). The philosophy of this approach is to share the work between the two agents, neither of which understands all the aspects of the translation process. The machine can perform many tasks automatically, but it often needs help from the human, who is unquestionably better at natural language. The human, however, needs no knowledge of Russian because the machine can present the problems in terms the human can understand, namely as English questions.

For this work, interactivity is driven by a formalized question-and-answer mechanism known as a *decision tree* (Partridge 1991:476). The tree consists of a root node that extends downward with any number of descendant nodes and terminates with goal nodes. Each non-goal node contains one question

and has one branch for each possible answer. The tree is traversed downward by answering the questions, either automatically or interactively. The first goal node reached contains the solution to the problem. Each problem is generally based on a separate tree.

Figure 1 illustrates a simplified Russian conjugation problem. The goal is to find the proper verb form—in this case, first person, singular, feminine—and for space reasons, only that traversal is shown. As each question is reached, the machine tries to answer it without consulting the user. If it cannot, it presents the question in simple terms so that the user does not need to understand the larger context of Russian grammar; e.g., *Is the person reading a male or female?*

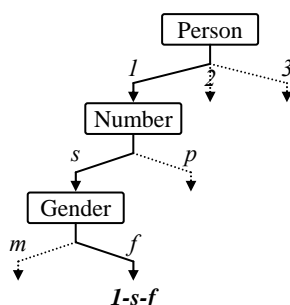


FIGURE 1: DECISION

The power and intuitive simplicity of decision trees make them ideal for this interactive approach. First, it appears that most well-defined linguistic problems (e.g., conjugations and declensions) can be solved by implementing strategies similar to those found in foreign-language textbooks. Second, each decision is based on earlier decisions and pertains directly to the goal. This property helps to determine which information is still needed and eliminates irrelevant questions. Finally, the remaining choices are reduced as the tree is traversed, so even if the incorrect goal is reached, it should be relatively close to the correct goal (e.g. incorrect gender on an otherwise correct conjugation).

## 2.2 ENGLISH ANALYSIS.

The first translation stage converts the English text into a form that the system can manipulate. This process is roughly comparable to language comprehension in psycholinguistics (Pinker 1994:195). It consists of four substages that progressively extract analysis information: *tagging*, *reducing*, *fragmenting*, and *chunking*.

The remainder of this paper will follow a sample English sentence through the system: *My brother Dave went to the store in the morning to buy food for dad's cat.* For space reasons, only the immediately pertinent details are shown at each point; an unabridged treatment can be found at <http://crl.nmsu.edu/~dtappan/hdls00/>.

## 2.3 TAGGING.

Taken out of context, many English words are ambiguous in their part of speech. For most language analysis—by machine or human—knowing the grammatical role played by each word in a sentence is essential for determining sentence structure and reducing ambiguity problems (Katz and Fodor 1963:170; van Deemter and Peters 1996). This requirement is satisfied here by a modified version of the Brill tagger, a popular tool used to annotate words in sentences with their part of speech (see <http://www.cs.jhu.edu/~brill/code.html>). The sample sentence is annotated as:

*My*/ADJ *brother*/NOUN\_S *Dave*/NOUN\_PROP\_S *went*/V\_PAST *to*/PREP *the*/DET *store*/NOUN\_S *in*/PREP *the*/DET *morning*/NOUN\_S *buy*/V\_INF *food*/NOUN\_S *for*/PREP *dad*/NOUN\_POSS\_S *cat*/NOUN\_S.

#### 2.4 REDUCING.

The original English text can be written however the author pleases. For the system to process it, though, it must be reduced to a simplified-language representation. The text is analyzed according to a variety of rules, and violations are fixed either automatically or interactively. This iterative process continues until the entire text satisfies the simplicity requirements. After reduction, the simplified text should correspond in meaning to the original, but the structure may be considerably different.

Reduction rules are based on five operations: *modification*, *substitution*, *insertion*, *deletion*, and *clarification*. Modification prompts the user to reformulate parts of the text; e.g., a highly ambiguous verb like *get* tends to translate poorly (Kay 1997), so a more specific construction is requested. Likewise, most phrasal and light verbs are prohibited, verb phrases cannot be conjoined, clauses cannot be fronted, and most noun-noun compounds are forbidden. Furthermore, only declarative sentences in the simple past, present, or future are currently supported. Substitution replaces certain complex structures with equivalent simpler structures; e.g., compound-complex sentences can be substituted with several simple sentences. Insertion prompts for additional words to simplify sentence structure, such as optional relative pronouns. Deletion removes stock phrases, fillers, certain quantifiers, and other troublesome words contributing little to the overall meaning of the text. Finally, clarification requires the user to resolve certain ambiguities like anaphoric binding and prepositional-phrase attachment.

#### 2.5 FRAGMENTING.

Most machine translation systems build a complete parse tree of the input sentence to represent its entire grammatical structure, much as humans do (Hutchins and Somers 1992; Pinker 1994). While this approach is clearly popular, basic structure can also be represented through simpler processing (Federici et al. 1996). Shallow analysis of the English sentence isolates grammatical fragments roughly corresponding to the familiar noun, verb, and prepositional phrases, etc. Fragmenting rules are similar to standard grammar rules; e.g., an optional determiner followed by any number of adjectives followed by at least one noun is an NP\_FRAGMENT. Thus, the fragmented structure of the sample sentence is [*My brother Dave*]NP\_FRAGMENT [*went*]VP\_FRAGMENT [*to the store*]PP\_FRAGMENT [*in the morning*]PP\_FRAGMENT [*to buy*]VP\_FRAGMENT [*food*]NP\_FRAGMENT [*for dad's cat*]PP\_FRAGMENT. Note that the part-of-speech annotations are still available, even though they are not shown here.

#### 2.6 CHUNKING.

Fragmenting considers only the superficial grammatical structure of the sentence. However, translating based on grammar alone is complex and difficult because English and Russian grammars differ considerably (Birnbau and Selfridge 1981:318; Hutchins and Somers 1992). Instead, this system translates simple conceptual fragments called *chunks*, which are based on the elementary-school concepts of *who*, *what*, *where*, *when*, *why*, *how*, etc. (Barr and Feigenbaum 1981:252). These broad conceptual generalizations and their subdivisions, as shown in Table 1, appear useful here because the highly restricted structure of the input text limits its conceptual complexity (Federici et al. 1996; Allen 1995:334).

Chunk	Class	Type	Subtype	
WHO	DOER			
	DOEE			
	RECIPIENT			
WHAT	COMPLEMENT			
WHERE	LOCATION			
	MOVEMENT	SOURCE DEST		
WHY				
WHEN	POINT			
	DURATION	START END		
HOW	DESCRIPTOR			
ACTION	TENSE	GENERIC		
		PRESENT		
		PAST		
			FUTURE	
		GENERAL	DURATION	ONCE MULTIPLE ONGOING
		LOCOMOTIVE	CONCEPT	GENERAL ROUNDRIP ONGOING GONE
			MEANS	WALK RIDE
	POSSESS	POSSESSOR		
		POSSESSEE		

TABLE 1: BASIC CHUNK TAGS.

Chunks are isolated based on fragment type, part of speech, location, proximity, etc., and may take into account complex constraints on the annotations. Any number of chunks can appear with any corresponding classes, types, and subtypes. As always, when sufficient information is not available, the user is prompted to supply it.

The chunked representation of the sample sentence is [My brother Dave]WHO\_DOER [went]ACTION\_TENSE\_PAST; ACTION\_LOCOMOTIVE [to the store]WHERE\_MOVEMENT\_DEST [in the morning]WHEN\_POINT [to buy]ACTION\_TENSE\_GENERIC [food]WHO\_DOEE [for [dad's]POSSESS\_POSSESSOR [cat]POSSESS\_POSSESSEE ]POSSESS ]WHO\_RECIPIENT ]WHY. The structure of these chunks is then used to find the thematic template best describing the idea. In this case, the sentence refers to *going somewhere to do something*. The remainder of the translation process is restricted to properties related to this template and will make decisions accordingly. If no appropriate template can be found, the user is prompted to rewrite the sentence, and the analysis stage is repeated.

## 2.7 RUSSIAN GENERATION.

The second translation stage maps annotated English structures to corresponding Russian structures. This process is roughly comparable to language production in psycholinguistics (Pinker 1994). It consists of three substages that progressively build the Russian translation: *grammar mapping*, *lexical-item mapping*, and *syntax mapping*. When the system needs interactive support, it poses its questions in such a way that knowledge of Russian is not required.

## 2.8 GRAMMAR MAPPING.

English and Russian grammar vary enough that direct word-for-word translation is usually not adequate (Hutchins and Somers 1992). This system operates one level higher by instead translating conceptual chunks. The primary advantage of this approach is that there are generally fewer possible ways to map chunks between languages (Birbaum and Selfridge 1981; King 1995). This mapping is done in two reordering substages that generate an annotated English sentence representation more closely resembling Russian word order and grammatical structure.

### 2.8.1 INTRACHUNK REORDERING.

The words in each chunk are reordered according to how the chunk is structured in English and how it should be structured in Russian. Reordering most closed-class chunks like time expressions is usually left to the lexical-mapping stage where direct replacements can be done; e.g., *from X to Y o'clock* to *c X do Y čas{a|ov}*. Chunks are considered closed-class if the number of possible replacements is finite; for example, *X* and *Y* can each range inclusively from 1 to 12, giving only 144 (12×12) possible Russian structures.

Reordering open-class chunks is also based on the chunk structure, but the number of possible replacements is infinite. The role of each word in a chunk is evaluated, and the position played by that role in the corresponding Russian chunk is established. For example, consider the POSSESS chunk [*dad's cat*], where the first word is annotated as the POSSESSOR and the second as the POSSESSEE. Russian has no apostrophe-s construction, so to become a valid Russian POSSESS chunk, the words need to be modified and reordered to [*cat dad*], where the annotations on each word remain the same. Later, the POSSESSOR annotation will render *dad* in the genitive case to indicate possession in Russian.

### 2.8.2 INTERCHUNK REORDERING.

After the words within the chunks have been reordered, the chunks themselves can be reordered to represent high-level, superficial differences between the languages. There are generally no restrictions on the order of chunks in Russian since it is primarily a free-word-order language (King 1995). However, for the sake of translation consistency, the default chunk order is WHO ACTION WHO WHAT WHERE WHEN HOW WHY, with variations based on the current thematic template.

The output at this point is annotated English words appearing in the intended Russian word order—an intermediate “Russlish” representation. In fact, it should ideally read the same as the literal word-for-word translation of the intended Russian sentence back into English, in this case, *My brother Dave to-go to store in-morning to-buy food cat father*.

## 2.9 LEXICAL-ITEM MAPPING.

At this point, the English words are replaced with their Russian equivalents. Automatically determining translational equivalents across languages, a form of *word-sense disambiguation*, is traditionally a difficult problem, as demonstrated in Scott (1993:174). Most words have multiple senses, and usually these senses do not map directly between the languages. In English, for example, a *plant* can be an organism or a factory. In Russian, these two senses are represented by two unrelated words. To choose the correct sense, the semantic context of the word must be considered, which is another area of difficulty in natural language processing (Russell and Norvig 1995:712). This work takes a simpler approach and avoids fully automated lexical-item mapping. Instead, an interactive approach tries to map as many items automatically as possible, then prompts the user for clarification on the remainder.



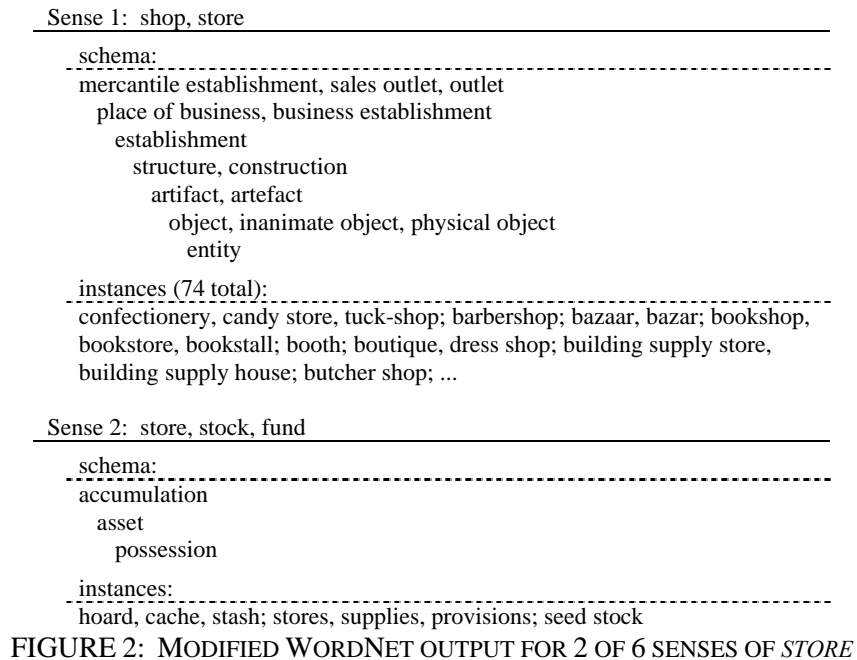
Translation requires lexical resources like bilingual dictionaries, glossaries, etc. The resources used in this work were acquired from various public-domain Internet sites and compiled into a consistent structure:

1. *English-Russian lexicon*: For each English entry, its possible Russian translations are listed, along with their grammatical information like gender, case, declension patterns, etc.
2. *Russian-English lexicon*: For each Russian entry, its possible English translations are listed.
3. *English dictionary*: For each English entry, its English definitions are listed.
4. *WordNet*: For each English word, lists of words satisfying various relationships are given. Standard relationships like synonym and antonym are augmented with conceptual relationships like *is-part-of* and *has-as-part*, etc., as well as example instances (Fellbaum 1998).

For this proof-of-concept system, the combined lexical coverage need not exceed a few hundred words specific to the examples used in evaluation. Indications are that this approach can be scaled up for greater coverage, but the extent remains to be demonstrated.

Two cases are considered here in mapping lexical items: *one-to-one* and *one-to-many correspondences*. The first is the simplest to handle: If an English word has a single Russian translation in the English-Russian lexicon, then this mapping is chosen automatically, and the human is not consulted. This case often applies to closed-class items like time expressions; e.g., *in the morning* maps uniquely to *utrom*. The second case is more common, however, since the majority of words have multiple translations (Hutchins and Somers 1992). A far more complicated approach is used, as shown here for the translation of *store*:

1. In the English-Russian lexicon, get the Russian words corresponding to *store*:  
*store*: 1. *magazin*; 2. *zapas*
2. In WordNet, get the conceptual schema and instances of *store*, as shown in Figure 2. Also get this information for the other content words in the English sentence. The combined result is a simple conceptual description of *store* and the context in which it appears.



3. For each Russian word in Step 1, in the Russian-English lexicon, get the English words corresponding to it:

**magazin:** 1. *store, shop*; 2. *magazine (of a firearm, camera, etc.)*

**zapas:** 1. *supply, stock, reserve*; 2. *reserve (military)*

- a. Assign each Russian headword a score based on how many times *store* appears in its corresponding English words. In this case, *magazin* scores higher than *zapas*.
- b. For each of the corresponding English words, in the English dictionary, get its English definition(s):

**store:** 1. *a supply (of something) for use when needed; reserve; stock*; 2. *supplies*; 3. *a retail establishment where goods are regularly offered for sale; ...*

Likewise, the definitions of *shop*, *magazine*, *supply*, *stock*, and *reserve* are looked up.

- i. Assign each Russian headword a score based on how closely its English definitions match the conceptual schema and instances from Step 2. Again, *magazin* scores higher than *zapas*.
4. Choose the corresponding Russian translation from Step 1 with the highest overall score. In the context of this sentence, *store* is correctly translated as *magazin*. In the case of a tie or insignificant scores, the user is presented with a menu of senses.

## 2.10 SYNTAX MAPPING.

The generated text now consists of Russian words in Russian word order. Still missing, however, are the Russian syntactic features used to tie the words together properly; i.e., verbs need to be conjugated, nouns need to be declined, etc. Recall that the thematic template of the sample sentence is *going somewhere to do something*. Based on this information and knowledge of roughly how an equivalent Russian template would represent this theme, various rules are selected to annotate each Russian word with its correct syntactic form. Figure 3 lists the basic form of the rules applied in this case.

```

WHO_DOER → CASE=NOM
WHO_DOEE → CASE=ACC
WHO_RECIPIENT → CASE=DAT

ACTION_TENSE_PAST → TENSE=PAST
ACTION_TENSE_GENERIC → FORM=INF
ACTION_LOCOMOTIVE → {clarify how}

WHEN_POINT → DIRECT_REPLACE
WHERE_MOVEMENT_DEST → CASE=ACC
POSSESS_POSSESSOR → CASE=GEN

```

FIGURE 3: SAMPLE SYNTAX-MAPPING RULES

For instance, these rules assign the person going—the WHO\_DOER, *my brother Dave*—the nominative case and the thing to buy—the WHO\_DOEE, *food*—the accusative case. Final semantic assignments are also made now. For example, the mode of conveyance (e.g. *walk, ride, fly*) must be determined to choose the proper Russian verb. Furthermore, variations of the verb indicate round trip, one trip in one direction, a trip in progress, etc. No explicit information is available in the English sentence to clarify these details, so interactive questions are posed.

Most Russian syntactic features are based directly on the word annotations, but some are based on sentence-level structures like government and binding (Chomsky 1981). To handle these cases, local syntactic context is considered, generally in a left-associative manner: Words with incomplete annotations borrow the governing annotations from those words to the left. For example, if the word *magazin* (*store*) had no case assignment, it would be assigned the accusative case that its governing preposition *v* (*to*) demands.

The final step in translation is to form the Russian words according to the syntactic-feature annotations. Russian has a well-defined, relatively unambiguous system of declension and conjugation patterns, which generally makes this step straightforward. The annotations on each word reference a complex data structure that describes the proper word form: *Moj*[NUM=SING; CASE=NOM] *brat*[NUM=SING; CASE=NOM] *Dave*[GENDER=MASC; NUM=SING; CASE=NOM] *ezdit'*[PERSON=3; NUM=SING; TENSE=PAST] *v*[GOVERN=ACC] *magazin*[NUM=SING; CASE=ACC] *utrom*[DIRECT\_REPLACE] *kupit'*[FORM=INF; GOVERN=ACC] *pišča*[NUM=SING; CASE=ACC] *koška*[NUM=SING; CASE=DAT] *otets*[NUM=SING; CASE=GEN].

This process is described in detail in Tappan (1996:122), which also includes an exhaustive listing of the data structure. At this point, the final form of the sample sentence is *Moj brat Dave xodil v magazin utrom kupit' pišču koške ottsa*.

## 3. DISCUSSION.

Space restrictions prevent empirical evaluation, so instead general observations will be addressed. Interactivity is a key feature of this system. As expected, keeping a human in the loop markedly reduces

the number of ludicrous errors often made by non-interactive systems. The major disadvantage is the multitude of little questions that arise at practically every step of translation. However, it seems that a significant portion of these questions could be eliminated through better implementation.

The analysis stage performs reasonably well because the input text is reduced with human direction to such a form where relatively few major errors are possible. Errors in analysis tend to propagate throughout the remaining stages of any system, so reducing such errors naturally improves later processing (Hutchins and Somers 1992). Forcing the user to rewrite the input text until it is acceptable, however, clearly ranks as a disadvantage.

The generation stage also performs reasonably well for the same reasons. Sample translations generally remain true to the original text, but they have an elementary-school structure that undermines their readability. The grammar mapping also performs poorly on cross-language divergences, such as active English phrases requiring passive Russian translations. Similarly, the lexical-item mapping considers few phrasal units, so common phrases are either not permitted or are not translated properly. On the positive side, the syntax mapping is based on a well-established approach and performs reliably.

Overall, this system demonstrated on a very restricted set of toy problems that it is a viable approach. However, it remains to be shown that the current architecture can handle greater variation in the input sentences and themes. Evaluation so far indicates that significant extension is not possible. Nevertheless, as a proof-of-concept work, the results were satisfying.

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# ALTERNATIVE ACCOUNTS OF DEVELOPMENTAL PATTERNS: TOWARDS A FUNCTIONAL-COGNITIVE MODEL OF SECOND LANGUAGE ACQUISITION

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## 1. DIFFERENT ACCOUNTS OF DEVELOPMENTAL PATTERNS IN SECOND LANGUAGE ACQUISITION.

Longitudinal studies of first and second language acquisition have often revealed specific developmental patterns that include *acquisition orders* across language elements and *developmental sequences* within elements (Larsen-Freeman and Long 1991; R. Ellis 1994; Braidt 1999). We believe that at least five different types of explanations for such developmental patterns in language acquisition have been proposed in the literature (cf. Brown 1973; O'Grady 1987: 194-200, 1997: 307-328). The first two types of explanations are external to human cognition and the remaining three types involve very different assumptions about the nature of cognition. The first type of explanation is environmentalist, with learning attributed to input frequency, opportunities for language use, and contextualization of language use (cf. Long 1996). The second type is compositionist, with learning attributed to the formal and functional properties that comprise the language elements or mappings being learned (cf. grammatical, semantic, and cumulative complexity proposed by Brown 1973, and the grammatical explanation proposed by O'Grady 1987: 195).

The third type of explanation is connectionist, with learning attributed to simple associative learning processes and not due to prespecified cognitive architecture, modules, or mechanisms (cf. Gasser 1990: 190; Ellis 1998; Elman et al. 1998: 35-42). The fourth type is general nativist, with learning attributed to innate cognitive mechanisms and modules that are not language-specific (O'Grady 1987, 1996, 1997: esp. 308, 1999). In contrast to connectionism, general nativism proposes innate modules and mechanisms which are self-contained cognitive units that perform relatively complex functions. Within a connectionist approach, these complex cognitive behaviors are thought to be epiphenomenal: They emerge as a result of "relatively simple developmental processes being exposed to a massive and complex environment" (N. Ellis 1998: 644). Using a somewhat more inclusive definition of general nativism, the information-processing approach, with the various mechanisms that it includes, is considered here to be general nativist (cf. McLaughlin and Heredia 1996 and section 4 below). The fifth type of explanation is special nativist, with learning attributed to innate, language-specific cognitive capacities (e.g. Krashen 1985; Pienemann and Johnston 1987; Zobl and Liceras 1994; Pienemann 1998).

The three different types of cognitive explanations can be ordered as in (1) below, with the simplest, most general, and most parsimonious explanation on the left of the continuum.

(1) connectionist < general nativist < special nativist

This view of theoretical simplicity is informed by the high value that O'Grady (1997: 307) placed upon general nonlinguistic cognitive processes, by that high value that McLaughlin and Heredia (1996: 222) placed upon a reduction in the number of learning mechanisms, and by the high value that N. Ellis (1998: esp. 645) placed upon the use of the simplest, most basic learning processes. Following this view of theoretical simplicity, we adopt an approach to second language acquisition (SLA) research in which we first seek explanations using the most general cognitive factors. Less general explanations would then be utilized only when the simpler explanations have been exhausted and found to be inadequate. Specifically, in order to account for four past time developmental patterns, we propose a functional-cognitive (or FC) model that, in addition to environmentalist and compositionist explanations, utilizes only a connectionist cognitive explanation.

In contrast to the high value that we place upon theories that use more general cognitive factors, many acquisition researchers have adopted special nativist positions. In order to account for acquisition orders such as those found across English morphemes (including progressive *-ing* preceding articles and articles preceding third person singular non-past *-s*), Krashen (1985: 3, 21) adopted the innatist position proposed by Chomsky (1975). Similarly, Meisel, Clahsen, and Pienemann (1981) and Pienemann and Johnston (1987) accounted for a wide array of acquisition orders in German and English by adopting a transformational syntactic analysis that presupposed special nativist linguistic mechanisms (for further discussion, see Mellow 1996a, Pienemann and Johnston 1996). Subsequent to transformational syntax, White (1989: 30-31) argued that Universal Grammar, when manifested as Government and Binding (GB) theory, accounts for certain acquisition order phenomena, but does not account for the order of English morpheme acquisition. Later, Zobl and Liceras (1994) accounted for acquisition orders in English morphemes using the constructs related to innate functional categories within GB theory. More recently, Pienemann (1998: esp. 23-24, 32-33, 93-98) has carefully combined the special nativism of Lexical Functional Grammar with general nativist cognitive constructs.

It is beyond the scope of this paper to compare the explanatory adequacy of these special nativist accounts to the account provided by our FC Model. Instead, our purposes in this paper are (i) to outline the FC Model, which utilizes connectionist explanations of developmental patterns within past time expression, and (ii) to distinguish the constructs of the FC Model from one type of general nativist account, the information-processing approach.

## 2. THE DATA: ACQUISITION ORDERS AND DEVELOPMENTAL SEQUENCES IN THE SLA OF ENGLISH PAST TIME MAPPINGS.

The FC Model accounts for four specific patterns in the longitudinal SLA of past time form-function mappings (i.e., of simple past, present perfect, and past perfect). These four previous findings are based upon analyses of written texts produced longitudinally by English as a Second Language (ESL) learners (Bardovi-Harlig 1994, 1997; Mellow and Stanley 1998). After exemplifying the ESL use of these mappings, the four patterns are described.

### 2.1 ESL EXAMPLES OF PAST TIME MAPPINGS: SIMPLE PAST, PRESENT PERFECT, AND PAST PERFECT.

Examples of how past time mappings are expressed in ESL writing are provided in (2).

- (2) a. I *when* home to relax. When I *got* home somebody call me and (let) massege in the answer machine.  
 b. One of the most important decision that I **have made** in whole my life *was* when I *decided* to (came) to U.S.A.

The meaning of the italics, underlining, bolding, and parentheses used in these examples are indicated in (3).

- (3) Native-like contexts for Simple Past: *Italics*  
 Native-like contexts for Past Perfect: Underlined  
 Native-like contexts for Present Perfect: **Bold**  
 Non-native-like overgeneralizations of Simple Past: (Parentheses)

The simple past is a mapping that pairs morphological forms such as suffixation (of *-ed*), internal change, or suppletion (or partial suppletion) with the expression of completed events or states in the past (the many other possible meanings of simple past and other past time forms are discussed by Binnick 1991, Celce-Murcia and Larsen-Freeman 1999 among many others). Native-like contexts for simple past in these three passages are italicized. Native-like uses of this mapping are *got* in (2a) and *was* and *decided*

in (2b). A non-native-like use of this mapping is *when* (a spelling which suggests a non-native-like form of *went*) in (2a). In these passages, simple past forms have also been overgeneralized to contexts where they are non-native-like: These contexts are enclosed in parentheses. In (2b) *to came* is an infinitival form that is unmarked in native-like English. In (2a), a simple past form has also been overgeneralized to a context for past perfect, as discussed below.

The past perfect mapping (also known as the pluperfect) uses a syntactic structure along with morphological marking. The past participle of a main verb is preceded by *had*, the partially suppletive form of the auxiliary *have*. The past participle is formed through either suffixation or suppletion. These forms are paired with the expression of a situation in the past that occurred prior to another situation in the past. Passage (2a) includes two native-like contexts for past perfect: These contexts are underlined. The events referred to by the verbs *call* and *leave* took place prior to the event referred to by *get home*. These two forms are non-native-like. There is no auxiliary *had* preceding *call* and *call* is unmarked morphologically. The word *let* appears to be a misspelling of *left*, a partially suppletive form that is either the simple past form or the past participial form. In addition, there is no auxiliary *had* preceding *let*, and the possibility of ellipsis of *had* is eliminated because there is no auxiliary preceding *call*. Consequently, *let* is interpreted to be a simple past form overgeneralized to a past perfect context and is enclosed in parentheses.

The present perfect mapping also uses a syntactic form along with morphological marking. The auxiliary *have* or its partially suppletive form *has* precedes the participial form of a verb. The participial form is marked by either suffixation or suppletion. These forms are paired with the expression of a situation in the past that has current relevance or is viewed from the perspective of present time. Passage (2b) includes a native-like context for present perfect: This context is in bold. This example, *have made*, is a native-like use of this mapping, expressing a completed action in the past that maintains relevance to present time.

The FC Model, as discussed below, is primarily concerned with four patterns in the development of these three past time mappings. However, data from two other past time mappings, reverse-order-reports and present perfect progressive, are discussed as well. Reverse-order reports are sequences of clauses that are not presented in the chronological order in which they occurred. The following example is from Bardovi-Harlig (1994: 244): *John entered college in 1980. He had graduated from high school five years earlier*. In addition, Bardovi-Harlig (1997: 380) indicated that “the present perfect progressive combines the meaning of the present perfect with the notion of a continuous event of process” and provided the following example: *She has been practicing law for 5 years*.

## 2.2 FOUR PATTERNS IN THE SLA OF ENGLISH PAST TIME MAPPINGS.

The first pattern in the longitudinal SLA of past time form-function mappings is an acquisition order in which more complex past time mappings only emerged in production data after the simple past exhibited a high level of suppliance. Bardovi-Harlig (1994: 265) found that when the learners first produced the past perfect (or pluperfect), their appropriate use of the simple past ranged from 78% to 100% and averaged 87%. When these learners first produced the present perfect, their appropriate use of the simple past ranged from 68% to 93% and averaged 85.9% (Bardovi-Harlig 1997: 390). When these learners first produced reverse-order-reports, their appropriate use of the simple past ranged from 37% to 100%, but averaged 84% (Bardovi-Harlig 1994: 265). Mellow and Stanley (1998) found that *post-threshold* texts, those with greater than 70% suppliance in obligatory contexts (SOC) of simple past, exhibited significantly more contexts for past perfect and present perfect mappings than did *pre-threshold* texts, those with less than 70% SOC of simple past.

The second pattern is an acquisition order in which certain complex past time mappings only emerged in production data after other complex past time mappings had already emerged. Bardovi-Harlig (1994: 264, 1997: 417) found that past perfect emerged at the same time as or after reverse-order-reports and present perfect had emerged. Past perfect was also found to appear relatively late in Klein (1995: 47, 50). In contrast, Mellow and Stanley (1998) found that past perfect emerged at least as early as present



perfect. Finally, Bardovi-Harlig (1997: 390) found that the present perfect progressive emerged only after the present perfect had emerged. These two findings are summarized in Figure 1.

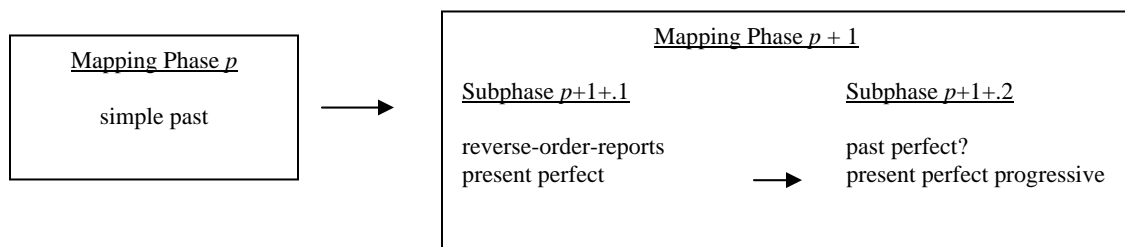


FIGURE 1: A SUBSET OF LOGICAL POSSIBILITIES OF PHRASES AND SUBPHRASES IN THE SECOND LANGUAGE ACQUISITION OF PAST TIME MAPPINGS.

We have characterized these past time findings by distinguishing between two types of groupings of language mappings that develop at similar times, *phases* and *subphases*. A phase includes a set of interrelated mappings that develop at a relatively similar time and which do not emerge in production until after the mapping(s) within the previous phase have achieved a high strength of cognitive representation (or strength of neural connectivity), as indicated by a high level of suppliance. In contrast, a subphase includes a set of interrelated mappings that develop at a very similar time and that may not emerge until after the mapping(s) in the previous subphase have emerged (if a previous subphase exists within that phase). These two categories of results are represented in Figure 1, with simple past in Phase *p*, with reverse-order-reports and present perfect in Subphase *p+1.1* and with past perfect and present perfect progressive in Subphase *p+1.2*. Because of the contradictory findings noted above, a question mark has been placed beside the past perfect in Subphase *p+1.2*.

The third pattern is a developmental sequence in which overgeneralizations of the simple past mapping increased significantly after the simple past exhibited a high level of suppliance. Mellow and Stanley (1998) found that all overgeneralizations of the simple past mapping were significantly more frequent when the mapping exhibited a high level of suppliance, greater than 70% SOC. These overgeneralizations were to target-like contexts for present perfect and for past perfect, as well as to target-like contexts for non-past time mappings, including infinitives and after modal verbs.

The fourth pattern is a pattern of overgeneralizations in which the emerging, more complex past time forms were often produced within target-like contexts for the simple past mapping and in which the simple past forms were used in contexts for the emerging mappings.

Bardovi-Harlig (1997: 400-402) found that when present perfect forms were overgeneralized ( $N = 65$ ), 63.1 % of the overgeneralizations were in contexts for simple past (cf. the similar finding reported by Klein 1995: 47), 23.1% were in contexts for past perfect (or pluperfect), and 10.8% were in contexts for the present tense. In addition, when other forms were overgeneralized in contexts for the present perfect ( $N = 35$ ), 43% were present tense forms, 37% were simple past forms, and 20% were past perfect forms. These patterns of overgeneralization were confirmed for the present perfect and extended to the past perfect in the data reported in Mellow and Stanley (1998). Of the uses of and contexts for present perfect ( $N = 8$ ), two (25%) were present perfect forms overgeneralized in simple past contexts and two (25%) were simple past forms overgeneralized in present perfect contexts. Of the uses of and contexts for past perfect ( $N = 17$ ), one (6%) was a past perfect form overgeneralized in a simple past context and eight (44%) were simple past forms overgeneralized in past perfect contexts.

### 3.0 THE FC MODEL OF ESL PAST TIME DEVELOPMENT.

Using only connectionist, environmentalist, and compositionist explanatory factors, the FC Model accounts for these four empirically-attested patterns in the longitudinal SLA of past time form-function mappings. The FC Model begins with the four primary theoretical commitments of the

Competition Model (MacWhinney 1997; MacWhinney and Bates 1989). The first commitment is that language and interlanguage systems are hypothesized to be composed of form-function mappings. In addition, following Sag and Wasow (1999), the FC Model conceptualizes language as form-function mappings in which phonological (or orthographic) features are paired with semantic and syntactic features. The second commitment is that language learning is thought to be incremental, resulting from associative (i.e., connectionist) learning processes. The third commitment is that language processing is thought to be restricted by capacity limitations in terms of short-term verbal memory. The fourth commitment is that developmental patterns are hypothesized to result from the frequency in input and functional properties of the mappings being learned (i.e., an empiricist or data-driven, rather than nativist position). The FC Model has also been formulated in order to be consistent with the developmental patterns reported in Cazden (1968), Huebner (1979, 1983a, 1983b), Barrett (1986), and Plunkett, Sinha, Moller, and Strandsby (1992). In accordance with these commitments, the past time patterns, including acquisition orders and overgeneralizations, are interpreted as manifestations of expansions in neural connectivity and modifications of connection strengths, changes that result from the associative learning that occurs during the processing of a large number of exemplars. The Model is explicated in more detail in Mellow and Stanley (1998), also providing an account of two patterns of task variation.

### 3.1 EXPLANATORY FACTORS WITHIN THE FC MODEL.

The FC Model accounts for the findings summarized in Figure 1 using only connectionist, environmentalist, and compositionist explanatory factors. Rather than relying upon cognitive modules or mechanisms that are either general to human cognition or specific to language, one of the main assumptions of the FC Model is that that key aspects of the development of past time mappings result from associative learning processes. Thus, language learning is not explained through the use of complex, self-contained cognitive units. Instead, language learning is characterized as changes in patterns of connections and activation between forms and functions. These changes can be represented and simulated by connectionist models (e.g., MacWhinney 1989, 1997; Broeder and Plunkett 1994; N. Ellis 1998, 1999, Kempe and MacWhinney 1998). More specifically, a connectionist approach to development (e.g., Elman et al. 1998) assumes that learning is a consequence of repeated neural network activation, in conjunction with learning algorithms such as backpropagation and Hebbian learning, that results in stronger and more easily activated connections.

In addition, the FC Model assumes that certain aspects of the development of past time mappings are affected by environmental factors. Long (1996) provides a detailed review of the role of environmental factors in SLA. One environmental factor that the FC Model includes is the frequency of items in input (e.g., Larsen-Freeman 1976; Gathercole 1986; Barlow 1996; MacWhinney 1997; N. Ellis 1998). To a certain extent, aspects of the acquisition order in Figure 1 may be due to frequency in input, with simple past presumably occurring more than present perfect and past perfect in the input to a learner. A second environmental factor is the frequency of opportunities and/or need for language use in output (Swain 1993). Although Bardovi-Harlig (1994, 1997) found that developmental patterns in past time expression were not affected by instruction, a third environmental factor included in the FC Model is the ways in which language use is contextualized and made meaningful, including salience-enhancement and instruction (Schmidt and Frota 1986; Sharwood Smith 1993; Schmidt 1994; VanPatten 1995).

In addition, to explain the past time findings, we utilize an explanation that we refer to as compositionist, expressed as the principle in (4).

#### (4) The Compositionist Principle of Acquisition Orders:

Form-function mappings will develop in a specific order according to the properties of which they are composed, including: (i) the aggregate processability of their formal and functional properties; and (ii) the cumulative ordering that results from the developmental interrelations of the forms and functions within each mapping.

The principle builds upon explanatory accounts of acquisition orders proposed by Brown (1973), Slobin (1982: 150-53), Johnson (1985), Gathercole (1986), O'Grady (1987: 194-198, 1997: 349), Radford (1990: 263-68), Cho and O'Grady (1995: 446), VanPatten (1995), and Bardovi-Harlig (1997: 412), among others. The first part of this principle proposes that acquisition orders across mappings occur because the aggregation of specific formal and functional properties makes a mapping relatively more or less difficult to process in comprehension or production. Because connectionist models propose that development results from the network associations that occur during the processing of masses of exemplars, mappings that are easier to process will presumably be processed more often and hence learned earlier. The formal properties that make mappings difficult to process include, but are not limited to, low perceptual salience and complex structural properties. Low perceptual salience may result when (i) a form is a bound morpheme, rather than a free morpheme; (ii) a morpheme is an unstressed syllable; or (iii) a morpheme is only a one-consonant phoneme. Complex structural properties include (i) a greater quantity of required morphological or syntactic forms (e.g., Brown, 1973; Givón, 1984); (ii) allomorphic variation and/or uses of different word formation structures by different lexical subcategories to encode the same meaning (e.g., affixation and suppletion alternatively used to express past tense); (iii) homophony with a form used to express another meaning; and (iv) syntactic dependency on a non-adjacent element, such as the preposing of a *wh*-pronoun that is the object complement of a verb.

The functional properties that make mappings difficult to process include, but are not limited to, low functional load and complex functional load. A low functional load may occur when there is (i) frequent or absolute discursal or syntagmatic redundancy (Mellow and Cumming 1994; VanPatten 1995; Mellow 1996b); (ii) paradigmatic redundancy (i.e., items in free variation that express the same meaning); and (iii) absence of cue contrast availability, low cue simple reliability, and low cue conflict reliability (MacWhinney 1997). A complex functional load may occur when there is (i) abstract, non-prototypical, or less 'relevant' semantic content (e.g., Blakemore 1992; Plunkett et al. 1992; Andersen and Shirai 1994); (ii) subtle social or emotional meaning; (iii) indirect speech acts; (iv) complex semantic content that is a combination of semantic features (e.g., Brown 1973; Bardovi-Harlig 1997); and (v) polyfunctionality of meaning (i.e., multiple meanings at grammatical, referential, pragmatic, and/or social levels, Mellow 1996b).

As indicated by the second factor specified in the Compositionist Principle of Acquisition Orders, a crucial assumption is that mappings that are sequentially related to each other within the order are interrelated and dependent upon each other (cf. Brown 1973; Borer and Wexler 1987: 126; O'Grady 1987: 195-198; Radford 1990: 268-270). If the Compositionist Principle of Acquisition Orders only made reference to the aggregation of properties of processability, then mappings could be assigned to different phases simply because one mapping has relatively more aggregate properties that impede processing and hence delay acquisition; however, the order would be neither coherent nor meaningful because there would be no linguistic relationship between the mappings. For example, the plural suffix on nouns (-s) appears to have fewer properties that hypothetically delay acquisition than does the past perfect marking on verbs, which has relatively more complex syntactic (auxiliary verb) and morphological (affixation or suppletion) components. Although this may lead to the prediction that the plural mapping will be acquired before the past perfect mapping, there is no overlap in either the form or function of these mappings and therefore no reason to place these two mappings within the same acquisition order. Indeed, the lack of theoretical relation between ordered elements has been one of the main criticisms of previous models of acquisition orders (e.g., Brown 1973: 407; Larsen-Freeman and Long 1991: 91; Zobl and Liceras 1994; Mellow 1996a).

In contrast, in the FC Model, the mappings within an acquisition order will share (during interlanguage development, although perhaps not in the target system) formal and/or functional properties, with the earlier acquired mappings having forms and/or meanings that are relatively more easily processed and learned (cf. Brown 1973; Bardovi-Harlig 1997; Andersen and Shirai 1994). Building upon Brown's (1973: 185-187, 368-379, 404-409) 'law of cumulative complexity', we describe this as a *cumulative ordering* within an acquisition order: certain linguistic forms or functions must have

already emerged or achieved stability before a mapping that includes (or builds upon) the form or function can emerge.

A cumulative ordering with respect to some of the primary meanings of the past time form-function mappings is indicated by the following feature analysis. In her analysis of interlanguage data, Bardovi-Harlig (1997; cf. Binnick 1991: esp. 102) proposes that simple past primarily encodes the semantic feature [+anterior] (i.e., it indicates that an event or situation took place prior to the time of speaking), but that present perfect may also encode both [+anterior] and the semantic feature of [+current relevance]. In addition, because a frequently occurring function of the past perfect is to encode an “action completed in the past prior to some other past event” (Celce-Murcia and Larsen-Freeman 1999: 116), past perfect can encode both [+anterior] and a feature that we tentatively refer to as [+prior to point of reference] (following Reichenbach 1947, as discussed in Binnick 1991: 110-118). Using these semantic features and following the notion of cumulative semantic complexity proposed by Brown (1973), Table 1 provides a hierarchy of the semantic features for these meanings of these three mappings.

<u>Mapping</u>	<u>Semantic Features</u>
simple past	+ anterior
present perfect	+ anterior, + current relevance
past perfect	+ anterior, + prior to point of reference

TABLE 1: A HIERARCHY OF THE SEMANTIC FEATURES OF A SUBSET OF THE MEANINGS OF THREE PAST TIME MAPPINGS.

As indicated in Table 1, the cumulatively complex meanings of these past time mappings correspond to the empirically attested acquisition order summarized in Figure 1, with simple past in Phase  $p$  and present perfect and past perfect in Phase  $p+1$ . By including the Compositionist Principle of Acquisition Orders, the FC Model is able to explain these orders as being a consequence of difficulty of processing.

### 3.2 AN EXPLICATION OF THE FC MODEL.

The FC Model was created to account for the past time findings while adhering to the theoretical commitments and explanatory factors described above. The FC Model is composed of the following constructs: (i) mapping *phases* that characterize a subset of acquisition orders across mappings; (ii) mapping *subphases* that characterize an additional subset of acquisition orders across mappings; (iii) a Compositionist Principle of Acquisition Orders that accounts for the placement of mappings in phases (or subphases); (iv) four *stages* that characterize the developmental sequence within a specific mapping: Emergence, Pre-threshold, Post-threshold, and Near Target-like; (v) two *substages* that allow for two subparts of overgeneralization (increases in overgeneralization and retreat of overgeneralization) within the pre-threshold, post-threshold, and near target-like stages; (vi) an important ‘*threshold*’ boundary between the second and third stages of a mapping, with the actual threshold SOC value varying according to the attentional requirements of task, among other possible factors; (vii) a post-threshold stage that occurs after a *developmental shift* and is characterized by a significant increase in overgeneralizations; (viii) a post-threshold stage that occurs after a *developmental shift* and is characterized by its co-occurrence with the emergence of mappings in the subsequent phase; and (ix) a specification of the domains of overgeneralization at each stage, with several important domains of overgeneralization linked to the Compositionist Principle of Acquisition Orders.

The FC Model is illustrated in Figure 2 with respect to the development of two mappings that express past time, simple past and present perfect.

Mapping Phase $p$			Mapping Phase $p + 1$		
simple past			present perfect		
Stage 1 - Emergence					
Stage 2 - Pre-threshold (< 70% SOC): Underapplication (substages not indicated)					
Increases in SOC ↓					
Stage 3 - Post-threshold (>70%SOC)			Stage 1 - Emergence		
			Stage 2 - Pre-threshold (< 70% SOC): Underapplication		
Increases in SOC ↓	Substage 3.1 - Increases in OvG to a f-f mapping in the next phase; ↑OvG ( $p \rightarrow p_{+1}$ )	Substage 3.1 - Increases in OvG from a f-f mapping in the next phase; ↑OvG ( $p_{+1} \rightarrow p$ )	Increases in SOC ↓	Substage 2.1 - Increases in OvG from a f-f mapping in the previous phase; ↑OvG ( $p \rightarrow p_{+1}$ )	Substage 2.1 - Increases in OvG to a f-f mapping in the previous phase; ↑OvG ( $p_{+1} \rightarrow p$ )
	Substage 3.2 - Retreat of OvG to a f-f mapping in the next phase; ↓OvG ( $p \rightarrow p_{+1}$ )	Substage 3.2 - Retreat of OvG from a f-f mapping in the next phase; ↓OvG ( $p_{+1} \rightarrow p$ )		Substage 2.2 - Retreat of OvG from a f-f mapping in the previous phase; ↓OvG ( $p \rightarrow p_{+1}$ )	Substage 2.2 - Retreat of OvG to a f-f mapping in the previous phase; ↓OvG ( $p_{+1} \rightarrow p$ )
Stage 4 - Near target-like (>95% SOC) (substages not indicated)			Stage 3 - Post-threshold (>70%SOC) (substages not indicated)		
			Increases in SOC ↓		
			Stage 4 - Near target-like (>95% SOC) (substages not indicated)		

FIGURE 2: A SUBSET OF LOGICAL POSSIBILITIES OF STAGES, SUBSTAGES, AND PHASES OF THE SLA OF PAST TIME FORM-FUNCTION (F-F) MAPPINGS WITHIN THE FC MODEL, INCLUDING OVERGENERALIZATION BETWEEN MAPPINGS IN ADJACENT PHASES.

In Figure 2, increases in overgeneralization are abbreviated as  $\uparrow\text{OvG}$  and the retreat of overgeneralization is abbreviated as  $\downarrow\text{OvG}$ . In addition, the domain of the overgeneralization is specified and abbreviated in parentheses, with the first variable indicating the phase of the form that is overgeneralized and the second variable indicating the phase of the context to which the form is generalized. For example,  $\uparrow\text{OvG} (p \rightarrow p_{+1})$  describes increases in overgeneralizations of a form from a mapping in phase  $p$  to the context for a mapping in phase  $p+1$ .

The horizontal dimension in Figure 2 indicates increases in interlanguage complexity. Thus, the horizontal axis indicates an acquisition order of phases across form-function mappings, with a subset of possible past time mappings indicated as mapping phase  $p$ , which includes simple past, and mapping phase  $p+1$ , which includes present perfect. Representing only a subset of the English mappings that express past time, Figure 2 includes only two past time mappings and does not indicate the *subphases* of mappings that were developed in Figure 1.

Vertically, Figure 2 represents developmental sequences within each mapping, with each mapping potentially going through four stages (Emergence, Pre-threshold, Post-threshold, and Near Target-like) and with important substages within three of those stages (increases in overgeneralizations, followed by decreases or retreat of those overgeneralizations). The 'vertical' stages and substages within a specific mapping may overlap to various degrees. In addition, the combination of the horizontal and vertical dimensions results in time being represented diagonally, beginning in the top left and moving toward the bottom right.

#### 4.0 THE NATURE OF GRADUAL INCREASES AND DEVELOPMENTAL SHIFTS: INFORMATION-PROCESSING (GENERAL NATIVIST) VS. CONNECTIONIST ACCOUNTS.

Clearly, the FC Model is very different from special nativist accounts of developmental patterns, both in terms of units of linguistic analysis (e.g., mappings of form and function vs. parameters, functional projections, and movement) and explanatory factors. In this section, we discuss the less obvious distinction between the FC Model's connectionist account and one type of general nativist account, the information-processing approach. Information-processing does not assume language-specific cognitive mechanisms, but does assume that humans are composed of separate information-processing mechanisms, including perceptual systems, output systems, memory systems, attention capacities, and several learning processes, including automatization and restructuring (McLaughlin and Heredia 1996). In contrast, a connectionist account assumes only a massively interconnected neural network, with behaviors due to the nature of connection patterns and with learning being the adjustment of those patterns of connectivity in response to the continual processing of linguistic (and other) exemplars.

Within the past time findings, two seemingly different types of learning patterns appear to be occurring in the development of mappings such as the simple past. The first pattern is the gradual increase in suppliance of target-like forms in obligatory contexts (during Stage 2, Pre-threshold). Slow and gradual development is a pattern that has often been reported in longitudinal SLA studies of past time and other grammatical mappings (e.g., Hakuta 1976, Klein 1995, Mitchell and Myles 1998: 119, cf. L1 acquisition: Brown 1973: 257, 410).

The second pattern is a more complex developmental shift and is comprised of three co-occurring patterns: (i) the achievement of high levels of suppliance of simple past; (ii) the emergence of the more complex past time mappings, and (iii) a significant increase in overgeneralizations of simple past (during Stage 3, and corresponding to Stage 1 of a more complex mapping). Many studies of first and second language acquisition have reported similar patterns that are relatively sudden and appear to involve a qualitative change in the learner's production or comprehension. These similar patterns have been characterized as restructuring (e.g., Lightbown 1985; McLaughlin 1990), sudden discontinuous shifts (McLaughlin 1990: 119), qualitative changes in internal representation (McLaughlin 1990; McLaughlin and Heredia 1996), the crossing of a threshold (Mellow 1988, for very different SLA uses of the term threshold level of development, see Cummins 1984 and van Ek 1987), the attainment of acquisitional prerequisites (Bardovi-Harlig 1994, 1997; cf. Pienemann 1984; Pienemann and Johnston 1987), the commencement of active engagement in the acquisition of a specific structure (Morgan, Bonamo and Travis 1995; Saxton 2000), burst patterns (or marked acceleration) (Elman et al. 1998: 182), and spurts (or fundamental advances) (Plunkett et al. 1992).

In order to account for these two different patterns, the information-processing approach has proposed two different types of learning processes: automatization and restructuring (McLaughlin 1990; McLaughlin and Heredia 1996; Mellow 1996b; Segalowitz, Segalowitz and Wood 1998). Automatization accounts for gradual increases in the suppliance of forms. Restructuring accounts for relatively sudden shifts that appear to involve qualitative changes in a learner's internal system. Within the FC Model, these two patterns are accounted for by only one process. Thus, although a developmental shift may not be as gradual as increases in SOC, these shifts are also interpreted to be the manifestation of cumulative, incremental, associative learning (changes in patterns of network connectivity) (cf. O'Grady 1987: 199; Barlow 1996). In the remainder of this section, we will explain how these two patterns can be accounted for with the same associative learning process. The discussion will summarize connectionist accounts of rapid changes and overgeneralizations, re-analyze the properties of the two apparently different developmental patterns, and then discuss the nature and operationalization of a threshold.

## 4.1 CONNECTIONIST ACCOUNTS OF RAPID CHANGES AND OVERGENERALIZATIONS.

Incremental associative learning has provided a plausible account of gradual patterns in SLA (Rumelhart and McClelland 1986; Schmidt 1994; N. Ellis and Schmidt 1997, 1998, MacWhinney 1997: esp. 129, N. Ellis 1998, 1999; Elman et al. 1998). These gradual changes can be attributed to the strengthening of the cognitive representation of those mappings, interpreted within connectionist models as the strengthening of patterns of connectivity. However, connectionist models have indicated that cumulative, incremental development is not always slow, gradual, and linear. Indeed, connectionist and mathematical models have indicated that a sudden 'readiness to learn', accelerations in slope (i.e., apparent discontinuities), U-shaped learning, and qualitatively different changes in behavior (especially dynamical changes in which later behavior depends on earlier behavior) can be accounted for by the processing of sufficient masses of exemplars in combination with relatively continuous rather than discontinuous equations and models (e.g., van Geert 1991; N. Ellis and Schmidt 1997, 1998; N. Ellis 1998; Elman et al. 1998: esp. 173-238). For example, the connectionist simulation of concept-formation and vocabulary growth reported by Plunkett et al. (1992) exhibited a developmental pattern that resembled a vocabulary spurt. This spurt occurred only after a prolonged period of training (cf. the discussion of spurts or bursts in Elman et al. 1998: 124-129, 181-186).

In addition, overgeneralizations can be accounted for by using incremental associative learning in conjunction with the use of form-function mappings as the unit of linguistic analysis. Overgeneralizations can be interpreted as changes in the interconnections within a learner's neural network. As a result of the associative learning that occurs during the processing of exemplars, learners develop patterns of connectivity between multiple forms and multiple functions. From the perspective of the target language, these interconnections may increase in such a way that the forms and functions of one mapping become connected to the forms and functions of another mapping or other mappings. Overgeneralizations then result when these 'overlapping' mappings are activated. Many of these overgeneralizations would be expected to occur only later in the development of a mapping: As the patterns of connection for a mapping become strong and less variable (and achieve a threshold strength of connectivity), learners are presumably able to begin processing meanings and structures that are increasingly and cumulatively complex. Therefore, overgeneralization patterns occur and increase as learners' neural networks expand and begin to regularly include related, more complex forms and functions. Importantly, in the connectionist simulation reported by Plunkett et al. (1992, discussed above), the associative learning resulted in a developmental pattern in which overgeneralizations (or over-extensions) primarily occurred only later in training, a result that is remarkably parallel to the third past time finding reported in section 2.2. In this way, behavior that might have been attributed to an overgeneralized rule is not rule-governed, but instead results from specific patterns of activation or weightings of connections between forms and functions.

## 4.2 RE-CHARACTERIZING THE PROPERTIES OF GRADUAL INCREASES AND DEVELOPMENTAL SHIFTS.

Although gradual increases and developmental shifts appear to have very different properties, a reanalysis of their properties reveals that they can be accounted for with a single learning process, associative learning. Building partially from McLaughlin (1990: 121), and accounting only for the findings with respect to past time mappings, we have characterized two 'seemingly' different types of patterns not as automatization and restructuring, but instead as (i) incremental increases in the suppliance of a form in its obligatory contexts; and (ii) sequential multi-staged shifts in the use of form-function mappings. There are two apparent differences between these types of developmental patterns: (i) the first type is clearly cumulative, incremental and gradual, whereas the second type appears to involve a change that is sudden and therefore may be discrete rather than continuous (cf. McLaughlin 1990: 120); and (ii) the first type does not involve the addition or deletion of forms or functions, whereas the second involves changes to interlanguage mappings so that the mappings overlap (or cease to overlap) with respect to forms and/or functions. However, a connectionist analysis of these apparent differences reveals that

neither of these differences is the result of distinct learning processes. Instead, the two types of developmental patterns are not distinct but are both manifestations of the same associative learning process.

The first apparent difference, suddenness or discreteness, is likely to result from the nature of the analyses and from the nature of the longitudinal data that are considered. As indicated by Huebner's (1979; 1983b) careful analysis of stages of overgeneralizations, a detailed analysis of the use of form-function mappings may reveal a series of small systematic changes that are not observed without such a fine-grained analysis (see also Preston 1996: 250; Bardovi-Harlig 1997: 415). In addition, a small number of data points may provide only a 'snapshot' of developmental changes, resulting in the interpretation that changes are relatively abrupt. In contrast, an extensive number of longitudinal data elicitation sessions may suggest that changes are gradual (for further discussion, see McLaughlin 1990: 118, 120). The data that motivated the FC Model suggest large but non-discrete changes in production patterns. For example, in Mellow and Stanley (1998), the pre-threshold texts exhibited a small number of instances of contexts of past perfect and present perfect (N=5), as well as a small number of simple past overgeneralizations (N=12). In contrast, the post-threshold texts had a significantly larger number of instances of contexts of past perfect and present perfect (N=18), as well as a significantly larger number of simple past overgeneralizations (N=34). Although these differences are statistically significant, our interpretation of these numbers is that they do not suggest discrete or entirely distinct stages. These findings of non-discrete changes are likely due to the moderately large number of sampling sessions which limits the snapshot effect. Thus, the specific temporal and linguistic analyses of the past time mappings suggest that the developmental shifts in those data, although less gradual than earlier changes, are continuous and incremental rather than discrete and sudden.

The second apparent difference between these types of patterns is that only shifts are associated with changes in other mappings. However, as indicated by the nature of overgeneralizations within connectionist models (section 4.1), associative learning can account for changes in overlapping patterns of connectivity between forms and functions: A developmental shift resulting in overlapping mappings is simply a later stage in the development of a mapping. In other words, the two types of patterns are different stages of one longer, complex developmental path that results incrementally from associative learning. Patterns of connectivity constantly change as a result of processing exemplars, with the part of the network associated with past time (or other) forms and functions first strengthening (exhibiting increasing SOC) and then expanding to related and more complex forms and functions (exhibiting overgeneralizations). In addition, the very earliest development of a mapping (Stage 1 and the early parts of Stage 2) may also exhibit overgeneralizations, overlapping with forms and functions that are part of a previously acquired mapping. Thus, a complete longitudinal perspective on the development of a mapping may reveal that shifts associated with changes in other mappings occur both in the early and late stages of development.

#### 4.3 THE NATURE AND OPERATIONALIZATION OF A THRESHOLD.

One final aspect of developmental shifts that warrants discussion is the timing of the shift. In the FC Model, we propose that, because one of the co-occurring patterns is high SOC scores, the strength of connectivity of the simple past forms and functions must reach a *threshold level* before the shift occurs and the co-occurring patterns appear. The construct of a threshold level implies that increases in overgeneralizations and the development of related, more cumulatively complex language mappings are significantly facilitated when less complex mappings have reached a certain strength of cognitive representation. In other words, the expansion of a learner's network to include additional complex forms and functions occurs only when simpler forms and functions have achieved a strength or consistency of network connectivity (cf. Plunkett et al. 1992: esp. 307; Elman et al. 1998: 128-129). Because not all mappings will exist in such a cumulatively complex relationship with each other, a precise model of development will need to specify a set of developmental relationships. These important theoretical issues



are addressed by the constructs of phases and subphases of mappings, constructs which were developed in Figure 1 in response to the past time data, as well as by the notion of cumulative ordering.

For the purposes of measurement, the construct of a *threshold* level for change may be operationalized within a study as a specific percentage of obligatory suppliance of a form in its functional context. For example, for a range of grammatical phenomena, active engagement in acquisition was hypothesized to occur at 50% of grammatical accuracy in Morgan et al. (1995) and Saxton (2000). Similarly, increases in overgeneralizations and the emergence of complex forms were hypothesized to occur at 70% SOC of simple past in Mellow and Stanley (1998). In Bardovi-Harlig (1994, 1997), in reference to the appropriate use of simple past, reverse-order-reports emerged at an average of 84.6%, pluperfect (past perfect) emerged at an average of 87%, and present perfect emerged at an average of 85.9%. The use of these specific operationalized values or levels suggests a division of development into discrete stages. However, our view, following Mellow (1988), is that a threshold level is not a single value or point. Instead, achievement of the threshold is a continuous, although fairly rapid, process. For example, the threshold level in Mellow and Stanley (1998) might have been operationalized at 65% SOC or at the range of 70% through to 73% SOC. An investigation of the narrowness of the threshold will require a larger data set than that analyzed in Mellow and Stanley (1998). In addition, the specific level at which a developmental shift occurs will vary across different ways of coding native-like or 'accurate' use, different learning opportunities, different individuals, different language mappings, and, especially, different task conditions in which language is used.

In sum, the construct of a threshold level provides an account of when and why these developmental changes occur. However, until some of the variables that affect development and use are better understood, the construct has limited predictive power. Overall, the connectionist simulations, in conjunction with an analysis of the distinctive properties of shifts in past time mappings, reveal that these developmental shifts can be accounted for with associative learning processes. In addition, the construct of prerequisite strength of connectivity also explains why patterns of overgeneralization increase late in the development of a mapping, a result reported both in the past time findings and in connectionist simulations. Following Mellow and Stanley (1998), in the FC Model the threshold level that defines the boundary between Stages 2 and 3 has been tentatively set at 70% SOC.

## 5.0 CONCLUSION.

In this paper, we have attempted to demonstrate that acquisition orders across form-function mappings, as well as developmental sequences within mappings, especially those related to stages of overgeneralization, can be accounted for with connectionist and compositionist explanations. The FC Model has been motivated by a desire for theoretical simplicity in a cognitive theory of language acquisition: Before postulating the need for innate cognitive mechanisms, we wish to determine whether patterns of development can be accounted for with simpler cognitive processes. As such, the FC Model contrasts sharply with the many previous special nativist accounts of acquisition orders. In addition, the FC Model is different from a general nativist approach, such as the information-processing approach, because complex developmental facts are accounted for with a single learning process. Although we are optimistic that the FC Model can be expanded to account for additional aspects of SLA, the true test of the explanatory adequacy of such a model will only come with analyses of additional and more complex linguistic phenomena.

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# EFFECTS OF SENTENCE STRUCTURE ON MEMORY: CLAUSAL AND PHRASAL MODIFIERS ARE THE SAME

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## 1. INTRODUCTION.

There is a large body of evidence indicating that clause structure has an important effect on memory for language. In particular, words from the most recently processed clause are remembered better than words from previous clauses. This was first shown in Caplan (1972) which tested recognition memory for words from either the initial or final clause of spoken two-clause sentences. For example, subjects listened to sentences like those in (1), then heard a probe word, in this case *oil*, and decided whether or not that word occurred in the sentence. The sentences were designed so that the endings were identical, but the beginnings forced a clause boundary to occur either before or after the word *oil*. The endings of the sentences were actually acoustically identical strings spliced onto different beginnings, ensuring that any effect was not due to prosodic cues marking the clause boundary, the distance of the target word from the end of the sentence, or other variation in the materials. Thus *oil* is exactly the same distance from the end of the sentence in both cases, while in (1a) it occurs in the first clause of the sentence and in (1b) it occurs in the final clause.

- (1) a. Now that artists are working in *oil*, prints are rare.
- b. Now that artists are working fewer hours, *oil* prints are rare.

Caplan found that subjects remembered the words better when they occurred in the final clause. In other words, subjects responded to *oil* faster after hearing (1b) than after (1a).

This basic finding has been repeated numerous times. For example, Jarvella (1979) found similar effects for recall. Subjects listened to passages and, at a prompt, recalled as much of the immediately preceding material as they could. Recall was best for the material in the last clause preceding the prompt, while recall of prior clauses dropped significantly. Von Eckardt and Potter (1985) found the same sharp drop-off in memory at a clause boundary using recognition memory for both words and pictures. Subjects heard sentences like (2a) and (2b) and then either heard the word *carrot* or saw a picture of a carrot and decided whether that word appeared in the sentence.

- (2) a. The *carrot* was badly overcooked, and the stew had too much pepper in it.
- b. The stew had too much pepper in it, and the *carrot* was badly overcooked.

Responses to both words and pictures were faster when *carrot* occurred in the final clause of the sentence. Finally, Gernsbacher, Hargreaves and Beeman (1989) found the clause boundary effect using recognition of visually presented materials.

These and other findings have led to a clause-by-clause processing hypothesis whereby clauses are processed one at a time, independently, and the current clause has a special status in processing and memory (Fodor, Bever and Garrett 1974; Glucksberg and Danks 1975). The clause boundary effect occurs because only one clause at a time can have this special status and once a new clause begins to be processed, the prior clause loses its special status and memory for it drops off.

A potential problem area for this hypothesis, though, is the processing of center-embedded clauses, such as the relative clause in (3).

- (3) The workers [who were assigned to the project] asked for advice from a consultant.

In this type of two-clause sentence one clause occurs in the middle of another. As a consequence, material from the main clause (i.e. the subject, *workers*) must be maintained in memory while the relative clause is being processed. It is not clear how a clause-by-clause mode of processing would handle such sentences.

There is evidence from language production studies indicating that center-embedded clauses are processed independently from the main clause. Bock and Cutting (1992) compared the number of agreement errors on main verbs following prepositional phrases and relative clauses modifying the subject, as in (4).

- (4) a. The editor of the history books ... was/were  
b. The editor who rejected the books ... was/were

In cases like this, the presence of a plural noun (*books*) near the verb can sometimes result in an agreement error in which the verb agrees with the closer plural noun rather than the singular, but farther away, head noun (*editor*). Bock and Cutting found a significant difference between the two types of modifiers, with more errors occurring after a prepositional phrase as in (4a). For example, participants were more likely to make an error like *the editor of the history books were* than an error like *the editor who rejected the books were*. Thus, a plural noun in a phrasal modifier was more likely to lead to an agreement error than one embedded in a clausal modifier. This indicates that the relative clause is more insulated from the main clause than the prepositional phrase, supporting the idea that the relative clause is processed separately, even though in the actual utterance it occurs in the middle of the main clause. Sevald and Garnsey (1995) found a similar effect in a combined comprehension and production task in which subjects read the noun phrases and then spoke the verbs.

These results support the idea that clauses, even center-embedded ones, are processed separately in production. However, the production of center-embedded clauses may differ from their comprehension since in production, each clause may originally be planned separately, and then interleaved at a later stage, while in comprehension, a listener must take the words in serial position as they come. One study, Townsend, Ottaviano and Bever (1979), examined the effects of center-embedding in comprehension. They tested recognition memory for words in center-embedded relative clauses (among many other types), comparing probe recognition times for the verbs in sentences like (5a) and (5b).

- (5) a. The owl *scratched* the fox [that *touched* the monkey].  
b. The owl [that *scratched* the fox] *touched* the monkey.

They found that probes from the final clause were recognized faster. There was also an effect of sentence type, with the center-embedded sentences being slower overall. The results from sentence type (5b) indicate that center-embedded clauses do cause a clause boundary effect. However, these sentence pairs included a number of other factors that could have affected the response times. The verb *scratched* is in the main clause in (5a) but in the embedded clause in (5b), while the reverse is true of *touched*. Also in (5a) the clauses are in main-subordinate order while in (5b) they are in subordinate-main order. Both of these factors have been shown to affect memory for words in a sentence (Bever and Townsend 1979; Jarvella and Herman 1972; Shedletsky 1974), making comparisons between (5a) and (5b) difficult.

The current experiment was designed to test the effect of center-embedded clauses in comprehension in a way that would test the effect of clause structure alone while keeping other factors constant. To that end, words from a relative clause were compared to words from a similar phrasal modifier--a prepositional phrase. For example, in sentences (6) and (7), memory for the noun *project* was compared to memory for the noun *advice*; in sentence (6), *project* is embedded in a relative clause (and thus in the prior clause) while in (7) *project* is in a prepositional phrase (and thus still in the main clause). Other aspects of the sentence, including the grammatical role of *project* and its distance from the end of the sentence, are identical in the two sentences.

- (6) The workers [who were assigned to the *project*] asked for *advice* from a consultant.
- (7) The inexperienced workers (on the *project*) asked for *advice* from a consultant.

As a further comparison, sentences containing reduced relative clauses (i.e., *The workers assigned to the project*) were included as a midpoint between the clausal and phrasal modifiers. And finally, a set of coordinate clause sentences were included as a control condition since clause boundary effects are typically strong in this type of sentence (Gernsbacher, Hargreaves and Beeman 1989; Von Eckardt and Potter 1985). The hypothesis was that the coordinate clause sentences should clearly show the clause boundary effect, while the prepositional phrases should not. The effect of the center-embedding and the reduced relative could then be compared to these two endpoints.

## 2. METHODS.

### 2.1. PARTICIPANTS.

Thirty University of Illinois students participated for payment or class credit (16 females; 14 males; mean age 21). All were native speakers of English.

### 2.2. MATERIALS.

There were 48 test items, each consisting of a sentence and a probe word. Each item occurred in six different versions, which resulted from crossing modifier type (full relative, reduced relative, prepositional phrase) with target word position (prior clause vs. final clause)<sup>1</sup>. In addition, a set of 16 coordinate clause sentences was included as a control condition, half with prior clause targets and half with final clause targets. The conditions are illustrated below in (8); the target words are in italics.

- (8) a. Full relative: The workers [who were assigned to the *project*] asked for *advice* from a consultant.
- b. Reduced relative: The workers (assigned to the *project*) asked for *advice* from a consultant.
- c. Prepositional phrase: The inexperienced workers (on the *project*) asked for *advice* from a consultant.
- d. Coordinate clause: [The *kitchen* was a mess] and the *grass* had not been mowed

The prior clause probe word appeared in a modifier which followed the subject NP and varied in syntactic structure, from full relative clause to reduced relative clause to prepositional phrase. The full and reduced relative sentences were identical except that the relative pronoun and copula were omitted in the reduced version. The prepositional phrase was equated as closely as possible to the reduced relative clause in content and number of words. Since the relative clause contained a participial verb (*assigned* in 8a and b), equating the number of words required adding another content word to the prepositional phrase sentences, which was always an adjective modifying and preceding the head noun (*inexperienced* in 8c). Although the total number of words, and the actual words, varied across the three different sentence types, crucially, the material following the first probe word was exactly the same in all three conditions.

The final clause probe word came from later in the sentence, in the main clause. It was separated from the initial clause probe word by at least two words, and was never the last word in the sentence or on the line. All probe words were singular nouns with a length of 5 to 7 letters and a frequency of 50 to 150 in the Francis and Kucera (1982) word frequency norms. Semantically related words and words that might form compounds were avoided.

<sup>1</sup> For simplicity, target words in the early position are called prior clause targets, even though some conditions do not include an actual clause boundary.



Each coordinate clause sentence consisted of two 5 to 7 word clauses conjoined with *and*, *but* or *as*. No subordinating conjunctions were used since main versus subordinate status may affect probe response times (Bever and Townsend 1979). The target words were always from the same grammatical position (subject) since grammatical position can also affect probe response times (Von Eckardt and Potter 1985). The probe words met the same criteria as those in the other sentences.

The critical sentences were all active and declarative. Other than the relative clauses being investigated, there were no other embedded clauses in the critical sentences. If one version of an item wrapped around to a second line, all versions of the item had line breaks inserted in the same position. A line break was never inserted between the first and second probe positions or immediately after the second probe position.

There were 116 filler sentences, 96 of which were followed by a probe word. The filler sentences were intended to balance some of the features of the test sentences and had a variety of syntactic structures and lengths. Some were single-clause sentences and some had embedded clauses of various types and in various positions. Some contained relative clauses and prepositional phrases that were not probed, or that did not modify the subject of the sentence. The sentences also varied in tense and voice. Filler probe words varied in grammatical class, inflection, frequency, length, location within the sentence, and correct response. To balance the fact that all of the test sentences were followed by probe words that were present in the sentence, most of the filler probes were not from the sentence and required a negative response. In the 20 remaining fillers, the sentence was followed by a comprehension question rather than by probe words. This was intended to ensure that participants read and understood the test sentences and did not just try to memorize words. Half of the comprehension questions had affirmative answers and half negative. Participants did not know whether probe words or a question would follow an item until after the sentence had been presented.

### 2.3. DESIGN.

Six lists were constructed, each containing all 48 test items and the 16 coordinate clause items, such that only one version of an item appeared in each list and there were equal numbers of items in each condition in each list. Test items were randomly ordered and interspersed with the 116 filler items, for a total of 180 trials per list. Each participant saw only one list.

### 2.4. PROCEDURE.

Materials were presented on a computer monitor and responses were made on the keyboard. Stimulus presentation and data collection were controlled using the Micro Experimental Laboratory software package. Participants pressed the space bar to begin each trial. After a 350 ms fixation point, a sentence was presented one word at a time in the center of the screen at a rate of 350 ms per word. Immediately after the last word of the sentence, a probe word was presented in a different color and all capital letters, one line above center. The probe word stayed on the screen until the participant responded or until a 2000 ms cutoff point. On trials with a comprehension question, the words *comprehension question* appeared instead of a probe word and were followed by a comprehension question. The question stayed on the screen until the participant responded or until 10 seconds had elapsed. Immediately after each response, a feedback message appeared, and a tone sounded on incorrect trials.

Participants were instructed to make their responses as quickly as possible while remaining accurate. There were 15 practice trials before the test trials began and the entire experiment lasted 30 to 35 minutes.

## 3. RESULTS.

Trials on which responses were inaccurate were omitted from the response time (RT) analysis (4.8% of trials). RTs more than 2.5 SD away from an individual participant's mean were replaced with the

2.5 SD cutoff value (2.5% of trials affected). Mean RT and percent accuracy for each condition, shown in Table 1, were submitted to both participant-based and item-based ANOVAs. Since the coordinate clause sentences were identical across all lists, they were not included in the items analysis.

Sentence type	Prior clause target		Final clause target	
	RT	Accuracy	RT	Accuracy
Full relative	755	91%	708	99%
Reduced relative	767	93%	712	97%
Prepositional phrase	785	93%	707	98%
Coordinate clause	779	93%	706	99%

TABLE 1: MEAN RT (MS) AND PERCENT ACCURACY BY CONDITION.

Prior clause targets showed significantly longer RTs than final clause targets ( $F_1(1,29)=42.07$ ,  $p<.001$ ;  $F_2(1,47)=30.29$ ,  $p<.001$ ). For the prior clause targets, responses were fastest in the full relative condition and slowest in the prepositional phrase condition, while for final clause targets, response times were very similar across sentence types. There was no main effect of sentence type ( $F$ 's  $<2$ ), nor any interaction between sentence type and target position ( $F$ 's  $<2$ ).

Prior clause targets also showed significantly lower accuracy than final clause targets ( $F_1(1,29)=24.02$ ,  $p<.001$ ;  $F_2(1,47)=21.11$ ,  $p<.001$ ), but there was no main effect of sentence type on accuracy ( $F$ 's  $<1$ ), nor any interaction between sentence type and target position ( $F$ 's  $<2$ ).

#### 4. DISCUSSION.

This experiment found a strong effect of target position: words from early in the sentence were remembered more poorly than words from late in the sentence, resembling a clause boundary effect. However, the effect held across all four sentence types; in other words, clausal and phrasal modifiers had the same effect on memory.

The position effect found here has an appearance similar to a clause boundary effect, and might have been misinterpreted as one but for the inclusion of the prepositional phrase condition. The effect was not only present in the prepositional phrase sentences--where there is no clause boundary--but was in fact strongest in those sentences. The effect also appeared in the reduced relative clauses, more strongly than in the full relative clauses. Thus, the effect cannot be due, at least not exclusively, to clause structure.

One possible explanation for this unexpected effect might be the serial position of the words, with the most recently read words being remembered better. However, it is not clear how recency would interact with the clause boundary effect. These two factors might be expected to add on to each other, resulting in doubly slow response times in the clausal conditions, which was not the case. Perhaps recency only applies within a single clause; but then the recency effect in the phrasal conditions would have to exactly balance the clause effect of the clausal conditions, which seems unlikely. Perhaps recency simply replaced the clause boundary effect? But then what about all the other experiments showing the importance of clause structure?

Grammatical position is another possibility; perhaps nouns contained in modifiers are remembered more poorly than nouns that fill a required slot such as subject or direct object. Grammatical position has been shown to affect response times (Von Eckardt and Potter 1985) but, as with recency, it is not clear how grammatical position would interact with clause structure to produce a similar effect across the four different sentence types tested here.

The unusual results of this experiment could be attributed in part to some properties that are unique to center-embedded clauses: when they end, no new clause is begun, and they are constituents of NP. Yet while these differences might be expected to cause unusual results for the relative clauses, they cannot explain the results for all four sentence types, and in particular they cannot explain why an apparent clause effect would appear with prepositional phrases.

Another property of the center-embedded clauses, though, is that they allowed complete control of both the serial and grammatical position of the target words in this experiment, while the structure varied in which the target words occurred varied from clause to phrase. Interestingly, serial and grammatical position have been controlled for in experiments on clause structure, but never both at the same time. Caplan (1972), for example, strictly controlled serial position, but allowed grammatical position to vary. Notice in the sentences in (1) that the probe word *oil* is in the same serial position in the sentences, but its grammatical role varies from object of a preposition in (1a) to pre-nominal modifier in (1b). In contrast, Von Eckardt and Potter (1985) controlled grammatical position, but allowed serial position within the sentence to vary. Again, notice in (2) that *carrot* retains the same grammatical position--subject--but its serial position varies from quite early to quite late in the sentence.

In the current experiment, the inclusion of the prepositional phrase condition allowed for control over both of these factors, since the target word from the prepositional phrase was in the same serial and grammatical position as the target from the relative clause. The structure--clause or phrase--was the only factor that varied. It is striking that when structure alone was varied, effects of structure apparently disappeared. This implies that the effects of structure alone are much less important than has been thought, and that effects of other factors may have been misinterpreted as due to structure in previous experiments.

While the results of this single experiment cannot answer these questions, they do suggest important limitations on the role of clause structure in memory. Clause structure alone may play a much smaller role than previously thought or may interact in complex ways with other factors like recency, grammatical role, and center-embedding. Further exploration of this issue will help determine what role clause structure does play and how it may interact with other factors.

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# DIALECTAL VARIATION IN ITALIAN PRENOMINAL POSSESSIVES\*

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## 1. INTRODUCTION.

In Romance languages the prenominal possessive can be syntactically represented in several ways:

- a. possessive + noun
- b. article + possessive + noun
- c. clitic + noun or noun + clitic

Numerous proposals have been advanced to account in part for this variation including that of Giorgi and Longobardi (1991).<sup>1</sup>

Giorgi and Longobardi, who consider the representation of the prenominal possessive from a synchronic vantage point, propose a possessive parameter to account for the distribution of the prenominal possessive. Treating prenominal possessives as genitive NPs, they argue that the possessive is realized as a determiner in French (later extended to Spanish as well) and English, while it is realized as an adjective in Italian. They note that prenominal possessives are in complementary distribution with elements traditionally treated as determiners, as shown in (1) for French.

- (1)
- a. \*le mon livre  
the my book
  - b. \*un mon livre  
a my book
  - c. \*chaque mon livre  
each my book
  - d. \*quelques mes livres  
some my books
  - e. \*trois mes livres  
three my books
  - f. \*plusieurs mes livres  
several my books
- (Giorgi and Longobardi 1991: 153-4)

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<sup>1</sup> Additional cross-linguistic data that weakens the determiner-position analysis is given in Haspelmath (1999).

However, all of these constructions are possible in Italian, as illustrated in (2).

- (2) a. il/un mio libro  
the/a my book  
b. ciascuno mio libro  
each my book  
c. questo/quel mio libro  
this/that my book  
d. alcuni miei libri/qualche mio libro  
some my books/some my book  
e. tre miei libri  
three my books  
f. molti miei libri  
many my books (Giorgi and Longobardi 1991: 154)

So in Italian it is possible to have the possessive cooccur with both the definite and indefinite articles, as in (2a), demonstratives as in (2c), numerals as in (2e) and quantifiers as in (2b,d and f).

They relate this to three other properties that distinguish English-type languages, on the one hand, from Italian-type languages, on the other. First, when focused or used contrastively possessives occur postnominally in Italian, as shown in (3).

- (3) a. È il mio cane.  
It's (the) my dog.  
b. È il cane mio.  
(it) is the dog Poss-1P  
It's my dog!

However, this cannot be taken as a matter of fact for Italian. Postnominal possessives can indeed be used with semantically contrastive readings, but prenominal possessives can also be used contrastively, as in (4). (Saltarelli p.c.)

- (4) Questa è la mia casa e quella è la tua.  
This is (the) my house and that is (the) Poss-2P  
This is my house and that is yours.

Secondly, these possessives can occur as sentential predicates in Italian, as shown in (5). In English the possessive form occurring as sentential predicates is not the same as that occurring prenominally.

- (5) a. Questo denaro è mio.  
\*this money is my  
b. È tua questa borsa?  
\*is this purse your  
c. Quei biglietti sono suoi.  
\*those tickets are his/her

Finally, in Italian possessives may cooccur with a gapped head noun, as illustrated in (6), although the question here remains as to whether *ai miei* is used pronominally or as an elliptical adjective (i.e. *ai miei pro*).<sup>2</sup> It does, however, show adjectival -like agreement.

<sup>2</sup> If this is an elliptical construction, then the question remains as to whether the ellipsis form is pre- or postnominal: la [e] tua or la tua [e]. Saltarelli (p.c.) observes that with respect to ellipsis, Romance would appear to need a licenser (*la*) and an identifier (*tua*).

- (6) a. Metti i tuoi libri vicini ai miei.  
Put (the) your books next to+the my  
b. \*Put your books next to my. (Giorgi and Longobardi 1991: 155)

To account for the differences with respect to distribution and properties between Italian-type languages and English-type languages, Giorgi and Longobardi propose that possessive elements are realized as adjectives or as determiners. In Italian, the possessive would be realized as an adjective, while in English and French, the possessive would be realized as a determiner. Following from this hypothesis, they note that the possessive NPs without articles in English and French behave semantically like NPs containing a definite article in that they may occur in theta-marked positions as referential arguments. However, Italian possessives without the article are indeterminate and when singular occur in non-thematic positions such as in vocatives as shown in (7a), predicatives as shown in (7b) and exclamations, as shown in (7c).<sup>3</sup>

- (7) a. Amico mio, vieni qui!  
My friend, come here!  
b. Gianni è mio amico.  
Gianni is my friend.  
c. Dio mio!  
My God! (Giorgi and Longobardi 1991: 156)

They conclude that French and English possessives are able to saturate an NP<sup>4</sup> in the same way that determiners do, while Italian possessives are not able to saturate an NP just as adjectives are not able to.<sup>5</sup> Considering the prenominal possessive as determiner-like is consistent with proposals arguing that the prenominal possessive is a clitic and arguments for the status of the prenominal possessive as a clitic have been advanced by Rivero (1986) for Spanish and by Aoun (1985), Authier (1992), and Tremblay (1991) among others, for French.

## 2. DIACHRONIC DEVELOPMENT.

Turning to the diachronic development of the prenominal possessive it appears that French and Spanish have developed phonologically reduced possessives which are proclitic to the noun, while Italian possessives appear to be the phonologically regular continuants of the Classical Latin possessives. According to Lyons (1986), Italo-Romance once had both weak and strong forms of the possessive analogous to the forms found in Spanish and French, but the standard language lost the weak forms.

### 2.1 ITALIAN.

For Standard Italian the prenominal possessive takes the form article + possessive with the possessive inflected for gender and number, as shown in (8).

- (8) La sua casa è in Italia.

<sup>3</sup> It is the absence of the article that is important not the position of the possessive as the possessive can occur both prenominally and postnominally in these contexts, as in (i).

(i) a. Gianni è amico mio.  
b. Mio Dio!

(Saltarelli p.c.)

<sup>4</sup> Saturate here refers to filling the available argument positions.

<sup>5</sup> For another view see Higginbotham (1987) and Ritter (1991). They consider adjectives as predicates and therefore they cannot appear as arguments as nouns can. Under their view only predicates need to be saturated contrary to Giorgi and Longobardi's view.



(the) his/her house is in Italy.

This form is attested in sixteenth century grammars in which the prenominal possessive occurs with both the indefinite and the definite article, as shown in (9), although enclitized possessives (attached to the noun) are found in early Italian literature, as shown in (10a) from Dante and (10b) from Boccaccio.

- (9) a. un vostro amico  
a your friend  
a friend of yours  
b. dammi i miei vestiti  
give me (the) my clothes  
c. dammi la mia cappa, e cingimi la spada  
give me (the) my cap and gird me the sword  
give me my cap and gird my sword about me (Florio 1591)
- (10) a. signor-so  
lord-3p poss  
his lord  
b. móglia-ta  
wife-2p poss  
your wife

## 2.2 FRENCH AND SPANISH.

In both Old French and Old Spanish, a fully inflected possessive also occurred with the article, as shown in (11) for French and (12) for Spanish, respectively.

- (11) a. la soe amie (Chrétien de Troyes, *Erec et Enide*, line 296)  
the (fm. sg.)his (fem. sg.) sweetheart (fem. sg.)  
b. un mien enemi mortel (Chrestien de Troyes, *Yvain*, line 4912)  
a (masc. sg.) my (masc. sg.) enemy (masc. sg.) mortal  
c. li miens cuers (La Chasteleine de Vergi, verse 773)  
the (masc. pl.) my (masc. pl.) heart (masc. pl.)
- (12) a. las suas fijas (El Cid, ln. 275)  
the (fm. pl.) his/her (fm. pl.) daughters (fm. pl.)  
b. los mios dias (El Cid, ln. 220)  
the (masc. pl.) my (masc. pl.) days (masc. pl.)

The Old Spanish use of the article with the possessive is not restricted to peninsular Spanish, but can also be found in New World Spanish. The evidence here shown in (13) suggests a transitional state between the Old Spanish in (12) where the article + possessive show both number and gender agreement and Modern Spanish in (14) where the possessive shows only number agreement while the article is absent.

- (13) a. en dote y casamiento con la nuestra hija (Tucuman 1611)  
in dowry and marriage with the our+fm+sg daughter  
b. este mi distrito (Bs. As. 1738)  
this my+sg district  
c. este mi recurso (Bs. As. 1803)  
this my+sg appeal
- (14) a. su casa  
his/her/your house

- b. \*la su casa  
(the) his/her/your house

The development of Modern Spanish from Old Spanish provides evidence of a process of cliticization for the prenominal possessive. Penny (1991) reports that the loss of tonicity and reduction in form was accompanied by the loss of the definite article resulting in the rarity of the article + possessive + noun form by the beginning of the sixteenth century.

### 3. CLITIC-LIKE PRENOMINAL POSSESSIVE IN ITALIAN.

In both French and Spanish the possessive became a reduced clitic-like form losing the article. Since Italian is also a Romance language, this suggests that Italian may also develop a clitic-like prenominal possessive. There is evidence from prosodic conditioning, word order variation and the use of the demonstrative which suggests such a development in Italian.

#### 3.1 PROSODIC CONDITIONING.

We will first consider prosodic conditioning. On the surface there is evidence that the prenominal form is a reduced form. Observe the prosodic contrast between the following given in (15).<sup>6</sup>

(15)

<p>* * ** * **</p>	<p>* * * * * * **</p>	<p>* * * * * *</p>
a. [la mia]	b. [la kasa mia]	c. [la mya kasa]
the Poss-1p sg	the house Poss	the Poss house

In both the independent form (15a) and the postnominal form (15b) the possessive *mia* is bisyllabic and receives prosodic stress on the penultimate. In (15c) the syllable consisting of the possessive merges into one resulting in a rising diphthong. This phonological reduction is reflected in some dialects by a loss of gender marking which results in a reduced form: *la su casa* rather than *la sua casa*. The reduced form *la su casa* has the article (*la*) which is feminine and singular, the possessive (*su*) which is third person but without gender marking and the noun (*casa*) which is feminine and singular.

#### 3.2 WORD ORDER VARIATION.

Further evidence comes from the placement of adjectives in a possessive phrase. The article and the possessive in Italian form a constituent and material separating the possessive and the determiner is limited or results in a grammatically less acceptable construction, as shown in (16).

- (16) a. la mia bella casa  
(the) my beautiful house  
b. ??la bella mia casa

So one can have 'the my beautiful house' as in (16a), but inserting the adjective between the article and the possessive results in a less acceptable construction.

However, variation is permitted with respect to word order when there is a numeral quantifier with the article or the article is replaced by a demonstrative, as in (17) and (18), respectively. The numeral

<sup>6</sup> The prosody patterns here follow the notation of Halle and Vergnaud (1987) where each level of prominence is indicated by a line of asterisks. Starting from the bottom line 0 is the basic level, line 1 the foot level and line 2 is word level.

quantifier in (17 a and b) indicates acceptability with respect to word order variation. So one can have (17 a and b), but not (17 c and d).

- (17) a. le mie due belle case  
 the my two beautiful houses  
 my two beautiful houses  
 b. le due mie belle case  
 c. ?le due belle mie case  
 d. ??la bella mia casa

The position of the numeral with respect to the article and possessive is, I suggest, related to its quantificational scope. That is whether it is quantifying over the possession of beautiful houses or over beautiful houses. Notice that there is a degradation in grammaticality when an adjective intervenes between the article and the possessive, as shown in (17c). This degradation increases further when the influence of the numeral quantifier is removed, as in (17d).

### 3.3 USE WITH DEMONSTRATIVE.

In the case of the demonstrative in (18), however, there is no degradation in grammaticality.

- (18) a. Questa mia bella casa  
 this my beautiful house  
 b. questa bella mia casa  
 c. quelle due belle mie case  
 these two beautiful my houses  
 these my two beautiful houses  
 d. quelle mie due belle casa  
 e. quelle due mie belle case

Without the presence of the article, here replaced by the demonstrative, *questa* (this) or *quelle* (these), the possessive behaves like an adjective and the tight unity of the determiner plus possessive no longer holds. The demonstrative by virtue of its position in the Determiner Phrase is able to license the possessive but it is the position here that is important for licensing not the lexical item. Since the Determiner position is filled the possessive is able to check its agreement features as well as the referentiality of the Determiner position.

The article in Italian while located in the Determiner position appears to contribute little more than number and gender features. This can be demonstrated by its occurrence within existential constructions, as seen in (19).

- (19) Ci sono i tuoi amici in giardino.  
 There are (the) your friends in the garden.

In Italian a generic reading is possible in an existential construction with the article; moreover, it is not possible to get a definite or specific reading.

The demonstrative, however, carries with it other features besides definiteness. It has a deictic feature as well which refers to location. Since pronominal elements, in this case the possessive (Antrim 1997), also carry the deictic feature of person in relation to the situation of the utterance, this would prohibit the adjunction of the possessive to the Determiner position because of the resulting deixis clash. The determiner and the possessive, not being in an adjoined position, would permit elements to intervene between them; however, the possessive plus the article must be viewed as a unit, as they generally occur

together except within certain restricted environments (i.e. with kinship terms<sup>7</sup>, in direct address and as a predicate after *essere* (be) or some other linking verb). At this point mention needs to be made of the third person plural form *loro* (their) which always occurs with the article.<sup>8</sup> Since *loro* is invariable and therefore unable to reflect number or gender agreement it would appear that the determiner is required in order to provide agreement features. This results in *loro* acting differently than the other possessives and would suggest that any changes with respect to the possessive system would have to accommodate this individual form. Rohlfs (1968/1969) suggests that *loro* is, in fact, not indigenous to Italy, but probably of Gallo-Romance origin. Maiden (1995) reports that as a possessive *loro* is frequently replaced in *italiano popolare* by *suo* as shown in (20).

- (20) Sono venuti con i suoi amici  
(they) came with (the) their friends  
They came with their friends.

#### 4. DIALECTAL VARIATION.

Given the relationship between the determiner and the possessive, if as I have argued a process of cliticization is going on, we would expect that intervening material between the determiner and the possessive would not be possible in dialects where the possessive is a reduced form or, at least, there would be a degradation in grammaticality. In the Italian dialect Tuscan, the possessive has a reduced form, as in (21).

- (21) le            su            case  
the - sg. fm. 3p poss    house - pl fm.  
his houses

The possessive, *su* (your, his or her), in (21) is reduced in that it does not show gender agreement or number agreement with *case* (houses) which is feminine and plural. According to Cocchi (p.c.) it is impossible to insert material between the article and a preposed possessive, as shown in (22).

- (22) a.        le su du case  
          the his two houses  
          his two houses  
      b.        le su du belle case  
          the his two beautiful houses  
      c.        \*le du su case  
      d.        \*le belle su case

Neither a quantifier, as in (22c) nor an adjective, as in (22d) can intervene between an article and the reduced possessive.

Further, given the proposed analysis that the phonological reduction of the possessive is an initial step in the eventual conflation of the possessive and the article to produce a possessive clitic, we would expect that determiners other than the definite article would not be permitted with the reduced form of the

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<sup>7</sup>Kinship relationships are considered inalienable and the definite article without the possessive occurs in these constructions, as shown in (i).

(i) Gianni ha perso il padre.  
Gianni has lost the father  
Gianni lost his father.

This article-less possessive form with kinship terms is only permitted when the noun is unmodified and singular.

<sup>8</sup> Haspelmath (1999) argues for an economy motivation to explain article-possessor complementarity. Since possessed NPs have a preference for definiteness, the definite article is redundant and eliminated in favor of economy. The case of *loro* suggests that more than definiteness may be involved.

possessive or, at least, that there would be a degradation in grammaticality. Again this proves to be the case. The use of the demonstrative with the reduced possessive is judged to be very marginal, as shown in (23).

- (23) a. questa sua casa (Standard Italian)  
this his house  
b. ?questa su casa (Tuscan)

Along with the Tuscan dialect, there are reduced forms of the possessive similar to Spanish in Venetian (Saltarelli p.c.) Piemontese, Lombardo (Rohlf 1968, 1969) although these forms still retain the article, as shown in (24).

- (24) la su casa  
the -fm. sg.- 3rd p poss. house -fm. sg.  
the your/his/her house

In addition to the article+possessive+noun and the possessive + noun patterns we have been considering, there is a third pattern that can be found in Romanian and the Italian dialect of Marsian. This pattern involves a clitic: N-clitic Poss, as in (25) for Romanian.

- (25) soru-sa  
sister-his  
his sister

This is not a general pattern as it is restricted in use. The possessive clitics found in Old Italian, as seen in (10) and modern dialects "occur mainly with nouns of personal relationship and other nouns commonly accompanied by a possessive expression." (Lyons 1986:2) The Marsian form is even more restricted. In Marsian, possessives only occur postnominally, either in unstressed (clitic) or stressed forms, as shown in (26).

- (26) a. frate-me  
brother - Poss 1p sg  
my brother  
b. ne/se frate maye  
a/the brother Poss 1p sg ms  
a brother of mine

In (26a) the possessive *me* is enclitic to the noun. This form cannot appear with either an indefinite or a definite article nor can it occur with a stressed or doubled possessive, as seen in (27).

- (27) a. \*ne/se frate-me  
b. \*ne/se frate-me maye

In (26b) the possessive *maye* is not enclitic and can only follow the noun. Contrary to the clitic form, the postnominal fully inflected form must occur with an article, as in (28).

- (28) \*(ne/se) frate maye

This parallels the reduced pronominal possessives in French and Spanish: *mon* and *mi*. It is interesting to note that an enclitic possessive form without a definite article, as shown in (29) was used in literary Tuscan until the 14th century when it was condemned as low according to Posner (1996).

- (29) a.      moglia-ta  
              wife-your  
              your wife  
       b.      signor-so  
              lord-his  
              his lord

## 5. CONCLUSION.

There appears to be a process of historical change involved here. The change in the possessive construction appears to progress in the following way:

- (30) a.      Art + Poss (number and gender) + noun  
       b.      Art + Poss (number only)   + noun  
       c.      Poss (number only)         + noun

and if we add the Romanian and Marsian, then

- d.      N-cliticPoss or cliticPoss-N

I suggest that the change was motivated by changes in the features on either the possessive, the article or both as a result of a gradual cliticization of the possessive: a process seen in Spanish and French and reflected in the dialectal variation of Italian.

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# MODULARITY IN KNOWLEDGE ELICITATION AND LANGUAGE PROCESSING

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## 1. INTRODUCTION.

This paper discusses the role of modularity in the knowledge elicitation component of a natural language processing system. The system at hand, Expedition, is intended to develop the capability for fast deployment of a machine translation (MT) system between any so-called “low-density” language (one lacking significant machine-tractable resources) and English.<sup>1</sup> The knowledge-elicitation component of Expedition, called Boas, guides non-expert human informants through questions about the morphology, syntax, lexical stock, and ecology (letters, symbols, punctuation, etc.) of their language. The collected source-language (SL) information provides static knowledge to fill in the blanks of the MT template. Once the informant provides all the requested information, he pushes a button and receives a moderate-quality MT system, with no need for further human intervention.

The linguistic challenges for the developers of Boas can be summarized as follows: how does one gather *all* the necessary information about *all* the phenomena that can occur in *any* natural language in a way that is both understandable to a non-expert informant and machine tractable without post-elicitation human intervention? We have chosen to start with the simplifying assumption that knowledge about a particular language is divided into modules that can be dealt with independently of each other. This modular approach covers the majority of facts about language in a computationally supportable fashion; however, it does not cover all facts, as many well-known language phenomena are cross-modular.

After presenting a brief overview of modularity (§2), we describe the basic modules of Boas (§3). We then present some language phenomena that cannot be handled in a strictly modular system and describe the micro-components being developed to account for them (§4).

## 2. MODULARITY: BACKGROUND.

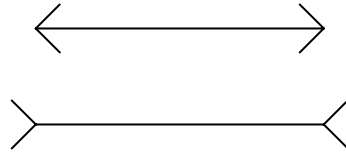
Modularity is the notion that complex systems are partitioned into a set of special purpose, autonomous modules. One important aspect of modularity is that the input for each module is restricted—limited to the necessary and sufficient information required for the module’s task. In addition, any particular module is minimally affected by the operation (and output) of other modules. Together, these two aspects are known as information encapsulation. For example, a person’s auditory system is informationally encapsulated because it has restricted input—only information from the cochlea structures—and has limited, if any, access to other modules, like the visual perception system.

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<sup>1</sup> This project is being carried out at the Computing Research Laboratory of New Mexico State University. See <http://crl.nmsu.edu/expedition> for an overview. Also see Nirenburg (1998); Nirenburg and Raskin (1998); and, McShane, Helmreich, Nirenburg and Raskin (2000) for more extensive coverage. The Expedition Project is supported by Department of Defense Contract MDA904-92-C-5189.



A particularly compelling example of encapsulation (cited in Maratsos 1992) is the Muller-Lyer optical illusion, which shows that the perceptual system cannot be ‘persuaded’ by the cognitive system to accept that the lines shown below are the same length, which they are.



One widely known account of modularity within cognitive science is presented in Fodor (1983), which proposes that modules are:

**a. Informationally encapsulated.** Modules have strictly limited input, minimal interaction with other modules, and are not driven by central cognitive processes.<sup>2</sup>

**b. Fast.** Fast processing is a result of encapsulation, since a given system need only consider specific information in a specific way; not all information need be interpreted by every possible cognitive system.

**c. Hard wired:** Fodor makes the hypothesis that modules are hard-wired (not derived from induction or experience) and are localized in a particular area of the brain.<sup>3</sup>

**d. Domain-specific.** Modules are often described as either horizontal—i.e., deriving from general reasoning ability, or vertical—i.e., domain-specific. Fodor considers language ability to be accounted for by vertical modules.

The assumption of modularity has been a driving force in descriptive linguistics, theoretical linguistics (e.g. Government and Binding Theory, Minimalism) and psycholinguistics (see, for example, Chomsky 1986 and Osherson and Lasnik 1990). The general view is that there is an innate language faculty that is distinct from that part of the mind responsible for general cognitive processing. The language faculty in turn consists of specialized modules for each language subtask (syntactic processing, lexical processing, etc.); each module has a well-defined task, specific inputs, and limited types of interaction with other modules. It is assumed, for example, that the syntactic processor does not have access to the speech waveform or even to the phonetic representation of that waveform. It is further assumed that there are no input loops between modules. Syntax, for instance, cannot affect morphology since it receives input from morphology.<sup>4</sup>

The notion of modularity, particularly the idea of information encapsulation, is also fundamental to computer science. The now standard technology of object-oriented programming (a primary motivation for languages such as C++ and Java) is based on this notion of modularity

<sup>2</sup> Other researchers reject encapsulation in the cognitive realm, believing that the cognitive faculty is a single, undifferentiated general processing machine. Proponents of this view include Piaget (1955) and Newell and Simon (1972).

<sup>3</sup> For an alternative view regarding hard-wiring, see Karmiloff-Smith (1994).

<sup>4</sup> For convincing counterevidence to the ‘no loop’ hypothesis, see Levelt and Maassen (1991), Dell 1986, and Bock (1987).

(see Booch 1994 among others).<sup>5</sup> Modularity also plays a key role in the fields of artificial intelligence and computational linguistics. For example, Marvin Minsky's popular theory of "Society of Mind" (Minsky 1985) describes a 'mind' as a group of encapsulated, highly specialized, agents.<sup>6</sup> Many systems within subsymbolic artificial intelligence (e.g. neural network systems), which traditionally were constructed with homogeneous architectures, now use a modular approach (see, for example, Miikkulainen 1993, which describes a modular neural network approach to natural language processing). Modularity is important in all these areas of computer science in part because a system composed of encapsulated, special-purpose modules is more easily built and studied than a non-modular one. It would be virtually impossible to build a Microsoft Word, a Windows Operating System, or a commercial machine translation system without the application of modularity.

### 3. THE MODULES OF BOAS.

The simplifying assumption of modularity was adopted as a first-cut approach in Boas for the following reasons. First, one needs a strict organizational principle for knowledge elicitation, especially when the expected language informant has little or no formal linguistic training. Second, one needs an anchor for cross-linguistic research and generalization. Finally, programs built to process language require narrowly defined types of input and output.

There are six basic modules in the Boas System, described briefly below.

**a. Ecology:** This module collects information about the writing conventions of SL, including the inventory of letters and punctuation marks, the treatment of numbers, dates, etc.

**b. Inflectional Morphology:** This module "learns" rules of inflection based solely on sample inflectional paradigms. The informant is guided through the process of building a paradigm template for each inflecting part of speech by answering questions about the parameters and values for which words inflect. For example, nouns might inflect for the parameter case using the values nominative, genitive, dative, and for the parameter number using the values singular, plural, dual. Once a paradigm template is established for a given part of speech, the informant provides a full inflectional paradigm for an example of his choosing. This inventory of examples should reflect all the productive patterns of inflection in SL. Paradigms thus established can be tested and made more robust using additional examples.<sup>7</sup> A morphological learner (Ofizer and Nirenburg 1999) creates rules of inflection based on the inflectional paradigms. The morphological learner, however, imposes one significant restriction: it permits only single-word input, thereby excluding as input paraphrastic forms like *would have been going*. This restriction is actually not surprising either theoretically or computationally: "inflection" is defined by many as belonging to the realm of single words. To circumvent this restriction in Boas, the micro-component Multi-Word Inflection is being developed (described in §4.1)

**c. Productive Affixation:** This module represents Boas's minimal treatment of derivational morphology. It collects two types of SL derivational affixes: (i) those that correspond to a small,

<sup>5</sup> Object-oriented programming is an approach to programming that is centered around creating and using objects, each of which has a specified inventory of properties and can be manipulated using specified methods. Each object is informationally encapsulated, meaning that one uses the object as a whole, not altering its stated properties or methods.

<sup>6</sup> "Each mental agent by itself can only do some simple thing that needs no mind at all. Yet when we join these agents in societies—in certain very special ways—this leads to true intelligence" (Minsky 1985: 17).

<sup>7</sup> This is just a sketch of the process of eliciting inflectional paradigms. Since the informant is expected to be a linguistic novice, he is lead methodically through every step, offered extensive suggestions and examples, provided with redo capabilities, etc.

selected inventory of productive derivational affixes in English—e.g., affixes expressing negation (*un- non- in-; anti- counter-*) and lesser degree (*mini- sub- under-*); and (ii) affixes that only change the part of speech of the word with no significant shift in meaning—e.g., English *-ly* (*joyful ~ joyfully*).

Considering that derivational morphology—particularly compounding and reduplication—is extremely widespread in natural language, the question is why does Boas not handle it productively? The answer is that the results of these word-formation processes are often semantically ambiguous or non-compositional. Therefore, even if Boas were to “understand” that a compound were composed of stem A and stem B, or that a reduplicative form were composed of prefix X plus root A with the first syllable reduplicated, how could that information automatically be translated into a natural English equivalent?

Consider in this respect the following examples. Example (1) shows a Swedish compound, *frukosten*, that could have five different interpretations, from which a machine could not be expected to choose the most logical.<sup>8</sup>

- (1) a. *frukost + en* ‘the breakfast’  
 b. *frukost\_en* ‘breakfast juniper’  
 c. *fru\_kost\_en* ‘wife nutrition juniper’  
 d. *fru\_kost+en* ‘the wife nutrition’  
 e. *fru\_ko\_sten* ‘wife cow stone’ (from Karlsson et al. 1995: 28)<sup>9</sup>

Example (2) shows one of the many patterns of reduplication in Tagalog: a noun undergoes a non-trivial pattern of reduplication resulting in another noun that refers to the vendor of the original noun. Both the semantics and the formal rules underlying this reduplicative pattern would be difficult to capture and convey in English in a fully automated manner: [prefix *mag*] + [first two letters of the base, reduplicated] + [base] results in “vendor of [original noun]” (Schachter 1972).

- (2) a. *mag**bu**bulaklak* ‘flower vendor’ (*bulaklak* ‘flower’)  
 b. *mag**k**kandila* ‘candle vendor’ (*kandila* ‘candle’)

A final complication is the theme-and-variations nature of reduplication, illustrated below with the Turkish method of deriving intensity of color:

- (3) a. *siyah ~ **sim**siyah* ‘black ~ very black’  
 b. *mor ~ **mos**mor* ‘purple ~ very purple’

Derivational processes such as this present practically insurmountable problems for a template system like Boas.

Boas’s answer to the problems of ambiguity, lack of compositionality, and formal variation in derivational word-formation processes is to have the informant enter all common words thus formed in the open-class lexicon. Corpus scans of the SL will assist the informant in selecting the most common words of this type.

Although Boas’s module Productive Affixation unquestionably does not cover the majority of derivational word formation processes, neither do systems built explicitly for

<sup>8</sup> All examples that are not attributed to a source were elicited from informants or created by the authors.

<sup>9</sup> The basic lexemes here are: FRUKOST ‘breakfast’, FRU ‘wife’, KO ‘cow’, KOST ‘nutrition’, STEN ‘stone’, EN ‘juniper’ or the definite ending of non-neuter nouns. The underscore indicates a compound boundary and the plus sign indicates an inflectional boundary (Karlsson et al. 1995:28).

individual languages (i.e., in situations when the investigators are trained linguists with a full understanding of the patterns in question). For example, Dura (1998) suggests that the best way to deal with compounding in Swedish is to list the most common compounds explicitly in the lexicon, then use these ready-made chunks as set units for further analysis of compounding forms. Boas's Productive Affixation module is, however, expected to permit significant time savings for informants of some languages: e.g., in Czech one negates verbs by adding the suffix *ne-*; this can be recorded and exploited to great effect by Boas.

**d. Syntax:** This module, still under construction, learns phrase structure rules based primarily on SL translations of a graduated set of English phrases and clauses.<sup>10</sup> This set has been designed such that the values of basic syntactic parameters like word order and agreement constraints can be determined. The syntactic learner works as follows. Suppose the informant translates *a new book* into Japanese as *atarasii hon-ga* ('new book-NOM'). The learner will generate a set of proposed rules to account for this word sequence. One proposed rule will be the very specific one that occurrences of *atarasii* precede occurrences of *hon-ga*. The learner will also posit increasingly generalized rules: adjectives precede nominative case nouns, adjectives precede nouns. Once the inventory of candidate rules has been established, the learner selects the most general rule that is consistent with the entire set of translated examples. The learned grammar produces fairly flat syntactic analyses; the goal is to perform basic 'chunking' of a sequence of words into noun phrases and clauses, not to generate a linguistically sophisticated detailed grammar of the language. Some preliminary empirical work suggests that 'chunking' grammars are more robust than typical computational grammars (see Beale, Nirenburg, Cowie, and Oflazer 1999).

**e. Closed-Class Lexicon:** The closed-class lexicon contains an inventory of English closed-class items (pronouns, prepositions, conjunctions, etc.), organized semantically. Informants are asked to provide as many equivalents for each English sense as are employed in SL. The equivalents can take the form of a word, a phrase, an affix or an inflectional feature. Examples (4) and (5) show cross-linguistic examples of affixal and feature realizations of closed-class items, respectively.<sup>11</sup>

- (4) a. BULGARIAN definite article: *more ~ moreto* 'sea ~ the sea'  
 b. RUSSIAN reflexive/reciprocal affix: *myt' ~ myt'sja* 'wash ~ wash oneself'  
 c. PERSIAN possessive pronoun: *kt|b ~ kt|bt* 'book ~ your book'  
 d. ARABIC preposition: *byt ~ bbyt* 'house ~ in a house'  
 e. CREE possessive pronoun: *astotin ~ nitastotin* 'cap ~ my cap'

- (5) RUSSIAN  
 a. On           šel           **lesom.**  
    he<sub>NOM</sub>       walked       **wood**<sub>INSTR</sub>  
    'He walked **through the woods.**'  
 b. On   ubil       vora       **nožom.**  
    he<sub>NOM</sub> killed   thief<sub>ACC</sub> **knife**<sub>INSTR</sub>  
    'He killed the thief **with a knife.**'

The affixal and feature realizations of closed-class items actually represent cross-modular phenomena: a morphological process is required to convey a full-fledged semantic meaning.

<sup>10</sup> See Sheremetyeva and Nirenburg 2000 for details about this module.

<sup>11</sup> The Cree example is from (Wolfart 1981).

However, this bit of cross-modularity does not pose problems for Boas because the module Closed-Class Lexicon was originally developed with this functionality in mind.

**f. Open-Class Lexicon:** The open-class lexicon collects SL translations of nouns, verbs, adjectives, adverbs, phrases, collocations, and idioms. Translations may be words or phrases; multiple translations may be posited (e.g. English *blue* would be translated by Russian *sinii* ‘dark blue’ and *goluboj* ‘light blue’; Russian has no generic word for ‘blue’); allomorphs can be listed, as can irregular inflectional patterns; lexical items carrying grammatically relevant inherent features (e.g. gender) can be so tagged. Acquisition is primarily English-driven, but SL-driven acquisition is also possible, especially if large SL corpora are available to generate wordlists.

Modules (a)-(f) of Boas cover most language phenomena. The adherence to modularity allows an informant to focus on providing just the knowledge associated with a particular aspect of language (inflectional morphology, syntax, etc.) rather than face the daunting task of interacting with an undifferentiated knowledge elicitation system that places the burden of organization on the informant. Modularity allows us to create efficient, specialized programs to handle different aspects of language. For example, finite state machines can handle morphological analysis, and chart-based parsing algorithms can handle syntactic analysis. In sum, the simplifying assumption of modularity provides numerous advantages for the architecture of the Boas system. However, not all facts about language fall neatly into the above-mentioned modules; some crucial language phenomena fall between the cracks. These cross-modular phenomena, and Boas’s treatment of them, are the subject of the next section.

#### 4. MICRO-COMPONENTS FOR CROSS-MODULAR PHENOMENA.

For language phenomena that do not neatly fall into one of Boas’s major modules, we are developing tailor-made micro-components. A sample of these, described in terms of their expected functionality, is presented below.

##### 4.1. THE MICRO-COMPONENT FOR MULTI-WORD INFLECTION.

Multi-word inflectional forms, like *would have been going*, straddle the line between morphology and syntax and are not acceptable input for Boas’s morphological learner (cf. §3b). Therefore, the task of establishing inflectional paradigms must be split into single-word and multi-word subtasks. Once the informant establishes a paradigm template, he is presented with that template and asked to indicate whether each combination of feature values is realized as a single word, multiple words, or either.<sup>12</sup> All single-word entries remain in the main paradigm and are processed as described in §3b. All multi-word entries are extracted and sent to the Multi-Word micro-component. “Either” entries require use of both modules.

The Multi-Word micro-component asks the informant to describe multi-word inflectional forms as the combination of auxiliaries and head words. The inventory of auxiliaries will be collected as a prerequisite task. All the necessary forms of the head word (e.g. infinitive, participles) should have already been collected in the single-word task and need only be pointed to in this module.

As concerns processing, multi-word inflectional forms present the same complexities as paraphrastic forms and idioms: often they can be scrambled and/or split by intervening words (*I would **definitely** have gone*). Processing of multi-word inflectional forms is done via pre-syntactic analysis. First, the basic morphological analyzer tags every individual word. Then the auxiliaries used as component parts of the inflected forms are deleted and their features transferred to the

<sup>12</sup> An example of “either” is the Ukrainian future tense: *robitimu* and *budu robiti* are both valid ways of expressing the 1<sup>st</sup> person singular ‘will work’.

head word. For example, in the word sequence *will have been going*, the auxiliaries *will*, *have*, and *been* will be deleted and *going* will be assigned the features ‘future’, ‘passive’, and ‘perfect’.

#### 4.2. MOVEMENT OF INFLECTIONAL AFFIXES.

Another phenomenon spanning morphology and syntax is the movement of inflectional affixes from their head words to another place in the sentence. Sometimes a moved affix cliticizes onto another word, sometimes not. A case in point is certain Polish person markers, which can move from their head verb to virtually any pre-verbal position. For example, the 1<sup>st</sup> person plural suffix *śmy* can occur in any of the positions shown in (6a-d) (hyphens are included only for clarity of illustration).

- (6) a. My-**śmy** znowu wczoraj poszli do parku.  
           we-1PL   again   yesterday went   to   park  
       b. My znowu-**śmy** wczoraj poszli do parku.  
       c. My znowu wczoraj-**śmy** poszli do parku.  
       d. My znowu wczoraj poszli-**śmy** do parku.  
       e. \* My znowu wczoraj poszli do-**śmy** parku.  
       f. \* My znowu wczoraj poszli do parku-**śmy**.  
           ‘We went to the park again yesterday.’ (Franks and Bański 1999: 125)

The processing problems for sentences like (6a-d) are obvious: the morphological analyzer will not find lexical matches for words like *myśmy* ‘we-1PL’ *znowuśmy* ‘again-1PL’ or *wczorajśmy* ‘yesterday-1PL’. In addition, the left-over verb forms in (6a)-(6c) will be incorrectly analyzed as 3<sup>rd</sup> person plural (plural verb forms have no person suffix).

The movement of inflectional affixes is handled in Boas using the micro-component Affix Movement. After the inflectional paradigms for a given part of speech are created, the informant is asked if affix movement occurs in SL. If so, he selects one paradigm to serve as a test case and highlights all affixes that can move. If different affixes from different paradigms can move, the process is repeated for more paradigms. In the end, Boas will contain an inventory of mobile affixes similar to the inventories of affixes collected through the Productive Affixation and Closed-Class modules.

For each inflectional affix that can move the system generates a set of morphological rules. One rule recognizes the affixless form of words in the source paradigm (i.e. wordforms the affix can hop from). For example, *poszli* in (6a) will be recognized as a verb that is missing inflection for person and number (*poszli* will *also* be recognized as the 3<sup>rd</sup> person plural form of the verb; this bit of ambiguity will be resolved at a later stage). A second rule strips the hopped affix off the target word, revealing its underlying form. For example, in (6a), *śmy* will be stripped off of *myśmy* and *my* will be recognized as a pronoun in the regular way. In post-morphological analysis, the features associated with the hopped affix (1st person plural for *śmy* in (6a)) are unified with their source stem (*poszli*).

#### 4.3. SPELLING CHANGES INDUCED WORD-EXTERNALLY.

Yet another phenomenon that straddles morphology and syntax is spelling changes induced by word-external factors. For example, lenition and eclipsis in Irish are word-initial phonological processes triggered by certain types of preceding words. Table 1 presents a small sampling of such alternations (discussed, e.g., in Ó’Sé and Sheils 1993 and Ó’Siadhail 1989 and 1995):

basic consonant	lenited consonant	eclipsed consonant
c	ch	gc
b	bh	mb
g	gh	ng

TABLE 1: EXAMPLES OF LENITION AND ECLIPSIS IN IRISH.

Lenition can occur, for example, after the preposition *ar* ‘on’: *bad* ‘boat’ → *ar bhad* ‘on (the) boat’; eclipsis can occur after the positive interrogative particle *an*: *bris* ‘break’ → *An mbriseann se...?* ‘Does he break...?’ (These processes occur in many other contexts as well and affect many other letters.)

In order to avoid the acceptable yet labor-intensive approach of having the informant list two variants of each affected word in the lexicon, Boas employs the micro-component Lenition Etc. If alternations induced word-externally occur in SL, the informant is asked to indicate the basic letter or cluster, the resulting letter or cluster, and where the alternation occurs: word-initially, word-finally, or both. Boas converts this information into a lexical redundancy rule covering both the open and closed-class lexicons. We do not need to elicit in what contexts such alternations occur since we are not producing, only decoding, SL.

#### 4.4. NOUN INCORPORATION.

Noun incorporation is a subset of compounding, namely, noun-verb compounding. In incorporating structures, the verb and one of its arguments (usually the subject or object, or just the head noun of the subject or object) either occur as a single word or occur in series with certain morphosyntactic modifications that indicate that incorporation has occurred.<sup>13</sup> Incorporation presents all the elicitation and processing problems of noun-noun compounding plus a host of others. This would suggest that Boas should handle incorporation like it handles noun-noun compounding and most other derivational word-formation processes—lexically. For some languages this approach seems feasible, as incorporation is lexically restricted and/or semantically non-compositional. However, for other languages a productive approach to compounding appears necessary. Below are some cross-linguistic properties of incorporation that pose particular challenges to the Boas system.

**Morphological Complexities.** Frequently, spelling changes occur as part of incorporation (just as they often occur in noun-noun compounding and reduplication). For example:

1. Incorporated nouns generally lose their inflectional morphology (Baker 1988:26), making their grammatical role (subject, object, etc.) opaque to a MT system.
2. An epenthetic vowel can sometimes be inserted between the V and N, as in Tuscarora: [a] is inserted when a consonant-final N and a consonant-initial V are joined (described by Williams 1976; cited in Baker 1988: 23). Insertions, deletions and phonological processes at morpheme boundaries are typically difficult to describe and they are difficult to prepare for in a template system like Boas.
3. The incorporated noun can occur between the verb stem and its inflectional affixes. This means that the verb forms collected via paradigms can potentially be divided by intervening material, with possible phonological processes occurring at the new morpheme boundaries. That is, whereas one type of phonological process might have occurred at the boundary of the verb stem and its inflectional ending, another might occur at either edge of the inserted noun.

<sup>13</sup> In some languages adjuncts can also be incorporated. See, for example, Spencer (1995), which gives examples of adjunct incorporation in Chukchi.

**Syntactic Complexities.** The syntax of incorporating structures can differ in significant ways from the syntax of non-incorporating structures. For example:

1. When the direct object is incorporated, the verb might become intransitive or it might remain transitive. In the latter instance, the oblique object or possessor is often promoted to the direct object role, as in Panare (Payne 1995: 299). For Boas, this means that basic source-language-to-English transfer rules will fail in incorporating structures. Assume, for example, that possessors in the source language are normally in the genitive case, such that genitive case maps to 's in English; in incorporating structures, possessors could bear accusative case, which normally maps onto direct-object status in English. Thus, a special set of transfer rules would have to be invoked in Boas for incorporating structures.
2. Generally only the head of the incorporated NP is incorporated, leaving modifiers as separate words, as in the following West Greenlandic example (from Fortescue 1984; cited in Bok-Bennema and Groos 1988):

(7) kissartu -mik      kavvi -sur -put  
       hot        -instr      coffee-drink-3Pl.Ind.  
       (they hot coffee-drank)

This means that the adjective appears with an elided head noun whose antecedent occurs as a bound morpheme attached to the verb.

3. In languages in which the incorporated noun remains a separate word, numerous syntactic changes may take place. Mithun (1984: 850-851) notes the following examples: in Samoan, particles that generally cliticize to the right of the verb cliticize to the right of the verb-noun complex under incorporation; the same applies to aspect suffixes in Micronesian languages; subjects in ergative languages are case-marked absolutive in intransitive incorporating structures as opposed to ergative in the transitive non-incorporating counterparts.

**Semantic Complexities.** Incorporation is at once a lexical and a syntactic process. Its lexical aspect can give rise to the same types of semantic shifts as other lexical processes. Linguistic descriptions of incorporating languages tend to be less rigorous regarding semantic compositionality than is necessary for a MT system. For example, Mithun (1984: 853) describes the following incorporating structures as “somewhat idiomatic”, although in the world of MT they would be considered completely idiomatic (a MT system would, at best, be able to produce the literal glosses): *heart+be.numerous* = ‘to be fickle’; *rump+be.heavy*= ‘to be sluggish’. Similarly, in describing Dutch, Weggelaar (1986: 302) groups together truly compositional incorporating structures with the following, which lack strict semantic compositionality: *to-buzz+(child’s)head* = ‘to be dizzy’; *to-roll+(child’s) head* = to tumble; *to lick + beard* = ‘to lick one’s lips’.

Another semantic complexity is shown in Panare: unincorporated “head cut” describes a person getting a cut on the head, whereas incorporated “head-cut” asserts that the head was cut off (Payne 1995: 300). Thus, incorporating and non-incorporating ‘cut’ in Panare are actually separate lexical items, at least in combination with body parts.

Within Boas, semantic non-compositionality and/or unpredictability of the types described above must be handled by explicit lexical listing.

**Lexical Restrictions.** Incorporation is highly lexically restricted in some languages, such that lexical specification of relevant word complexes would be both feasible and preferable in Boas. For example, in many languages incorporation occurs either exclusively or primarily with nouns indicating body parts (Weggelaar 1986: 301-2). This is true of Panare, in which “most



incorporated nouns are body parts, and the verbs that allow incorporation are verbs of ‘removal’ or ‘destruction’, e.g., ‘cut’ (of various kinds), ‘break’, ‘hit’, ‘pluck’, etc.” (Payne 1995: 300). It is also true of Dutch: only about thirty verbs support incorporation, and the nouns that incorporate must refer to body parts (incorporation can be used somewhat more productively, but not to an extent that would be crucial for Boas) (Weggelaar 1986: 301).

As the above evidence makes clear, productively handling incorporation in a MT system would be extremely difficult even if one were dealing with a single language for which extensive data were available and a highly-trained linguist were to provide analysis.<sup>14</sup> The challenge grows exponentially under the constraints of the Boas environment.

In the current implementation of Boas, no attempt is being made to elicit specific information about patterns of incorporation in SL. Only two questions will be asked: Is incorporation employed in SL? If so, is it employed in a highly productive manner with the resulting NV complexes having compositional semantics? (Of course, all of these notions will be explained.) If incorporation is used only in a limited or non-compositional manner, the informant will be asked to enter the most common incorporating structures in the lexicon, using source-language corpus scans to help compose this list. If incorporation is used highly productively and compositionally, we will create a last resort program to deal with it: all unknown words will be submitted to a fuzzy match algorithm which will assume that: (i) all nouns and all verbs in the lexicon can potentially have affixal status; (ii) inflectional affixes on the verb are mobile, and (iii) morpheme boundaries can show phonological processes. This algorithm will assume that the form of the noun and the form of the verb are basically the same in incorporating and non-incorporating structures and that at least some semantic compositionality obtains. This should provide at least some degree of coverage of this complex and largely idiosyncratic linguistic process.

## 5. CONCLUSIONS.

Modularity in complex systems is assumed by researchers in a variety of fields. There has been considerable debate within theoretical linguistics, neurolinguistics, developmental linguistics and other areas regarding the exact nature of modularity and whether modularity is needed at all (see Karmiloff-Smith 1994; Mueller 1996; Bates 1994; among others). For example, in the area of cognitive science, several contemporary theories (modern cognitivism, cognitive linguistics, associationistic empiricism) reject modularity and argue that all mental processes are interconnected and exchange data freely.<sup>15</sup> However, when it comes to building large practical systems that deal with natural language, modularity has been shown to be a sound architectural principle (see Booch 1987 and Allen 1995 among others).

In this paper we have described a system that acquires information about any natural language from untrained human informants and uses that information to construct an SL-to-English machine translation system. We have shown how the simplifying assumption of modularity has helped us to organize both the acquisition of knowledge and the architectural development of the system. Strict modularity must, however, fail because some language phenomena (e.g. multi-word inflection, movement of affixes, noun incorporation) span modules. The solution we propose is to develop a highly specialized micro-component for each cross-modular phenomenon we identify. We have sketched out a few of these micro-components in this

<sup>14</sup> For example, a trained linguist working with Eskimo might include a class of “noun-verb postbases” in the closed-class lexicon; these are verbal elements that can never stand alone but, rather, must participate in incorporating structures (Baker 1988: 16). Boas would analyze these the same way as other affixal elements gathered in the Productive Affixation and Closed-Class Lexicon modules.

<sup>15</sup> See, for example, the papers from the Crossmodal Attention and Multisensory Integration Conference (<http://www.wfubmc.edu/bgsm/nba/IMRF/meeting.html>) and Feldman, Lakoff, Stolke, and Weber (1990).

paper. Continued work on Boas will concentrate on identifying still more cross-modular phenomena that occur in natural languages and developing micro-components to elicit and process the varied instances of those phenomena found in the world's languages.

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THE OCCURRENCE AND NON-OCCURRENCE OF JAPANESE LOCATIVE  
POSTPOSITIONS 'NI' AND 'DE' IN CONVERSATION\*

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1. INTRODUCTION.

Japanese grammatical relations are marked by postpositions such as the nominative marker *ga* and the accusative marker *o*. Like grammatical relations, spatial expressions are indicated by locative postpositions, such as *ni*, *de* or others (1), alone or combined with spatial nouns such as *ue* 'up'/'above'/'on', and *shita* 'down'/'below' (e.g. *ue-ni/de* and *shita-ni/de*) as shown in sentences (2) and (3).<sup>1</sup>

- (1) Mary ga Tucson ni it-ta.  
Mary NOM GOAL go-PST  
'Mary went to Tucson.' [constructed]
- (2) Heikindai no ue de Mary ga taisou o shiteiru  
balance beam GEN on LOC Mary NOM exercising ACC is doing  
'Mary is exercising on a balance beam.' [constructed]
- (3) Heikindai no ue ni Mary ga iru  
balance beam GEN on LOC Mary NOM is  
'Mary is on a balance beam.' [constructed]

In (1) *ni* indicates a location that Mary has reached. In (2) *de* indicates where Mary is exercising, while in (3) *ni* indicates the existence of Mary. In informal conversation, however, these postpositions do not always appear. This phenomenon is what has traditionally been referred to as 'ellipsis'. (4) and (5), which are taken from my database, show this variation.

- (4) Harajuku ni itte mitara?  
Harajuku GOAL go try  
'Why don't you go to Harajuku?'
- (5) Harajuku itte mitara?  
Harajuku go try  
'Why don't you go to Harajuku?'

In this paper, I would like to examine how Japanese locative postpositions are used in informal conversation, especially by focusing on the non-occurrence of locative postpositions<sup>2</sup>.

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<sup>1</sup> The abbreviations used for the glosses in this paper are as follows:

NOM	nominative	ACC	accusative	GEN	genitive
GOAL	goal	TOP	topicalizer	LOC	locative
PST	past	Q	question marker	FP	final particle
NEG	negative	PASS	passive		

<sup>2</sup> In this paper I use the term 'non-occurrence' rather than 'ellipsis' following Fujii and Ono (to appear).



marker. Example (7) illustrates that *sore*, ‘it’, is not marked by the accusative marker *o*. Fujii and Ono explain that the pronoun *sore* referring to a surprise visit has already been discussed within the context of the discourse and firmly established in the discourse. Examples (8) and (9) demonstrate that an indefinite pronoun such as *nanka* ‘something’ and an interrogative pronoun such as *dare* ‘who’ are not marked by the accusative marker *o*, respectively. Fujii and Ono state that it is not necessary for the listener to make much cognitive effort to identify the referent and therefore it is not marked by the object marker.

In general, Japanese is post-predicate final. The post-predicate noun phrases (i.e. nouns expressed after the predicate) are deviations from the canonical word order (Ono and Suzuki 1992). According to Fujii and Ono, post-predicate nouns, for instance, are often marked as shown in (10), which is taken from Fujii and Ono.

- (10) Totsuzen            yoba-rete            namae    o  
 Suddenly            be called-PASS    name    ACC  
 ‘Suddenly,            (he) was called,    (his) name.’

In (10), *namae* ‘name’ appeared after the predicate *yobareta* ‘be called’ and was marked by *o*. Fujii and Ono interpret that since the speaker of this utterance thinks that the post-predicate noun phrase, *namae*, has not been established in the discourse, s/he used the object marker *o*.

In light of the above studies, the goal of this present study is the following: to clarify the characteristics of non-occurrence of Japanese locative postpositions in informal conversation, and see if this supports the findings of Fujii and Ono whose study suggests that the occurrence/non-occurrence of grammatical markers is related to cognitive effort in the discourse.

### 3. METHODOLOGY.

The analysis was drawn upon a database from *Japanese Data* (Aoki et al. to appear). A database of twenty-one sets of informal conversations was used, consisting of eleven sets of male-female conversations and four male-male and six female-female conversations using the standard Japanese dialect. The conversation participants’ ages ranged from 16 to 48. The total number of conversation participants was 59. Each conversation varied from 2 to 19 minutes in length, for a total of 152 minutes. The present study examines all occurrences of locative phrases marked with either *ni* or *de*, as well as locative phrases not marked by *ni* or *de*<sup>3</sup>.

#### Results & Discussion (1): Occurrence/Non-occurrence of Locative Postpositions by Verb Types

First I would like to discuss the frequency of occurrence/non-occurrence of Japanese locative post-positions in the conversational corpus.

	<i>Ni</i>	<i>De</i>	Total
Occurrence	129 (74%)	81 (99%)	210 (82%)
Non-occurrence	<b>45 (26%)</b>	1 (1%)	46 (18%)
Total	174 (100%)	82 (100%)	256 (100%)

TABLE 1: FREQUENCY OF OCCURRENCE/NON-OCCURRENCE OF LOCATIVE POSTPOSITIONS.

As shown in Table 1, the total number of locative phrases was 256. *Ni* showed up 129 times, while *de*

<sup>3</sup> There are locative phrases followed by the topic marker *wa* and another particle *mo* (too) and the combination of a topic marker *wa* or *mo* with locative postpositions, such as *niwa* and *dewa* and *nimo* and *demo*. In this paper, however, I will not discuss these cases, since the number of these cases was insignificant. In the database, *niwa*, *dewa*, *nimo*, *demo*, and *wa*, and *mo* were not frequent with eight, one, one, five, and five tokens respectively.

occurred 81 times. As Table 1 clearly illustrates, the majority of locative non-occurrences in informal conversation were in cases where *ni* would be expected. Out of 174 possible occurrences of *ni*, there were 45 non-occurrences (26%); however, *de* was used 99% of the time out of 82 possible occurrences. Table 1 bears witness to the fact that locative non-occurrence happens with *ni*, and not with *de*.

There are two main conditions related to the phenomenon of locative non-occurrence in the corpus: verb types and discourse factors. First, I would like to discuss verb types and then the details of the non-occurrence of *ni* with respect to various verb types. Table 2 provides the figures for occurrence/non-occurrence of *ni* with respect to the three major *ni*-marking verb types: motion verbs, existential verbs, and other verbs. In this study, motion verbs are defined as verbs or verbal phrases describing the motion of some entity, while existential verbs are defined as verbs expressing an entity's existence. Examples of motion verbs are *iku* 'go' and *kuru* 'come'; those of existential verbs are *iru/aru*, 'there is/are'; and other verbs are *sumu* 'live', *ryuugaku-suru* 'study abroad', *motsu* 'carry something', *tomaru* 'stay of a night', and *tsutomeru* 'work for'.

	Motion Verbs	Existential Verbs	Others	Total
Occurrence	77 (64%)	27 (96%)	25 (96%)	129 (74%)
Non-occurrence	<b>43 (36%)</b>	1 (4%)	1 (4%)	45 (16%)
Total	120 (100%)	28 (100%)	26 (100%)	174 (100%)

TABLE 2: FREQUENCY OF OCCURRENCE/NON-OCCURRENCE OF LOCATIVE POSTPOSITION *NI*.

From Table 2, it is clear that the non-occurrence of *ni* is a phenomenon unique to motion verbs. Note that existential and other verbs are almost always marked by *ni*. There was only a single case where the verb *aru* when used to describe location was not marked by *ni*.

Table 3 lays out the frequency of occurrence/non-occurrence of *ni* for some of the motion verbs and all existential verbs which appeared in the database. Table 3 does not include motion verbs whose locations were marked by *ni* in the data. The number of these cases are 26, and the verbs in these cases were found to be infrequently used in the database.

	<i>iku</i> 'go'	<i>kaeru</i> 'return'	<i>kuru</i> 'come'	<i>hairu</i> 'enter'	<i>deru</i> 'come out'	<i>iru</i> 'be'	<i>aru</i> 'be'	Total
Occurrence	23(44%)	6 (46%)	9(69%)	12 (86%)	3 (75%)	17 (94%)	12 (100%)	82 (65%)
Non-occurrence	<b>29(56%)</b>	<b>7 (54%)</b>	4 (31%)	2 (14%)	1 (25%)	1 (6%)	0	44 (35%)
Total	52(100%)	13(100%)	13 (100%)	14 (100%)	4 (100%)	18 (100%)	12 (100%)	126 (100%)

TABLE 3: FREQUENCY OF OCCURRENCE/NON-OCCURRENCE OF *NI* BY VERB TYPE.

The verbs such as *iku* 'go', *kaeru* 'return', *kuru* 'come', *hairu* 'enter', and *deru* 'come out' are motion verbs, while the remaining two verbs, *iru* 'be' (for animates) and *aru* 'be' (for inanimates), are existential verbs. Notice that *iku* 'go' is the most frequently used motion verb in the corpus, and that out of 52 possibilities, there were 29 non-occurrences for this verb. That is, more than half of the occurrences of the verb *iku* 'go' appeared without being *ni*-marked. It is noteworthy that out of 13 possible occurrences, there were 7 non-occurrences for the verb *kaeru* 'return'. This is another case where more than half of the occurrences of the verb appeared without being *ni*-marked. Out of 13 possible occurrences of *kuru* 'come', there were 4 non-occurrences. Out of 14 possible occurrences of *hairu* 'enter', there were 2 non-occurrences. Out of 4 possible occurrences of *deru* 'come out', non-occurrence appeared only once. Notice that the existential verb *iru* 'there is/are' is also a frequently used verb. In contrast to *iku* 'go', there was only one observed case of the non-occurrence of *ni* in conjunction with the existential verb *iru*. There were no tokens of the non-occurrence of *ni* with the existential verb *aru* in the data. Thus, we see that non-occurrence frequently happens with the most frequent motion verb in my corpus, *iku* 'go'. The question to be answered next is why in these conversations, the use of *ni*, a goal marker, frequently did not appear.

First, I would like to discuss Hypothesis 1: the demonstrated non-occurrence patterns for the

goal marker *ni* imply that non-occurrence is motivated by the frequency of the verb. That is, the more often a speaker uses a motion verb, the more strongly s/he tends to associate the goal marker with the verb, a situation which results in non-occurrence (cf. the Reduction Effect discussed by Bybee and Thompson [1997]). However, it seems that the frequency issue alone will not explain the observed patterns of non-occurrence since other frequently used verbs, such as the existential verbs *aru/iru* ‘there is/are’, were marked almost all the time in the data<sup>4</sup>. In order to explain the observation that the verb *iku* ‘go’ is frequently unmarked by *ni*, there is a need for further inquiry.

Next, I would like to discuss Hypothesis 2. Ikegami (1987: 135) proposes that the goal, ‘the ending point’, is more salient than the source, ‘the starting point’, to human cognition and, therefore, the goal may be less frequently unmarked than the source. Following Ikegami (1987), I propose that the motivation for the non-occurrence of a goal marker is that motion verbs are strongly associated with the concept of ‘goal’ to the extent that the speaker does not feel a strong need to mark the goal in conversation.

#### 4. RESULTS & DISCUSSION (2): DISCOURSE MOTIVATIONS FOR NON-OCCURRENCE OF THE GOAL MARKER.

It was observed that the non-occurrence of locative postpositions in conversation was unique to *ni*, not *de*, and that the most frequently-used verb *iku*, ‘go’, often co-occurred with the non-occurrence of *ni*. This section will discuss how the discourse factors (e.g. non-referentiality and demonstratives) discussed by Fujii and Ono (to appear) are applicable to this study. Fujii and Ono point out that when objects are non-referential, then these objects are predominantly unmarked. If this is the case for locative postpositions as well, then the following prediction should hold: when locations are interrogatives or indefinite pronouns that have no referent, they will predominantly be unmarked.

	Interrogative/indefinite	Other locative nouns	Total
Occurrence	2 (28.6%)	77 (70%)	79 (64.8%)
Non-occurrence	<b>5 (71.4%)</b>	38 (30%)	43 (35.2%)
Total	7 (100%)	115 (100%)	122 (100%)

TABLE 4: FREQUENCY OF OCCURRENCE/NON-OCCURRENCE OF *ni* IN INTERROGATIVE/INDEFINITE PRONOUNS.

Table 4 summarizes the frequency of occurrence/non-occurrence of *ni* with interrogatives or indefinite pronouns occurring with motion verbs. It shows that out of 7 possible occurrences of locative interrogatives or indefinite pronouns, there were 5 cases which were not marked by *ni* (71.4%). In contrast to interrogatives or indefinite pronouns, there was a low preference (30%) for non-occurrence when other locative nouns were used. Next consider examples (11) through (14) taken from the conversational data.

(11) **doko** it-ta-n daroo kanojo Oregon?  
 where go-PST I wonder she Oregon?  
 ‘(I was) wondering where she went?’ (Did she go to) Oregon?’

(12) **doko** it-ta no?  
 where go-PST FP  
 ‘Where (did you) go (skiing)?’

<sup>4</sup> Bybee and Thompson (1997: 381) propose the Conserving Effect which says that high frequency sequences resist change on the basis of newer productive patterns for neighboring words and morphemes. This idea, however, will not provide an explanation for the observation that *iku* ‘go’, but not *iru/aru* ‘be’ were frequently unmarked in the data.



- (13) **doko** ikya ii-n daroo ne are.  
 where go good I wonder FP that  
 '(I) wonder where (I) should go (about that).'
- (14) Nanka **dokka** icchat-ta shi ne.  
 something somewhere go-PST FP  
 '(He) has gone somewhere, you know.'

In examples (11), (12), and (13), the interrogative pronoun *doko* 'where' was not marked by *ni*. Example (14) illustrates that the indefinite pronoun *dokka* (a contracted form of *dokoka* 'somewhere') which refers to a non-specific place is also unmarked. All these examples from discourse data suggest that non-referentiality is strongly associated with non-occurrences of the goal marker *ni*<sup>5</sup>.

Lastly, I would like to suggest one way to look at well-established elements in discourse in order to examine the discourse factors that Fujii and Ono discuss more fully. I observed many cases where proper nouns referring to locations were used with and without *ni*-marking. Examples of proper locative nouns in the data are *Amerika* 'America', *Nihon* 'Japan', and, *Yooroppa* 'Europe'. It seems that these proper locative nouns were not randomly marked. I found that when proper locative nouns were previously used in discourse, the tendency to be unmarked increased. My observations are summarized in Table 5.

	Newly introduced	Previously mentioned	Total
Occurrence	14 (66.7%)	11 (42%)	24 (51%)
Non-occurrence	7 (33.3%)	<b>15 (58%)</b>	23 (49%)
Total	21 (100%)	26 (100%)	47 (100%)

TABLE 5: FREQUENCY OF OCCURRENCE/NON-OCCURRENCE OF *NI* IN REPEATED PROPER LOCATIVE NOUNS.

Table 5 shows that 15 out of 26 cases (58%) are repeated references to unmarked proper locative nouns. The fact that these 15 cases are of repeated tokens identifies them as well-established elements in the discourse. Following Chafe (1986: 25), I believe these cases are what he calls 'activated' since they currently lit up, and exist in a person's focus on consciousness among discourse participants. Notice that the ratio of non-occurrences increased to 58% from 33.3% in the case of locative proper nouns which were previously mentioned in the conversation. Consider example (15) where speakers K and T are talking about what happens after spending a long time outside of Japan.

- (15) K: ... dakedo,  
 kono kankaku de,  
 Nihon **ni** kaeru no wa, ← 1  
 kowai yo [ne].
- T: [ne],  
 .. kono kankaku de,  
 nareteru kara sa.  
 [moo].
- K: [soo].  
 ... dakara=,  
 .. sa[=].
- T: [n=].
- K: But, with this sense of feeling  
 We are nervous about going back to Japan,  
 aren't we?
- T: Yes, because we got used to the ways  
 things are here with this sense of feeling/
- K: So.
- T: yeah

<sup>5</sup> Following Fujii and Ono, I looked at well-established elements in discourse expressed by demonstratives such as *asoko* 'there' and *socchi* 'over there'. In the data, out of 6 possible demonstrative pronouns occurring with motion verbs, there were only 2 cases where demonstratives were not marked by *ni*.

- K: ... monotarinai nante o[moun ja]n. K: We will feel something is missing .  
 T: [n=].  
 ... moo,  
 Nihon kaetta ra, ← 2 T: When we go back to Japan, we will go  
 ... gyaku karuchaashokku [de], through a terrible 'reverse-culture-shock'.  
 K: [un]. K: Yes.  
 T: sugoi to omou. T: I suppose.

Notice that in the line pointed by the arrow 1, K mentioned *Nihon* 'Japan' is marked by *ni* and followed by *kaeru* 'return'. However, in the line pointed to by arrow 2, the same proper locative noun and the same verb were used, but this time *Nihon* 'Japan' was not *ni*-marked. Thus, both cases of *Nihon* are referential, but the one with arrow 2 is different from the one with arrow 1 in that it is well-established in the discourse.

## 5. CONCLUSION.

In this paper, I have examined how the Japanese locative postpositions *ni* and *de* are used in informal conversation. The phenomenon of non-occurrence, or what has been referred to as 'ellipsis', is unique to the locative *ni* as a goal marker. The most frequently used motion verb in the data, the verb *iku* 'go', was often unmarked by a goal marker. I have proposed that this is because the meaning of the goal marker is so salient that the speaker does not feel the need to use *ni* and because the verb entails the meaning of the goal. When the location is non-referential, such as with interrogatives and indefinite pronouns, the goal marker is very likely not to be used. My observations seem to partially support the findings of Fujii and Ono who argue that discourse factors motivate non-occurrence of the accusative marker *o*. I have demonstrated that repeatedly used locative nouns, which are also well-established in discourse, are likely not to be *ni*-marked. In summation, I have found that there are observable patterns of the non-occurrence of locative postpositions, *ni* and *de*, in conversation. Furthermore, these patterns cannot be only observed in conversation, but more interestingly, can be predicted by focusing attention upon cognitive and discourse factors central to conversation

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# LEAST EFFORT IN WH-DROP QUESTIONS IN CHILD SPEECH AND ASL<sup>1</sup>

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## 1. INTRODUCTION.

This paper examines the dropping of wh-words in child speech and adult American Sign Language (ASL). It has been reported that children frequently drop wh-words when acquiring Scandinavian and Germanic languages such as Swedish, Dutch and German. An example from Dutch is shown in (1) (Van Kampen 1997) :

- (1)     zei je? (Sarah 2;3.26)  
      said you  
      ‘(What) did you say?’

The underline shows that the wh-word, which should be in sentence-initial position, was not produced by the child. We refer to this dropping of wh-words as “wh-drop”. The occurrence of wh-drop is not allowed in the corresponding adult languages.

The question arises whether wh-drop occurs in any adult language. As far as we know, wh-drop is observed only in adult ASL, as shown in (2) (Petronio and Lillo-Martin 1997):<sup>2</sup>

- (2)     topic     whq  
      EARRINGS, *e* GIFT  
      ‘(Who) gave you the earrings?’

In ASL, overt wh-words usually appear in wh-questions. However, when the content of the wh-word is recoverable from the context, wh-drop occurs as in (2). In (2), the possible context is that the speaker knows that addressee received several gifts from different people and somebody gave the earrings to the addressee. The italicized ‘e’ indicates that wh-drop occurs.

In this paper, we consider the wh-drop phenomenon within the framework of the principles-and-parameters (P&P) theory of generative grammar. In the P&P theory, it is assumed that Universal Grammar (UG) consists of universal principles and parameters, and acquisition of a particular language is considered to be the process of setting values of the parameters based on the primary linguistic data.

To explain the occurrence of wh-drop in the P&P theory, two approaches are possible: parametric approach and non-parametric approach. In the parametric approach, a parameter is set as to whether wh-drop occurs or not, and the occurrence of wh-drop in a language is explained by the particular value setting of the parameter. In the non-parametric approach, wh-drop is not allowed in UG, but it occurs due to a factor outside of UG. Both approaches, however, have problems. In the parametric approach, ASL is the only language which has the value allowing wh-drop, and all spoken languages have the value which does not allow wh-drop. In the non-parametric approach, it is not clear how a factor outside of UG makes possible what is not allowed in UG. Because both approaches have these problems, we focus on three basic questions raised by both approaches.

The first question is whether children acquiring non-Germanic or Scandinavian languages

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<sup>2</sup> ASL uses both manual markers and non-manual markers which involve facial expressions. The words in capital letters in (2) are the glosses of manual markers, and the line above the glosses show non-manual markers. The line with whq involves a facial expression with furrowed brows and the head tilted back, and the line with topic involves brow raising and an upward head tilt.

also drop wh-words. We will show that while wh-drop occurs in the course of acquisition of other languages, it occurs rarely in the speech of Japanese children. The second question is what general principle lies behind the wh-drop phenomenon. The third question is why the frequency of wh-drop varies among child languages and whether this variation correlates with characteristics of the adult target languages.

## 2. WH-DROP IN CHILD LANGUAGES.

### 2.1. SWEDISH.

Santelmann (1995, 1997) examines cross-sectional natural speech data of five Swedish children listed in Table 1 and longitudinal speech data of three children listed in Table 2.

Subject	Age	#utterances	Wh-Qs with verb	Wh-drop questions	% wh-drop questions
Åke	1;11	111	2	1	50.00%
Frank	2;0	211	16	13	81.25%
Kenneth	2;2	429	18	1	5.56%
Daniel	2;10	339	1	0	0.00%
Lars	2;11	243	20	2	10.00%
Totals:	1;11-2;11	1,333	57	17	29.31%

TABLE 1 : INFORMATION ON SUBJECTS FROM SANTELMANN (1997).

Subject	Age	#utterances	Wh-Qs with verb	Wh-drop questions	Range of wh-drop in each session	% wh-drop over all sessions
Ask	1;11-2;9	4,103	214	23	0-100%	10.75%
Embla	1;8-2;8	4,288	154	26	0-75%	16.88%
Tor	2;1-3;0	3,756	247	58	0-100%	23.48%
Totals:	1;8-3;0	12,147	615	107		

TABLE 2: LONGITUDINAL SPEECH DATA FROM SÖDERBERGH CORPUS (SÖDERBERGH 1997, LANGE AND LARSSON 1977).

Santelmann points out several important characteristics of wh-drop. First, various kinds of wh-words are dropped in the speech of Swedish children as shown in (3).

#### (3) a. Missing vad 'what

Frank: \_ är det? (pointing to a new picture) (Frank 2;0)  
is that?  
'(What) is that?'

Adult: ja vad är det?  
yes, what is that?

#### b. Missing var 'where'

Tor: \_är de andra bilen? (Tor 2;9)  
is the other car?  
'(Where) is the other car?'

Tor: där var den.  
there was it.

c. Missing *var* 'where-to'

Adult: Vart tror du R. åkte med båt då?  
 where think you R. went by boat then  
 'Where-to do you think that R-went by boat then?'  
 Ask (to R.): \_ åkte du med båten? (Ask 2;8)  
 went you with boat-the  
 '(Where-to) did you go with the boat?'

d. Missing *hur* 'how'

Tor: \_gör apa då? (Tor 2;5)  
 makes monkey then  
 '(How) does the ape (go) then?'

Hur gör apa då?  
 how makes monkey then  
 'How does the ape (go) then?'

\_gör apa då?  
 makes monkey then  
 '(How) does the ape (go) then?'

e. Missing *varför* 'why'

Tor: Varför kan den inte komma in? (Tor 2;11)  
 why can it not come in  
 'Why can it not come in?'

Varför kan  
 why can

\_ kan den inte komma in?  
 can it not come in  
 '(Why) can it not come in?'

(4) shows that every child who produced wh-drop questions also produced well-formed wh-questions, except for the first recording of one child. In addition, no *whin situ* questions are found. This indicates that wh-drop does not occur in the base-generated position, but rather in sentence-initial position, that is, CP Specifier position.

(4) wh-drop

a. \_ gör det?  
 \_ makes that  
 '(What) makes that?'

with wh-word

vad är denna? (Frank 2;0)  
 what is this  
 'What is this?'

b. \_öppnar man?  
 \_opens one  
 '(How) do you open (this)?'

hur ska det va? (Lars 2;11)  
 how should it be  
 'How should it be?'

c. \_är det för något?  
 \_is that for thing  
 '(What) is that?'

vad är det för något? (Tor 2;6)  
 what is that for thing  
 'What is that?'

In (5), we also find that wh-drop questions occur with different kinds of verbs in various tenses.

- (5) a. \_\_gör den (Kenneth 2;2)  
does it  
'(What) is that doing?'
- b. \_\_är där? (Frank 2;0)  
is there  
'(What) is there?'
- c. \_\_äter den? (Embla 2;3)  
eats it  
'(What) does it eat?'
- d. \_\_sa du? (Embla 2;3)  
said you  
'(What) did you say?'
- e. \_\_ ska man göra med den da? (Ask 2;6)  
shall one do with it then  
'(What) should one do with this then?'
- f. \_\_ har hänt? (Ask 2;3)  
has happened  
'(What) has happened?'

In addition, in (3), (4) and (5), verbs appear in sentence-initial position in wh-drop questions, which shows that V-to-C movement has occurred. However, wh-drop also occurs in embedded clauses as in (6), in which V-to-C movement has not occurred.

- (6) titta en katt gjorde där. (Freja 2;8 from Söderbergh corpus)  
look a cat did there  
'Look (what) a cat did there'

2.2. DUTCH.

Van Kampen (1997) examines longitudinal natural speech data of two children shown in Table 3. Table 4 shows the numbers of wh-questions in her corpus.

Child	bi-weekly recordings	monthly recordings	# utterances in audio-recordings	diary notes	#utterances in diary notes
Laura	1;9-6;0	none	24,127	1;7-10;0	1,659
Sarah	1;7-3;0	3;0-5;5	16,546	1;7-7;0	873

TABLE 3: INFORMATION ON SUBJECTS FROM VAN KAMPEN (1997).

	overt wh-questions		wh-drop questions	
	recordings	diary	recordings	diary
Laura	263	92	228	128
Sarah	370	47	127	51

TABLE 4: WH-QUESTIONS IN VAN KAMPEN'S (1997) CORPUS.

As with the Swedish child data, various wh-words are dropped, and different kinds of verbs appear as shown in (7):

- (7) a. \_\_zit dr achter nou? (Sarah 2;4.27)  
sits there behind then  
'(What) is sitting behind then?'
- b. \_\_is dat nou? (Sarah 1;11.27)  
is that then  
'(What) is that?'
- c. \_\_moet jij noudoen? (Laura 3;7.3)  
must youthen do  
'(What) must then do?'
- d. \_\_lag mijin lepel nou? (Laura 3;6.26)  
lied my spoon then  
'(Where) was my spoon?'
- e. \_\_heb dat daan nou? (Sarah 2;4.18)  
has that done then  
'(Who) has done that?'
- f. \_\_kan dit nouin? (Laura 3;7.25)  
can this one then in  
'(How) can this one go in?'

Furthermore, Van Kampen (1997) points out the occurrence of wh-drop in embedded clauses, in which V-to-C movement does not occur as in (8) through (10):

- (8) Missing *wat* 'what'
- a. ik weet niet er in zit (Laura 3;8.14)  
I knownot there in sit  
'I do not know (what) is in there.'
- b. kijk eens zij doet! (Laura 3;10.22)  
look once she does  
'Come and look (what) she is doing!'
- (9) Missing *waar* 'where'
- a. opa, ik weet ookniet jij brill is (Laura 3;6.20)  
granddaddy, I know also not your glasses are  
'Granddaddy, I do not know either (where) your glasses are.'
- b. weet jij Laura is? (Sarah 2;9.29)  
know you Laura is  
'Do you know (where) Laura is?'
- (10) Missing *hoe* 'how'
- a. weet jij ik heet? (Laura 3;8.6)  
know you I call  
'Do you know (how) I am called?/(what) is my name?'
- b. waar is de klok? ik wil kijken laat het is (Laura 3;10.22)  
where is the clock? I want look late it is  
'Where is the clock? I want to look (how) late it is (=what time it is)'



- c. voel eens, Sarah, koud ze handen is! (Laura 3;9.4)  
feel , Sarah, cold her hands is  
'Feel, (how) cold Sarah her hands are!'

2.3. GERMAN.

Wh-drop is also reported in child German. Felix (1980) examines longitudinal natural speech data of one child from 2;7 to 2;11. Although Felix does not show at what age wh-drop occurred, he gives detailed contexts of wh-drop questions as in (11):

- (11) a. (Father is fixing Bernie's toy car. The boy curiously watches the action.)  
Bernie: \_\_ macht du denn?  
'(What) are you doing?'
- b. (Bernie's father is late coming home. The mother insists on Bernie's going to bed, but the boy obviously wants to see his father before going to sleep.)  
Bernie: \_\_ kommt der Pappi denn?  
'(When) does Daddy come?'
- c. (Bernie is busy doing a puzzle with wooden blocks. However, he is not very successful.)  
Bernie: kann das nicht: \_\_ geht das denn?  
'cannot do that, (how) does that work?'
- d. (Father and Bernie are looking through the family's photographs.)  
Father: guck mal, ist das die Oma?  
'Look, is that grandma?'  
Bernie: weiß nicht, \_\_ ist die?  
'don't know, (who) is she?'

Furthermore, Rothweiler (1990), as cited in Vainikka and Roeper (1995), reports that embedded questions initially appear without a wh-word in the speech of German children.

We have seen that wh-drop questions which appear in child Swedish, Dutch, and German have similar properties. First, various wh-words are dropped. Second, various types of verbs appear. Third, wh-drop also occurs in embedded clauses where V-to-C movement does not occur.

Up to this point we have focused on only wh-drop questions in Verb Second (V2) languages, in which V-to-C movement occurs. In 2.4. 2.5 and 2.6, we will show that wh-drop is not peculiar to V2 languages. Wh-drop questions also seem to appear in child French, Spanish and English.

2.4. FRENCH.

Guillaume (1927), in his diary study, notes that, at the age of 1;10, his subject dropped wh-words in spontaneous speech as in (12):

- (12) a. \_\_ il est? (1;10)  
he is  
'(Where) is he?'
- b. \_\_ il est l'autre de maman? (1;10)  
it is the other of mama  
'(Where) is it, mama's the other one?'

- c. \_\_\_ il est maman chérie? (1;10)  
 it is mama dear  
 ‘(Where) is it, dear mama?’ (1;10)

In (12), it seems that the child dropped “Où est-ce que” (‘where is-it that’) in sentence-initial position.

## 2.5. SPANISH.

Hernández-Pina (1984) cited in Pérez-Leroux (1993) reports that wh-drop questions appear in child Spanish as in (13).

- (13) a. \_\_\_ ta taza nene? (after two years)  
 is cup child  
 ‘(Where) is the child’s cup?’
- b. \_\_\_ tan zapatillas?  
 are slippers  
 ‘(Where) are (the) slippers?’
- c. don’ta las papas?  
 are the potatoes  
 ‘Where(re) are the potatoes?’

In (13a) and (13b), the wh-word *donde* ‘where’ is completely dropped. In (13c), *donde* is partially dropped. Let us next examine wh-drop in child English.

## 2.6. ENGLISH.

### 2.6.1. PREVIOUS STUDIES.

Wh-drop is reported in the spontaneous speech of children acquiring English by Radford (1990) as shown in (14):

- (14) a. Bow-wow go? (‘Where did the bow-wow go?’ Louise 1;3)  
 b. You got? (‘What have you got?’ Harriet 1;6)  
 c. Mummy doing? (‘What is mummy doing?’ Daniel 1;9)  
 d. Car going? (‘Where is the car going?’ Jem 1;9)  
 e. My shoes gone? (‘Where have my shoes gone?’ Jenny 1;10)

Brown and Fraser (1963) report that children at the age of 2;1, 2;4 and 2;6 dropped wh-words in sentence-initial position as in (15) when they were asked to repeat adult wh-questions in the elicited imitation experiment:

- (15) Adult sentences / Child’s imitation
- a. Where shall I go? / Go? (Eve 2;1)  
 b. Where does it go? / Go? (Adam 2;4)  
 c. Where does it go? / Does it go? (Helen 2;6)

In addition, Vainikka and Roeper (1995) mention that wh-drop in embedded clauses exists in child English.

### 2.6.2. EXPERIMENT 1: CHILD ENGLISH.

To confirm the presence of wh-drop in child English, we have conducted an elicited production experiment. The subjects were 19 monolingual English-speaking children listed in Table 5.

Age	2;9-2;11	3;1-3;11	4;0-4;11
Number	6	8	5

TABLE 5: NUMBER OF THE SUBJECTS AND THEIR AGES.

The experiment was a combination of a comprehension task and an elicited production task as shown in (16).

- (16) Example of a test sentence: matrix wh-question  
 (showing a picture in which Winnie the Pooh is hiding in a bucket)  
 Experimenter : Who is hiding in the bucket?  
 Child : Pooh.  
 Experimenter : Yes! Can you ask Mommy/Mickey(doll)  
 who is hiding in the bucket?  
 Child: Mommy, who is hiding in the bucket?  
 Mother : Pooh is hiding in the bucket.

First, the experimenter, who was a native speaker of English, asked a wh-question to the child such as ‘Who is hiding in the bucket?’ with the picture, to see whether the child could comprehend the wh-question. Then, the experimenter said to the child, ‘Can you ask Mommy who is hiding in the bucket?’. This tries to elicit a wh-question from the child and see if the child produces a wh-drop question. The test sentences included 14 matrix wh-questions and 3 embedded wh-questions.

The results for the matrix wh-questions are shown in Table 6.

	Correct responses with overt wh-words	Responses with wh-drop	Incorrect responses
2-year-olds	42 (82.4%)	9 (17.6%)	33
3-year-olds	97 (98.0%)	2 (2.0%)	13
4-year-olds	62 (100.0%)	0 (0.0%)	8

TABLE 6: MATRIX WH-QUESTIONS.

Table 6 shows that 17.6% of all the wh-questions produced by the two-year-olds were wh-drop questions and that 2% of all the wh-questions produced by the three-year-olds were wh-drop questions. Examples of wh-drop questions produced by the children are shown in (17). Words in parentheses show what was dropped.

- (17) a. (Who is) hiding in the bucket? (Brittney 2;9)  
 b. (Which) dog is barking? (Brittany 2;9)  
 c. (Why is the) mouse crying? (Brittany 2;9)  
 d. (What is the) boy eating? (Ana 2;11)  
 e. (Which car is) the cat driving? (Avery 3;1)

In the case of the embedded wh-questions, even older children produced wh-drop questions. An example of the task is shown in (18).

- (18) Example of a test sentence: embedded wh-question  
 (Showing a picture of Winnie the Pooh eating honey)  
 Experimenter : Do you know what Pooh is eating?  
 Child: Yes, honey.  
 Experimenter : Can you ask Mommy/Mickey(doll),  
 “Do you know what Pooh is eating?”  
 Child: Mommy, do you know what Pooh is eating?

We used the phrase ‘Do you know’ to make embedded wh-questions. The results of the embedded wh-questions are shown in Table 7.

	Correct responses with overt wh- words	wh-drop with “Do you know” at the beginning of the question	wh-drop without “Do you know”	Incorrect responses
2-year-olds	6 (50.0%)	0 (0.0%)	6 (50.0%)	6
3-year-olds	15 (83.3%)	3 (16.7%)	0 (0.0%)	6
4-year-olds	12 (100.0%)	0 (0.0%)	0 (0.0%)	3

TABLE 7: EMBEDDED WH-QUESTIONS.

As Table 7 shows, 16.7% of all the embedded wh-questions produced by the three-year-olds were wh-drop questions. Examples of children’s wh-drop questions without the phrase “do you know” and with the phrase are shown in (19):

- (19) a. (Do you know what) Pooh is eating? (Brittney 2;9)  
 b. You know (where) the cat is resting? (Austin 3;2)

In sum, by conducting this experiment, we have confirmed that wh-drop occurs both in matrix wh-questions and embedded wh-questions in child English. Although the same experiment was not conducted in child Swedish or Dutch, it seems that the frequency of wh-drop in child English is lower than in child Swedish and Dutch.

Next, let us examine Japanese, a typologically different language in that it does not have overt wh-movement and it allows the dropping of arguments such as subjects and objects.

## 2.7. JAPANESE.

### 2.7.1. EXPERIMENT 2: CHILD JAPANESE.

We conducted a similar experiment with 15 monolingual Japanese children, shown in Table 8.

Age	2;5 -2;11	3;1 - 3;9	4;5 - 4;7
Number	6	6	3

TABLE 8 : NUMBER OF SUBJECTS AND THEIR AGES.

The test sentences used in this experiment were 27 matrix wh-questions containing all kinds of wh-words.

The results for matrix wh-questions are shown in Table 9.

	Correct responses with overt wh-word	Responses with wh-drop	Incorrect responses
2-year-olds	117 (96.7%)	4 (3.3%)	34
3-year-olds	154 (100.0%)	0 (0.0%)	8
4-year-olds	78 (100.0%)	0 (0.0%)	0

TABLE 9: MATRIX WH-QUESTIONS.

Table 9 shows that only 3.3% of all the wh-questions produced by the two-year-olds were wh-drop questions. These wh-drop questions are shown in (20).

- (20) a. Okaasan, raion-kun (nande)naiteru no? (Koji 2;5)  
 Mommy, lion (why) cry-Prog Q  
 ‘Mommy, (why) is the lion crying?’
- b. (doushite) zou-san naiteru no? (Koji 2;5)  
 (why) elephant cry-Prog Q  
 ‘(Why) is the elephant crying?’
- c. (naze) naiteru no?(naze) kore, kore naiteru no? (naze) kore naiteru no? (Koji 2;5)  
 (why) cry-Prog Q (why) this, this cry-Prog Q (why) this cry-Prog Q  
 ‘(Why) is (this) crying? This, (why) is this crying? (Why) is this crying?’
- d. Mama (itsu) nenne-suru no? (Maimi 2;9)  
 Mommy (when) sleep Q  
 ‘(When) does Mommy sleep?’

We have also tested two embedded wh-questions to the subjects reported on in Table 10.

Age	2;5 -2;11	3;1 - 3;9	4;5 - 4;7
Number	4	4	3

TABLE 10: NUMBER OF SUBJECTS AND THEIR AGES.

The results are shown in Table 11.

	Correct responses with overt wh-word	Responses with wh-drop	Incorrect responses
2-year-olds	1 (100.0%)	0 (0.0%)	7
3-year-olds	2 (100.0%)	0 (0.0%)	6
4-year-olds	5 (100.0%)	0 (0.0%)	1

TABLE 11: EMBEDDED WH-QUESTIONS.

Table 11 shows that wh-drop did not occur in embedded wh-questions in child Japanese.

### 2.7.2. NATURAL SPEECH DATA OF JAPANESE CHILDREN.

Yamakoshi (1999) examined the natural speech data of Japanese children to see whether wh-drop occurs in Japanese children’s natural speech. The data examined are longitudinal speech data of one

child, Akifumi (1;5.7-3;0.0), taken from the CHILDES database (cf. MacWhinney 1995, Miyata 1995, Oshima-Takane and MacWhinney 1995), and cross-sectional speech data of four children, shown in Table 12, collected by Tatsuko Wakayama and transcribed by the author and Yasuko Uemura. Each session of cross-sectional speech data consists of an approximately 40 minute recording of the speech of a child and his/her mother.

Subject	Age	#utterances	Total #Wh-Qs
Hiroko	2;2	279	10
Kuniyuki	2;5	394	6
Goichiro	2;7	450	15
Takayuki	2;10	484	47

TABLE 12: INFORMATION ON THE CROSS-SECTIONAL SPEECH DATA.

The finding is that wh-drop questions were not observed in these children's natural speech.

To summarize, there seems to be a difference in the frequency of wh-drop among child languages. Wh-drop occurs frequently in child Swedish, Dutch and German, whereas wh-drop seems to occur less frequently in child English, and it rarely occurs in child Japanese.

### 3. ANALYSIS.

#### 3.1. PRINCIPLE OF LEAST EFFORT.

In this section, we argue that a general principle, the principle of least effort, underlies the occurrence of wh-drop in child languages and ASL. The principle of least effort is a pragmatic principle, which has been proposed to explain the deletion or the reduction of grammatical elements. For example, in a number of languages, reflexives can be deleted. (21) is an example in English from Haiman (1983).

- (21) a. Max washed (himself).  
b. Max kicked himself.

In (21a), *himself* is omitted. *Wash* is a transitive verb, but when it is understood reflexively, the reflexive pronoun is preferably omitted, because the verb refers to an action which one can perform on one's self. Thus according to the principle of least effort, the reflexive is dropped in (21a) because it is recoverable from its linguistic context. No such omission is possible with other transitive verbs like *kick*, as shown in (21b). The verb describes an action which the subject normally performs toward others. The object *himself* is not expected and thus cannot be omitted.

Now let us see how the principle of least effort is related to the occurrence of wh-drop in ASL. It seems that the dropped wh-word is recoverable not only from its situational context but also from the non-manual marker. In (22), the line with whq corresponds to the non-manual marker involving furrowed brows and the head tilt. This is clearly different from the non-manual marker for yes/no questions, which corresponds to raised brows and the head tilt. Because the marker for wh-questions and yes/no questions are distinct, (22) is correctly interpreted as a wh-question even if the wh-word is dropped, not as a yes/no question which would mean 'Did you eat breakfast?' (Petronio and Lillo-Martin 1997).

- (22) topic whq  
BREAKFAST, EAT *e*  
'As for the breakfast, (what) did you eat?'

Therefore we claim that wh-drop in ASL occurs due to the principle of least effort when the dropped wh-word is recoverable from the non-manual marker whq in addition to the situational context.

In the next section, we explore possible clues which make the content of a wh-word recoverable in child languages, analogous to the non-manual marker in ASL. We suggest that the presence of the clues triggers wh-drop in child languages according to the principle of least effort. The clues we will

look at are characteristics of the adult target languages.

3.2. A DIFFERENCE IN THE FREQUENCY OF WH-DROP AMONG CHILD LANGUAGES.  
 3.2.1. INTONATIONAL DIFFERENCES.

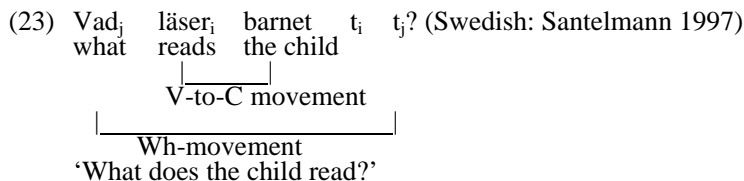
Let us first examine the intonational differences in adult languages. In adult Swedish, German and English, the intonation of a wh-question and a yes/no question are distinct. For example, a wh-question such as “Which books have you lent him?” in adult American English has falling intonation while a yes/no question such as “Has the boat left?” has rising intonation (Quirk et al. 1985).

Santelmann (1995, 1997) reports that wh-drop questions in child Swedish have the wh-question intonation. Also in the experiment in child English we have conducted, children’s wh-drop questions such as “\_\_ dog is barking?” missing *which* and “\_\_ is the boy playing?” missing *where* (Brittany 2;9) had the wh-question intonation. Thus the intonational difference between wh-questions and yes/no questions in adult languages may be a clue to recover the dropped wh-word in child languages.

In the case of Japanese, however, the intonation of a wh-question and that of a yes/no question seem to be quite similar. For example, a wh-question such as “Kimi-wa nani-o tabe-tai no?” (“What do you want to eat?”) and a yes/no question such as “Kimi-wa okashi-o tabe-tai no?” (Do you want to eat sweets?) both have rising intonation. Therefore wh-drop questions and yes/no questions cannot be distinguished by their intonations alone in Japanese, and intonation in Japanese cannot be used as a clue to recover a wh-word’s content.

3.2.2. SYNTACTIC POSITIONS OF WH-WORDS.

Let us next deal with syntactic positions of wh-words. In adult Swedish, Dutch and German, a wh-word moves to sentence-initial position due to overt wh-movement, and a tensed verb moves to the second position in main clauses due to V-to-C movement, as shown in (23).



If children have already acquired these movements, it seems relatively easy to indicate that wh-words in sentence-initial position are dropped, because verbs which are supposed to occur in the second position appear in sentence-initial position in wh-drop questions. Therefore the position of a wh-word can be a clue in these languages. Also in adult English, a wh-word must appear in sentence-initial position, and thus this fixed position of the wh-word can be a clue. In contrast, in adult Japanese, the position of a wh-word is not fixed, because wh-words stay in-situ. A wh-word can appear in various places such as subject, object, scrambled or adjunct positions as shown in (24).

- (24) The position of wh-words in adult Japanese
- a. *Dare-ga* kita no?  
 who-Nom come-Past Q  
 ‘Who came?’
  - b. Kimi-wa *dare-o* mita no?  
 You-Top who-Acc see-Past Q  
 ‘Who did you see?’

- c. *Dare-o* kimi-wa mita no? (Scrambled)  
 who-Acc you-Top see-Past Q  
 ‘Who did you see?’
- d. John-wa *naze* kita no?  
 John-Top why come-Past Q  
 ‘Why did John come?’

Because the position of a wh-word is not fixed, it is impossible to identify a dropped wh-word from its syntactic position alone. Thus the position of a wh-word cannot be a clue in Japanese.

### 3.2.3. ADVERBS COLLOCATING DROPPED WH-WORDS.

Lastly, we focus on the presence of adverbs indicating dropped wh-words. In adult Dutch, according to Van Kampen (1997), a particular adverb *nou* which is translated as ‘then’, appears in about 10 percent of wh-questions. Likewise, similar adverbs such as *denn* in adult German and *då* in adult Swedish exist.

In child Dutch, Van Kampen (1997) reports that this adverb appears in about 85 percent of wh-drop questions, as shown in (25).

- (25) Child Dutch (Van Kampen 1997)
- a. zit daar *nou* in? (Laura 2;8.22)  
 sit there then in?  
 ‘(What) sit in there?’
- b. is deze voor *nou*? (Laura 3;2.9)  
 is this one for then  
 ‘(Whom) is this one for?’
- c. ga jij *nou* heen? (Sarah 2;3.26)  
 go you then to  
 ‘(Where) are you going?’
- d. gaat deze *nou* open? (Laura 3;7.6)  
 goes this one then open  
 ‘(How) does this one open?’

This adverb was not found in other constructions such as yes/no questions and topic-drop sentences in child Dutch, which suggests that the adverb marks the wh-drop questions as wh-questions. The adverbs in German and Swedish also appear in wh-drop questions in child speech, as shown in (26) and (27).

- (26) Child German (Felix 1980)
- a. \_\_ macht du *denn*?  
 do youthen  
 ‘(What) are you doing?’
- b. \_\_ geht die Mami *denn*?  
 go the mother then  
 ‘(Where) is mother going?’



- c. \_\_\_ kommt der Papp *denn*  
 come the Daddy then  
 '(When) does Daddy come?'
- d. kann das nicht; \_\_\_ geht das *denn*?  
 can that not go that then  
 'cannot do that, (how) does that work?'

(27) Child Swedish (Santelmann 1995, 1997)

- \_\_\_ gör apa *då*  
 makes monkey then  
 '(How) does the ape (go) then?'

Therefore the presence of these adverbs in wh-drop questions can be a clue. In English and Japanese, however, there are not any adverbs which may mark the dropped wh-word.

#### 3.2.4. SUMMARY.

We have seen three characteristics of adult languages which seem to be clues for recovering the dropped wh-words. In Dutch, German and Swedish, we have seen that all of these characteristics can be clues to make dropped wh-words recoverable. In English, however, a particular adverb which indicates a dropped wh-word does not exist. In Japanese, none of these characteristics serve as clues.

The number of clues that each language has seems to correspond to the frequency of wh-drop in child languages. Swedish, Dutch and German have all the clues, and wh-drop occurs frequently in these child languages. Wh-drop occurs less frequently in child English, and this may be due to the fact that adult English has fewer clues. Wh-drop rarely occurs in child Japanese, which may be because adult Japanese does not have any clue to make dropped wh-words recoverable.

Although we have argued that the principle of least effort lies in the occurrence of wh-drop in child languages and ASL, how to explain the non-occurrence of wh-drop in adult spoken languages is a remaining issue. The occurrence of wh-drop in child languages and ASL might be due to their deictic properties, but this issue needs to be investigated further.

#### 4. CONCLUSION.

We have examined the occurrence of wh-drop in various child languages, and we have shown that there is a difference in the frequency of the occurrence of wh-drop in child languages. We have argued that the occurrence of wh-drop is due to a general pragmatic principle, namely, the principle of least effort. We have pointed out several characteristics in adult languages which can be clues to recover dropped wh-words, and we have suggested that the difference in the frequency of wh-drop in various child languages depends on the different number of clues that the corresponding adult languages have.

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SAYING SOMETHING LIKE:  
UTTERANCE-FINAL EXPRESSIONS OF SELF-MOCKERY IN JAPANESE

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1. INTRODUCTION.

This paper discusses self-mocking linguistic acts in Japanese. An example of Japanese self-mockery<sup>1</sup> is illustrated in the following example.<sup>ii</sup>

- (1) Boku no shashin wa mada data node, itsu tori ni  
I LK photograph TP yet was so when take AV  
  
kuru ka matte-ta nda keredo naa.  
come FP was-waitingEP but FP

*Nanchatte.*  
something.like.saying.ending.up

'My picture was not displayed yet, so I was waiting for them  
to come and take a photograph of me. Just kidding.'  
(Miyamoto 1997: 41)

The speaker of (1) is a musician but not a famous one. Prior to the discourse shown in (1), he was describing a restaurant he visited while traveling in Spain. On the wall in the restaurant photographs of world famous celebrities were displayed. In (1) he says that he was waiting for the people in the restaurant to come and take his picture as if he were a world famous celebrity. In order to show that he is not being serious, he attaches an expression *nanchatte*, the contracted form of *nante* ('something like') *itte* ('saying') and *shimate* ('ending up'). By adding this expression, the speaker mocks his own statement (cf. English *just kidding*).

Another example is given below in which the speaker's own statement is mocked.

- (2) A: E, ja moo ima wa shuushoku katsudoo o  
oh then already now TP employment activity OB

oete.  
finishing  
'Oh, then you are now done with the job search.'

B: Un.  
yeah  
'Yeah.'

A: Soredee?  
and

---

<sup>1</sup> The term 'self-mockery' is taken from Maynard (1996) which provides a brief but insightful section on the phenomenon.

<sup>2</sup> Note the abbreviations used in the literal glosses: AV (adverbial marker), EP (extended predicate), FP (final particle), LK (linker), OB (direct object marker), QP (quotative particle), SB (subject marker), TG (tag-like expression), TP (topic marker).

'And?'

B: Doo shiyoo?  
how shall.do  
'What should I do?'

A: Doo shite-ru?  
how are-doing  
'What are you doing?'

B: Benkyoo, *toka* *itte* [laughter] ima-sara.  
study something.like saying this-late

Iya, ryokoo shiyoo kanaa to mo omou kedo.  
well travel shall.do I.wonder QP also think but  
'Studying, just kidding [laughter], at this belated time.  
Well, I'm also thinking of traveling.'

(2) is a conversation between two senior university students.<sup>iii</sup> When asked about what she is doing now that she has completed a job search, B says *benkyoo* 'studying' and then quickly tries to buffer the seriousness of the answer by adding *toka* ('something like') *itte* ('saying'), which is also an equivalent of *just kidding*.

In both of the above examples the speaker makes a statement and then denies, invalidates, or expresses his/her non-serious attitude toward the content of the utterance by adding a phrase which is more literally translated as 'saying something like.'<sup>iv</sup> The basic structure common to (1) and (2) is thus:

(3) UTTERANCE + *nanchatte/toka itte* 'saying something like'

I will henceforth use the term UTTERANCE to refer to the part of the discourse that is mocked/invalidated.

Why, however, should the phenomenon of self-mockery be studied? In his recent book, Haiman (1998) discusses the notion of the speaker as a divided self. He observes that "the speaker's self-conscious alienation from the actual referential content of his or her message" (Haiman 1998: 10) is the key factor in understanding a wide range of linguistic phenomena from sarcasm and politeness to ritual language. As will be argued later in this paper, the notion of the speaker as a divided self also plays a central role in self-mockery.

Among the phenomena which involve the notion of the speaker as a divided self, sarcasm/irony<sup>v</sup> has received considerable attention (e.g., Grice 1975, 1978; Sperber and Wilson 1981; Clark and Gerrig 1984; Wilson and Sperber 1992; Haiman 1989, 1990, 1998). Self-mockery is very similar to sarcasm/irony. They both involve the speaker's mockery of the message that is expressed in an utterance. In both linguistic acts the speaker is psychologically detached from the content of the message and

<sup>3</sup>Examples (2) and (6) are drawn from a collection of taped conversations from twelve Japanese undergraduate students who were enrolled in a Japanese university at the time of the recording. Dyadic conversations were recorded for thirty minutes without the presence of an observer in order to enhance the naturalness of conversations.

<sup>4</sup>Although not explicitly expressed, the subject of "saying" is understood to be the speaker. The subject is often ellipted in Japanese.

<sup>5</sup>Based on common usage, Haiman (1998: 20) makes two distinctions between the two. First, while situations may be ironic, only people can be sarcastic. Second, people may be unintentionally ironic, but intention is required in expressing sarcasm. However, these two terms are sometimes used interchangeably, so I will use both of them in my discussion henceforth.

suggests that s/he does not really mean what s/he says. As the study of sarcasm/irony helps us understand various aspects of human communication such as multivoicedness, the study of self-mockery should also be enlightening. Yet, there has been very little written about self-mockery in the linguistic literature.<sup>vi</sup> This paper is an attempt to make a contribution to the study of this topic.

## 2. SELF-MOCKERY AND SARCASM/IRONY.

Although there are similarities between self-mockery and sarcasm/irony as mentioned above, the two are distinct from each other in several respects. First, self-mockery does not involve hostility or contempt for others. Haiman (1998: 25) notes that in using sarcasm/irony "the speaker expresses hostility or ridicule of another speaker." The "other speaker" could be the present interlocutor, the third person who is absent, or the opinions or conventions of the society. Sperber and Wilson (1981: 314) observe that the target of this verbal aggression is the originator, real or imagined, of the utterance that is echoed in the sarcastic comment. If there is a "target" in self-mockery, it is not others, but the speaker him/herself that is ridiculed.

The above-mentioned difference between self-mockery and sarcasm/irony is related to the more fundamental difference between the two. As argued by Sperber and Wilson (1981) and Wilson and Sperber (1992), many of the cases of sarcasm/irony involve echoic mention/interpretation.<sup>vii, viii</sup> In being sarcastic, the speaker "echoes a thought she attributes to *someone else* [emphasis added]" (Wilson and Sperber 1992: 60). In self-mockery, nobody's thought or utterance is echoed. Instead, the speaker's own immediately preceding utterance is deflated.

Another difference between self-mockery and sarcasm/irony is its form. A classic example of sarcasm/irony is (4) uttered on a dark rainy day.

(4) What lovely weather!

This is a double-voice discourse in that the speaker's self is divided. On one level there is an ostensible message and on another level a metamessage, which invalidates the ostensible message. Both voices are usually delivered in a single utterance.<sup>ix</sup> In contrast, the two voices in self-mockery are always physically separated. The UTTERANCE is given and then another voice invalidates its effect by appending a self-mocking expression such as *nanchatte* or *just kidding*.

The fourth difference between self-mockery and sarcasm/irony concerns the speaker's commitment. In uttering a sarcastic/ironic utterance such as (4), the speaker believes something different from what is ostensibly expressed in (4), presumably something like "What nasty weather!" The same could be said in some cases of self-mockery. However, self-mockery could be used when the speaker is truly committed to what the UTTERANCE expresses. In such cases self-mockery is used as a kind of face-saving device. An example of such use from Maynard (1996: 221), which was originally taken from a comic book, is given below. The transcription is slightly modified.

<sup>6</sup>Fónagy (1982: 33, 63) briefly discusses the invalidating force of phrases such as I was just kidding.

<sup>7</sup>Clark and Gerrig (1984) argue against Sperber and Wilson's (1981) mention theory of sarcasm/irony and theorize that the key notion in understanding the phenomenon is pretense. Haiman (1998: 25-26) observes that there is not real conflict between the ideas of pretense and mention and that the former simply subsumes the latter. He also states: "At the deepest level, [...] the difference between mention and pretense dissolves completely, in that both derive from the more fundamental notion of repetition" (Haiman 1998: 26).

<sup>8</sup>Wilson and Sperber (1992) modify their original theory (Sperber and Wilson 1981) and state that sarcasm/irony is a variety of echoic interpretation rather than echoic mention, where mention is equated with literal interpretation. Even after this modification, I believe Haiman's (1998) observation discussed in footnote 7 is still relevant since it is concerned with the notion of echo.

<sup>9</sup>It is possible to have the metamessage separated from the ostensible message as in the "... not" example shown in footnote 10.

- (5) Hoshina: Kedo, omee no me de wakarū.  
 but you LK eye with understand  
 But I understand you by (looking into) your eyes.'
- Sari: Kaa  
 (Blushes in embarrassment)  
 'Ohh ... (embarrassed)'
- Hoshina: *Naanchatte* na.  
 Something.like.saying.ending.up FP  
 'Umm, just kidding.' (Maynard 1996: 221)

As Maynard (1996: 122) explains, Hoshina and Sari are beginning to fall in love. In this scene Hoshina catches himself expressing his love and he feels embarrassed and vulnerable. In order "to avoid being taken too seriously and to circumvent possible rejection," he qualifies his own statement by adding *nanchatte*. In doing so, "he retains the possibility of backing out from his confession of love without losing face." In this case it is likely that the speaker is committed to his UTTERANCE, his confession of love, but for various reasons (e.g., fear of rejection) he decides to make a mockery of it. His intention is not necessarily to communicate something different from what his UTTERANCE says, but to mitigate its effect.

When self-mockery is used in this manner (i.e., as a self-protective strategy), the addressee is not likely to interpret the UTTERANCE as invalidated despite the invalidating force of self-mocking expressions. This can be seen in (6).

- (6) A1: Ima hikooki ton-nai-to moo dame na nda yo  
 now air-plane if-not-take already no-good LK EP FP  
 nee.  
 FP  
 'If I don't reserve a plane ticket now, it'd be too late, you know.'
- B1: Un un.  
 uh-huh uh-huh  
 'Uh-huh.'
- A2: Hitori de iku-na tte yappa mata oya  
 one-person by not-go QP as.expected also parents  
 ga usurai koto iidashichattee.  
 SB annoying thing start.saying.ending.up  
 'As expected, my parents also started saying I shouldn't go alone.'
- B2: Uu uun.  
 uh-huh uh-huh  
 'Uh-huh.'
- A3: Ikanai, mitchan ? toka itte.  
 not-go [name] something.like saying

'Won't you go with me, Mitchan? Just kidding.'

B3: Sasuga ni kono natsu wa benkyooshi-nai-to  
As.expected AV this summer TP if-not-study

dame deshoo.  
no.good probably  
'This summer, as may be expected, I will have to study.'

Speaker A is thinking about going to Russia in the summer and is telling Speaker B her plan. In line A3, A asks B to join her in her travel. Perhaps in anticipation of B's rejection, A adds *toka itte* to show she is not really serious. She may actually be completely serious in her invitation to B, much like Hoshina is likely committed to his confession of love in (5), but she chooses to present the invitation in a non-serious manner. Despite this nullification of the invitation in A's utterance, B interprets her utterance as an invitation and answers accordingly (i.e., declines it).

### 3. SELF-MOCKERY IN JAPANESE.

What is the significance of studying self-mockery in Japanese? Self-mockery can take various forms. Similar to *nanchatte/toka itte*, *just kidding* is appended to an immediately preceding utterance. (7), which was said by someone who was helping a person who fell off a chair, illustrates this.<sup>x</sup>

(7) I'm more worried about the chair ... *just kidding*.

Another expression in English that may be used for self-mockery is the colloquial sentence-final *not*, which also gets attached to an utterance after it is made.<sup>xi</sup> An example from Haiman (1998: 53), who calls the expression "[t]he utterance deflater," is given below.

(8) Guess I'll hit the books in time for that quiz ... *not!*

Note that in both (7) and (8) *just kidding* and *not*, like *nanchatte* and *toka itte*, deny, invalidate, or express the speaker's nonserious attitude toward the content of the utterance to which they are attached. The difference between the English and Japanese expressions is that in English the functions are indicated explicitly. With *just kidding*, the speaker's nonserious attitude is explicitly represented in the lexical item *kid*. As for *not*, the function of denial and invalidation is spelled out.

In contrast, none of the lexical items contained in the equivalent Japanese expressions, *nanchatte*, which is the contracted form of *nante* ('something like') *itte* ('saying') *shimatte* ('ending up'), and *toka itte* ('something like' plus 'saying'), specifically express a nonserious attitude or invalidation. Why do these expressions function to express self-mockery, then? I would like to argue that two factors (the act of self-quotation and the lexical meaning of *nante* and *toka*) contribute to the function.

<sup>10</sup>This is an utterance overheard by the author.

<sup>11</sup>It seems that *not* may also be used to express sarcasm/irony as shown in the following example taken from Haiman (1998: 54).

Bush/Quayle in 1992 ... *not!* (bumper sticker)

The distinction seems to derive from the difference in the types of UTTERANCE which precedes ... *not*. When the UTTERANCE is considered to be "echoic" (Sperber and Wilson 1981; Wilson and Sperber 1992), the whole utterance is considered to be a case of sarcasm/irony rather than self-mockery.



## 3.1 SELF-QUOTATION.

As mentioned earlier, the basic structure of self-mockery in Japanese is (3), which is repeated here.

(3) UTTERANCE + *nanchatte/toka itte* 'saying something like'

The subject of saying is understood to be the speaker although it is not explicitly expressed. The translation of (3), which expresses who the subject of saying is and which is faithful to the word order of the original Japanese, is given in (9).

(9) UTTERANCE, something like that, I said/am saying.<sup>xii</sup>

Why is the speaker compelled to express "I said/am saying"? The fact that the speaker is saying what s/he is saying is clear from the act of saying itself. There clearly has to be significance in the speaker explicitly referring to this act of saying.

Maynard (1996) treats this as a case of self-quotation. Quotation is most typically used when the speaker repeats what somebody else said. In self-quotation, in contrast, an utterance is made, and the speaker specifically expresses that s/he said/is saying it.

Quotation is a place where the idea of the speaker as a divided self is most vividly expressed. As Volosinov (1973: 116) notes, quotation is "regarded by the speaker as an utterance belonging to *someone else*, an utterance that was originally totally independent, complete in its construction, and lying outside the given context." Haiman (1998: 26) observes that the metamessage in quotation is paraphrasable as "this is not really me: I'm just playing a role, mouthing someone else's words."

Maynard's work on self-quotation (1996) is significant because she points out that this idea of multivoicedness in quotation is applicable to self-quotation as well.<sup>xiii</sup> In saying 'I am saying [X],' Maynard (1996: 212) notes that 'although in physical terms only one person stands behind the statement [...], one can say that there exists a character who utters [X] and a speaker who frames and controls the character's voice.'

Why is self-quotation used in the expression of self-mockery in Japanese? In self-mockery the speaker is divided into two. One part of the speaker delivers the UTTERANCE and another part of the speaker invalidates and expresses his/her nonserious attitude toward the UTTERANCE. Multivoicedness associated with (self-) quotation is well-suited for this phenomenon. By saying "I am saying (something like) UTTERANCE" the speaker activates the image of a double voice. Put differently, the speaker presents the UTTERANCE "as if it represents someone else's voice" (Maynard 1996: 224). The speaker effectively dissociates him/herself from the UTTERANCE and evokes the idea of pretense/fakery ("I'm just playing a role"), which presents the speaker's denial of, and nonserious attitude toward, the UTTERANCE.

## 3.2 "SOMETHING LIKE".

In the last section it was argued that by explicitly expressing that the speaker said/is saying the UTTERANCE, s/he communicates that there is a double voice involved; one delivers the message in the UTTERANCE, but promptly dissociates him/herself from it. This idea of a double-voice is extremely important, but by itself is not enough to explain the expression of self-mockery because double-voiced discourse does not necessarily imply the speaker's negative view of the UTTERANCE. In self-mockery

<sup>12</sup>Since the verb is in the gerund form, it is tenseless. It is common in Japanese conversation to use the gerund form at the end of an utterance (Maynard 1989: 38)

<sup>13</sup>In fact, Maynard (1996: 211) argues that the notion of multivoicedness associated with quotation appears in its clearest form in self-quotation precisely because self-quotation is a seemingly unexpected place for the phenomenon of many voices to appear.

the speaker invalidates the effect of the UTTERANCE. This indicates that the speaker has a low opinion of the message expressed in the UTTERANCE. In cases in which the speaker uses self-mockery as a self-protective strategy, s/he may not actually have a negative attitude toward the message in the UTTERANCE, but presents the discourse as if s/he did. Whether it is serious or fake, the sense of negative evaluation is present.

In this section I would like to argue that the lexical meaning of the particles contained in the expressions in question (*nante* of *nanchatte* and *toka* of *toka itte*, which are translated as 'something like') provides this negative attitude and thus contributes to the function of self-mockery along with the image of a double voice associated with self-quotation.

The speaker's negative attitude can be detected in various uses of *toka* and *nante*. Some examples are given below.

- (10) *Konna jikan ni fuannai na michi o hashiru*  
this.kind hour in unfamiliar LK road on drive

*nante mondai-gai da!*  
something-like beyond-question is  
'Doing something like driving on an unfamiliar road at this  
hour is beyond question!' (*More*, April 1996: 221)

- (11) *Josei-tachi mo katsute wa "san koo" toka*  
women also before TP "three highs" something.like

*itte, jibun de jibun no kubi o shimete-ita kedo ...*  
saying self by self LK neck OB were-strangling but  
'Women also used to say (as criteria for a husband) something like  
"Three Highs" and were putting themselves into difficult positions,  
but ...' (*More*, April 1996: 121)

The topic of (10), *konna jikan ni fuannai na michi o hashiru* 'driving on an unfamiliar road at this hour' is marked with *nante*. From the content of the comment *mondai-gai da!* 'is beyond question!', we can tell that the speaker thinks the content of the topic is outrageous. The *toka*-marked 'Three Highs' in (11) refers to a phrase which describes three criteria for selecting a husband: high income, high education, and physical height. The phrase and the idea behind it were popular among young women in Japan at one time. The speaker of (11) is critical of such a trend which places importance on money, prestige, and appearance. It is clear, then, that the speaker feels contempt toward the phrase *san koo* 'Three Highs.' In this way *nante* and *toka* often mark phrases toward which the speaker has a negative attitude.

The reader may wonder if it is really these particles that are responsible for communicating the speaker's negative attitude. After all, these particles have the lexical meaning, 'something like,' which contributes to the propositional meaning of the sentences. However, the contexts of these sentences are such that the lexical meaning, 'something like,' is not required. (11) is uttered by a father whose daughter said she would drive her boyfriend home at a late hour. Thus, the very act that he condemns is her driving on an unfamiliar road at a late hour and nothing else. He does not have to use *nante* 'something like,' which indicates lack of specification. In (11) *san koo* 'Three Highs' is the exact phrase that women used to use. Therefore, the speaker does not have to use *toka* 'something like,' which signifies lack of specification. The speaker could have used a regular quotative particle *to*.

Why do the speakers of (10) and (11) use phrases with the lexical meaning 'something like,' then? Because the phrases are not needed propositionally, I would like to argue that they are present to convey the speaker's attitude, which in this case is negative. Why are these phrases associated with the connotation of the speaker's negative attitude? Because they represent lack of specification.

Both *X nante* and *X toka* 'something like X' indicate lack of specification. Lack of specification implies lack of the speaker's willingness to commit herself/himself to X. This implication of the speaker's non-committal attitude toward X may be interpreted as the speaker's negative evaluation of X.<sup>xiv</sup>

Because of this lack of specification, *nante* and *toka* may be used to express the speaker's negative attitude. The association of *nante* and *toka* with the speaker's negative evaluation contributes to the meaning of self-mockery in the phrases which contain *nante* and *toka*, *nanchatte* and *toka itte*, respectively. As discussed earlier, because these phrases include the verb of saying *itte* and thus allude to self-quotation, they suggest a double-voice discourse. In addition, because the particles within these phrases which mark the UTTERANCE connote the speaker's negative attitude, the addressee will know that one of the voices involved in the double-voiced discourse (i.e., the one that does not deliver the ostensible message expressed in the UTTERANCE) looks down upon the message.

#### 4. CONCLUDING REMARKS.

With the preceding discussion in mind, what is the speaker's motivation for using self-mockery? As discussed in Matsumoto (1998), news media and language specialists have noted in the past decade that the speech of young Japanese has undergone considerable change. Using naturally-occurring data from various sources, Matsumoto detects two directions of change. In one direction young speakers are using less honorific expressions, and in the case of female speakers, fewer forms which are considered to be feminine expressions. In another direction young speakers are using expressions such as *mitai na* 'like' in sentence-final position which weaken the force of speech acts.<sup>xv</sup> These two directions are seemingly contradictory since the former suggests the development of a more direct and assertive speech style while the latter suggests the opposite. Matsumoto argues that this apparent contradiction disappears when viewed against the background of diverse social and linguistic ideologies across generations. The abandonment of conventional honorifics and feminine forms may be seen as an avoidance of the implied normative indexing of social hierarchy. The use of less imposing expressions may be viewed as the construction by young Japanese of an alternative model of deference.

Self-mocking expressions discussed in this paper clearly belong to the group of expressions which are characterized as weakening the force of speech acts. Seen from this perspective, one of the motivations for using self-mockery is politeness if politeness is defined as "a means of minimizing the risk of confrontation in discourse" (Lakoff 1989: 102). Ikegami (1995: 11) concurs, saying:

the speaker avoids imposing on the hearer exactly what he means; instead, he offers a set of options within a range tolerable to him and leaves the final choice to the hearer. Such behavior is "polite" in that the speaker puts the hearer first.

This strategy of putting the addressee first seems to contradict another motivation for using self-mockery mentioned earlier, i.e. the speaker's self-protective strategy. As discussed in relation to examples (7) and (8), the speaker is able to say what s/he wants to say and at the same time invalidate it to protect him/herself from potential embarrassment, heartbreak, etc. Self-mockery is a means which allows the speaker to not take full responsibility for what s/he says.

These two goals (respecting the addressee and protecting the speaker) do not necessarily contradict each other. They are achieved concurrently in the expression of self-mockery. Returning to example (6), in which the speaker asks the addressee to go on a trip with her, we see that the speaker is able to say what she wants to say (i.e., the invitation for the trip) by uttering the UTTERANCE. By

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<sup>14</sup>The implication of the speaker's non-committal attitude is not always interpreted as his/her negative evaluation. In contexts which call for consideration of politeness, the implication may be considered as the speaker's strategy of avoiding imposition. In fact, the particles *nante* and *toka* may be used as hedging expressions in certain contexts. See Suzuki (1998) for a discussion of the relationship between the function to express the speaker's pejorative attitude and the hedging function.

<sup>15</sup>See Suzuki (1995) for a detailed analysis of the sentence-final *mitai na*.

appending *toka itte* and hence making the invitation less imposing, she honors the addressee's desire of not wanting to be put on the spot. At the same time, by using the self-mocking expression, she places distance between her and the speech act so that she can avoid the possible embarrassment which results from rejection.

The phenomenon of self-mockery is deserving of further studies. If, as Matsumoto (1998) states, the mode of speech which provides less imposition for the addressee (and less commitment and thus more protection for the speaker) is being chosen by young Japanese as an alternative way of communication, self-mockery should be examined in the context of language change. In this regard, cross-cultural comparisons may prove worthwhile. Haiman (1998: 94) says that in his culture "[j]ocularly is so much a given in popular discourse that we sometimes have to signal its absence with the special metamessage "I am sincere" [...]. So pervasive is the jocular style that we become aware of it only in its absence." This comment suggests that in the current Anglo-American culture invalidating signals such as just kidding are almost superfluous. The speaker's insincerity in uttering the UTTERANCE is taken for granted and thus does not require special marking. Will this be the advanced stage of the current style of speech among the Japanese youth? If so, has there been any indication? If not, are there any correlations between this type of linguistic behavior and cultural factors? These are some of the questions further studies might explore.

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