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FOREWORD

The editors of this volume, Leslie Blair, Christine Burns and Lorna Rowsell are pleased to present the twentieth issue of the *Calgary Working Papers in Linguistics* published by the department of Linguistics at the University of Calgary. The papers contained in this volume represent works in progress and as such should not be considered in any way final or definitive.

This issue of *CWPL* includes papers from both graduate and undergraduate students in the Department of Linguistics as well as a guest submission from the Faculty of Music at the University of Calgary. A second guest submission is included from the Department of Linguistics at the University of Munich. The articles in this journal discuss a broad range of topics from the fields of syntax, phonology and historical linguistics, in addition to new technologies in Phonetics and vocal instruction.

The first submission by Valerie Baggaley is the first of two Syntax papers, and examines Reinhart and Reuland's (1993) theory of reflexivity as it applies to Chinese data. Baggaley concludes that this analysis illustrates the limitations of Reinhart and Reuland's departure from standard Binding Theory. A second syntax paper, submitted by Olga Karpacheva, examines Superiority Effects in Russian. Karpacheva argues that in Russian multiple wh-questions, only one wh-word appears in Spec, CP and that all others are adjoined to IP.

In addition to the syntactic articles, this issue includes two papers written in the field of Phonology. Leah Bortolin's submission discusses Italian phonotactics within the framework of Optimality Theory, proposing an affinity constraint which establishes possible onsets and possible nuclei. However, Bortolin concludes that this model fails to ensure the fulfillment of minimal sonority distancing in Italian word-initial consonant clusters. The paper by Jacqueline Onslow discusses phonological acquisition. Onslow examines two perspectives on the acquisition of voicing in word-initial stops, arguing that voiceless stops are less marked and acquired earlier than their voiced counterparts, despite apparent counterevidence in English.

As a departure from the standard fields of linguistic study, this issue includes a paper by Donald Bell from the Faculty of Music at the University of Calgary. Bell's paper discusses the benefits of new technology in vocal pedagogy, citing the influence of tape recording, computer sound analysis programs and other electronic devices in vocal instruction. Further discussion of new technology is provided by Timothy Mills in the first of his two submissions to this issue. Mills provides an overview of the University of Calgary Phonetic Inventory (*UCPI*), a multimedia phonetics program being developed as an instructional tool to supplement introductory phonetics courses.

Mills' second paper in this volume is an overview of language classification arguments. Specifically, Mills examines arguments for the relatedness of Turkish and Japanese. He concludes that these two languages belong to groups which descended from a single linguistic entity, the proposed *proto-Altaic*.

We wish to express our sincere gratitude to Vi Lake for her assistance in this project. We would also like to thank the University of Calgary Department of Linguistics for providing the necessary funding to produce this volume. A final word of thanks is owed to each of our contributors for their submissions to *CWPL* volume 20.

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CALL FOR PAPERS

Calgary Working Papers in Linguistics is an annual journal which includes papers by faculty and students in Linguistics and related disciplines, both at the University of Calgary and elsewhere.

The editors would like to encourage all readers to submit papers for future publication. The deadline for submission of papers is August 30 in order to meet the publication date. The editors would like contributions on 3 1/2" Micro Floppy Disks (preferably formatted for Microsoft Word for Macintosh version 5 or higher). We further request that the submissions follow the Style Sheet provided at the end of the journal. All submissions should be camera-ready. Page numbers should not be included on the front of the papers, but should be lightly printed on the back of the pages in pencil. Authors should submit their papers to the address listed below. The editors reserve the right to return papers for revisions if they do not conform to the Style Sheet as outlined at the end of the journal. Appearance of papers in this volume does not preclude their publication in another form elsewhere.

Any correspondence should be sent to the address below:

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The editors can also be reached by e-mail at the following address: rowsell@acs.ucalgary.ca. Any queries regarding the formatting of papers can also be directed to that address.

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Reflexivity and Chinese Anaphors: A Review of Reinhart and Reuland's Reflexivity

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As a departure from Standard Binding Theory, Reinhart and Reuland (1993) argue that binding is about the reflexive properties and interpretation of predicates. This paper provides a summary of this theory of reflexivity and then applies it to Chinese data. Reinhart and Reuland's Condition A and B are applied to Chinese anaphors and, in several instances, fail to predict the correct results. The binding conditions are found to be too restrictive for they predict ungrammatical sentences, when in fact, the sentences are grammatical; hence reflexivity fails to capture the full range of reflexivity in Chinese.

1.0 INTRODUCTION

In this paper I will provide an examination of Reinhart and Reuland's (1993) (RR henceforth) theory of reflexivity and then apply this theory to Chinese data. I will demonstrate, that while reflexivity has a significant degree of empirical adequacy for Dutch, English and Norwegian, it has more limitations when applied to Chinese.

1.1 Definition of the Problem

Standard Binding, as set out in by Chomsky (1981, 1986), has a number of difficulties when applied cross-linguistically. In Reflexivity, RR react against these empirical inadequacies by proposing a very different approach to binding and reflexivity. They argue that, rather than being a property of anaphors, reflexivity is a property of predicates.

2.0 TWO TYPES OF ANAPHORS

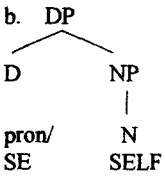
RR differentiate two types of anaphors: simplex expressions (SE anaphors) and complex expressions (SELF anaphors). The two anaphor types differ in their distribution, morphology, and syntactic structure. SELF anaphors are always local (English himself, Dutch zichzelf) while SE anaphors are optionally long-distance, as in Italian sè and Dutch zich. Both types are referentially defective DPs[1] and do not refer to some entity in the world, so binding is seen as the " procedures assigning the content necessary for their referential interpretation" (Reinhart and

[1]Reinhart and Reuland refer to anaphors as NPs but I will assume the more current DP hypothesis, which complies with X bar theory, throughout my paper.

Reuland 1993: 658). SE anaphors lack number and gender features although, depending on the language, they may have person features. RR take this lack of phi[2] features to be responsible for their anaphoric nature. SELF anaphors, on the other hand, can be inflected for all the phi features.

Syntactically, SE anaphors (1)a pattern together with pronouns, as determiners, while SELF anaphors (1)b function as nouns, combining with pronouns or SE anaphors located in the determiner position. In today's terminology these structures would be represented as[3]:

(1) a.


(1) b.


The two types of anaphors differ substantially, according to RR, in their grammatical functions. Only SELF anaphors reflexive-mark their predicates; they impose coreference on the two arguments of a predicate. Thus SELF anaphors have a reflexivizing property.

SE anaphors, together with pronouns, lack this reflexivizer function altogether. RR note that SE anaphors and pronouns pattern together with respect to Standard Binding Condition B cross-linguistically. In example (2) either the SE anaphor or the pronoun is grammatical. RR attribute this to their similar syntactic structure (1)a.

(2) Jan zag jou achter zich/hem staan
Jan saw you behind SE/him stand
Jan saw you stand behind SE/him. (Dutch) (Reinhart and Reuland 1993:661)

3.0 CONDITIONS A AND B REFORMULATED

With the theory based on reflexivity, RR define reflexive predicates and then present their

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[2]Phi features are person, number and gender features.

[3]Reinhart and Reuland assume that nouns, rather than determiners, head the noun phrase. Their analysis of the internal structure of SELF anaphors is:
(1) $[_{NP}$ Pron/SE $[_{N'}$ self]]
and their analysis of SE anaphors is:
(2) $[_{NP}$ SE $[_{N'}$...e...]]
However, throughout this paper we will assume the more current DP hypothesis, where the determiner is the head of the noun phrase, and this head projects to its maximal projection, DP.

reformulated binding conditions (Reinhart and Reuland 1993:670-671):

Definitions:

(3) A predicate is *reflexive* iff two of its arguments are coindexed.

(4) A predicate is *reflexive-marked* iff it is either lexically reflexive or one of its arguments is a SELF anaphor.

(5) Condition A: A reflexive-marked predicate is reflexive.

(6) Condition B: A reflexive predicate is reflexive-marked.

According to these conditions if two arguments of a predicate are coindexed, then the predicate must be lexically reflexive, or one of its arguments must be a SELF anaphor, for only SELF anaphors reflexive-mark their predicate. If the predicate is lexically reflexive, then it may have two coindexed arguments, neither of which has to be a SELF anaphor. This follows from the fact, that lexically reflexive predicates are already reflexive-marked and thus do not require a SELF anaphor. Turning to some data, we see how these conditions work.

(7) a. John shaves.
b. John shaved himself.

(8) John$_i$ hates himself$_i$.

Sentences (7) and (8) are both examples of reflexive predicates. Shave is lexically reflexive hence it is by definition reflexive-marked; in English, it may optionally take a coindexed argument as in (7)b. In example (8), the predicate hate is not lexically reflexive. We see that it is reflexive-marked by the SELF anaphor, which is coindexed with the argument John. Hence both (7) and (8) comply with the reformulated Condition A and B. These conditions also make correct predictions in languages other than English. The following examples are from Dutch.

(9) *Max$_i$ haat zich$_i$.
Max hates SE.

(10) Max$_i$ legt het boek achter zich$_i$.
Max puts the book behind SE.

In example (9) we see that Condition B correctly rules out the SE anaphor, while in (10) the SE anaphor is permitted. As mentioned earlier, SE anaphors are not reflexivizers hence they are unable to reflexive-mark their predicates. Condition B states that reflexive predicates must be reflexive-marked. In example (9), there are two coindexed arguments, so by definition the predicate is reflexive. Since neither of the arguments is a SELF anaphor, nor is haat lexically reflexive, the reflexive predicate is unlicensed and Condition B is violated, hence the sentence is ungrammatical. In example (10), RR argue that no reflexive predicate is formed for zich is not an argument of the predicate put; rather it is embedded in the prepositional argument (Reinhart and Reuland 1993:665). In this example, Condition B correctly predicts that the sentence is grammatical since there is no violation of the binding condition.

Further refinement of Conditions A and B are made by RR as a result of data such as (11).

(11) Lucie believes herself to be beyond suspicion.

As stated so far, herself and Lucie are not coarguments of the same predicate. Herself is an argument of the predicate in the lower clause, and thus reflexive-marks it; Lucie is an argument of the matrix clause predicate. As stated thus far, this sentence would be in violation with Condition A: herself is a SELF anaphor which reflexive-marks the lower clause predicate, yet the predicate is not reflexive. In order to escape problems such as this one, RR introduce a refinement to their binding conditions. Condition A, they claim, applies only to syntactic predicates and Condition B applies only to semantic predicates. They define syntactic and semantic predicates as:

(12) Syntactic Predicate: is a head, all its syntactic arguments and an external argument (subject); syntactic arguments are the projections assigned a theta role or Case by the predicate.
(13) Semantic Predicate: is the predicate and all its arguments at the relevant semantic level.

The refined and final version of the binding conditions are:

(14) Condition A: A reflexive-marked syntactic predicate is reflexive.
(15) Condition B: A reflexive semantic predicate is reflexive-marked.

Since verbs always have a subject, they form both semantic and syntactic predicates, falling under both Condition A and B, while subjectless nouns and prepositions form only semantic predicates and fall under Condition B alone.

In summary, RR's claim is that binding is about the interpretation of predicates. SELF anaphors can reflexive-mark their predicate while SE anaphors can not. In this next section, I will apply reflexivity to Chinese data.

4.0 CHINESE ANAPHORS

Chinese has two anaphors: ziji 'self' and pronoun+ziji. The second form, pronoun+ziji is morphologically complex and inflects for person (ta-ziji 'himself, herself', niziji 'yourself') thus by RR's definition is a SELF pronoun. The other anaphor, ziji, qualifies for RR's SE pronoun, for it is morphologically simple and lacks phi features. Like other SE anaphors cross-linguistically, ziji is able to have a long distance antecedent (Pan 1997:182).

(16) John$_i$ minglin Bill$_j$ gei ziji guahuzi$_{i/j}$.
John order Bill to self shave
John$_i$ ordered Bill$_j$ to shave self$_{i/j}$.

In (16) we see that the SE anaphor, ziji can have a long-distance antecedent for it can be coindexed with the subject of either the matrix or the lower clause. Condition A states that a reflexive-marked predicate is reflexive. Since shave is lexically reflexive, it is indeed reflexive-marked. Thus Condition A is satisfied and the sentence is grammatical with either interpretation.

Many examples suggest that the SELF anaphor is local (Huang and Tang 1991:263).

(17). Zhangsan$_i$ renwei [Lisi$_j$ hai-le ta-ziji$_{*i/j}$]
Zhangsan think Lisi hurt-ASP self
Zhangsan$_i$ thought that Lisi$_j$ hurt himself$_{*i/j}$

In example (17), Conditions B and A correctly predict that the sentence is grammatical. The predicate hurt is reflexive as two of its arguments are coindexed. The SELF anaphor, ta-ziji, reflexive-marks the predicate so both conditions are met and the sentence is grammatical. The other interpretation is correctly predicted to be ungrammatical. Zhangsan is not an argument of the predicate hurt so it can not be coindexed with ta-ziji. Condition A correctly rules out this interpretation.

Now we look at two more complex examples to see how reflexivity accounts for them.

(18)a. John$_i$ shuo Bill$_j$ gei ta-ziji$_{*i/j}$ pai de zhaopian mingtian hui paimai.
John say Bill for he-self take DE picture tomorrow will auction.
John$_i$ said that pictures that Bill$_j$ took of himself$_{*i/j}$ will be on sale tomorrow.

b. John$_i$ shuo Bill$_j$ gei ziji$_{i/j}$ pai de zhaopian mingtian hui paimai.
John say Bill for self take DE picture tomorrow will auction.
John$_i$ said that pictures that Bill$_j$ took of himself$_i$ / him$_j$ will be on sale tomorrow.
(Pan 1997:119, 134)

RR claim that take a picture is an idiom which "produces a Condition B effect inside the NP). An example taken from the article may clarify this (Reinhart and Reuland 1993:685):

(19) *Lucie$_i$ took a picture of her$_i$.

RR explain this ungrammatical sentence by claiming that Lucie and her are coarguments of the verb take a picture, hence the predicate must be reflexive-marked. Since there is no SELF anaphor nor is the predicate lexically reflexive, the sentence is ungrammatical.

Applying this to sentence (18)a, we can claim that the verb take a picture requires a SELF argument in order to be reflexive-marked, thus licensed as a reflexive. On the interpretation where Bill is coindexed with the SELF anaphor, the predicate is reflexive-marked and reflexive, thus Condition B and A are satisfied, and the sentence is grammatical. When John is coindexed with the SELF anaphor, the predicate is reflexive-marked, but not reflexive since John is not an

argument of the predicate take a picture. As predicted by Condition B, this sentence is ungrammatical.

Looking at (18)b, we are only able to get the right results if we look at the sentence in a different light. Instead of claiming that take a picture is the predicate, we can claim that the predicate is take alone. Next we must recognize that [pictures op$_i$ that Bill took t$_i$ of self] is the subject NP of the lower clause. This NP is embedded in the sentential argument of the predicate say. With this in mind, Condition A predicts both interpretations to be correct and they are. When ziji is coindexed with Bill, it is a logophoric usage of the SE anaphor, for we could argue that Bill and ziji are not coarguments and there is no reflexive predicate, thus Condition A is adhered to. When the SE anaphor is coindexed with John, again, they are not coarguments and neither condition rules them out.

Although the above analysis works, it is inconsistent with the analysis provided for (18)a. In order to yield the correct results in (18)a, we analyse take a picture as an idiom, and in (18)b, we analyse it as a simple verb, rather than an idiom. This is inconsistent treatment of the same structure, thus providing the first indication that RR's reflexivity may not work well for Chinese.

Looking at further data yields further problems with the application of Conditions A and B to the Chinese data.

(20)a. John$_i$ yiwei Bill$_j$ xihuan ta-ziji$_{*i/j}$
John think Bill like himself.
John$_i$ thinks that Bill$_j$ likes himself$_{*i/j}$.

b. John$_i$ yiwei Bill$_j$ xihuan ziji$_{i/j}$.
John think Bill like himself.
John$_i$ thinks that Bill$_j$ likes himself$_{i/j}$.

(21)a. John$_i$ xihuan ta-ziji$_i$.
John like self
John$_i$ likes himself$_i$.

b. John$_i$ xihuan ziji$_i$.
John like self
John$_i$ likes self$_i$ (Pan 1997:118, 134)

In these examples we see that ziji is able to have a long-distance antecedent while ta-ziji is not. Using RR's binding conditions, we see that Condition A and B correctly predict the grammatical sentence (20)a. The predicate like is reflexive-marked by the SELF argument, and it is indeed reflexive and grammatical, when ta-ziji and Bill are coindexed.

When ziji, a SE anaphor is coindexed with the matrix subject John in (20)b Conditions A and B

correctly predict the sentence to be grammatical. The arguments of think are John and the IP[Bill xihuan ziji], so ziji is not a coargument with John in (20)b. Since they are not coarguments, there is no reflexive and reflexive-marking is not required, hence the conditions are complied with. However, in Chinese it is also possible to coindex ziji and Bill in (20)b. This then, creates a violation of Condition A and this interpretation is wrongly predicted to be ungrammatical. When the two arguments, ziji and Bill, are coindexed, the predicate like is not reflexive-marked, hence the reflexive predicate is unlicensed. Yet the sentence is grammatical.

Like (20)a, (21)a obeys both binding conditions. It is a reflexive predicate which is reflexive-marked by the SELF anaphor, ta-ziji. Hence Conditions A and B correctly predict sentence (21)a to be grammatical.

Like (20)b, in (21)b Condition A makes the wrong predictions, predicting that the sentence should be ungrammatical. Like is not intrinsically reflexive, nor does it have a SELF argument; hence it is not reflexive-marked. It does, however, have two coindexed arguments. According to this theory, it is an unlicensed reflexive predicate. The sentence, though, is grammatical.

As we see, these examples pose problems to RR's theory of binding, for these sentences are indeed grammatical even though binding conditions have been violated. From this small sample of Chinese data, we see that the binding conditions make incorrect predictions about the data. In the areas explored in this paper, the binding conditions are too restrictive for they predict ungrammatical sentences when, in fact the sentences are perfectly grammatical.

5.0 CONCLUSION

As we have seen, RR's theory of reflexivity takes the view that binding is about the interpretation of predicates, rather than the standard view that it is about the distribution of NPs. Although their theory is superior to Standard Binding Theory in capturing the nature of the otherwise unexplained anaphors in English, Dutch and Norwegian, it fails to capture the full range of reflexivity in Chinese. From this small sample of Chinese data, we see that the reformulated Conditions A and B do not completely cover all cases; they are too restrictive, for the binding conditions incorrectly predict ungrammatical sentences when, in fact, the sentences are grammatical. Further research into the Chinese data may provide some insight into how RR's binding conditions may be expanded in order to better capture all of the data.

REFERENCES

Huang, C.T. James and Tang, C.C.Jane. 1991. The local nature of the long-distance reflexive in Chinese. In Long-distance anaphora, ed. Koster, Jan and Eric Reuland. 263-282. Cambridge: Cambridge University Press.

Huang, Yan. 1994. The syntax and pragmatics of anaphora. Cambridge: Cambridge University Press.

Lidz, Jeffery. 1995. Morphological reflexive marking: evidence from Kannada. Linguistic Inquiry 26:705-710.

Pan, Haihua. 1997. Constraints on reflexivization in Mandarin Chinese. New York: Garland Publishing.

Reinhart, Tanya and Eric Reuland. 1993. Reflexivity. Linguistic Inquiry 24:657-721.

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Using Digital Technology in a Voice Lesson

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Deep rooted teaching traditions and practices are slow to alter to newer more advanced ways that use technology. For decades, the tradition of voice teaching was the teacher at the piano and the student standing facing the teacher awaiting instruction; only the eye and the ear, along with the teacher's good musical taste (tradition), guided students through their vocal development. Technology such as tape recorders, video cameras, computer sound analysis programs, and other such electronic devices were unknown. Today, they are gaining in importance in vocal pedagogy.

The large modern orchestras and performing areas place ever greater demands on vocal production. Vocal loudness alone cannot be sustained nor is it sufficient to rise above a harmonically rich background accompaniment in today's performing arenas. These demands require an increasing need for digital technology in order to redefine and refine the acoustical properties of the human voice. Only through an understanding of vocal energy and all of its components and how they relate to physiology and acoustical laws can voice be given the necessary power (projection) to meet the acoustical demands of our future concert halls and opera houses.

To combine visual and audial observation brings a new consciousness to the act of singing. It also establishes documentation for later usage which might significantly shorten the normal development time of student's studies, an important financial consideration in today's world. For example, questions pertaining to posture and how to apply breath to tone become clearer through technology's ability to quantify vocal output. Postural alignment during phonation is made significantly clear through the use of video cameras.

The data acquired during voice teaching can be of immense value to the pedagogue as well. A quiet time to review one's teaching practices throw into relief areas of weakness and suggests where more detailed information could be given to the student. Out of this can evolve new approaches to the disciplines of breath, onset, and resonance.

Using new technology requires the pedagogue to research the areas of physiology and acoustics that pertain to phonation. Many articles and books on the subject grace our libraries today. They form a data base which covers the multitude of dysfunctions found in students seeking vocal instruction. A few of the prominent voice researchers are: Minoru Hirano, Seishi Hibi, Richard Miller, Thomas Hixon, Diane Bless, and Johan Sundberg. Their work deals with the basic functions of voice production and the voice's acoustical properties and production.

It is beneficial to read vocal research which can result in a deeper understanding of vocal pedagogy. Questions as to how the physical and the acoustical relate, how resonance and breath are related, and how alterations unnatural to speech affect the vocal tract and its output remain unanswered when little or no reference is made to scientific studies.

The technology of vocal amplification through sound systems becomes clearer to the user when an analysis defines the results and shows that microphones do not correct

vocal faults - they merely amplify them. Some sound systems synthetically add in harmonics. In such cases, the singer is noted as a better recording studio singer than performing artist. Experience tells us that it is better to bring all the tools a voice requires - a full range of harmonics and a pleasing vibrato - with us, rather than rely on recording technology to supply the missing elements. The following sections demonstrate some applications of digital technology to vocal analysis and pedagogy.

The Instrumentation

The instrumentation used to record the voices was a Sony ECM 155 Electret Condenser Microphone IMP High held up to 24 inches away from the singer; the software program was "Dr. Speech" made by Tiger Electronics Inc.; the computer was a Toshiba Satellite Pro 400 CS laptop. All of this instrumentation is portable and within the financial boundaries of most singing teachers.

The Singers

There were five singers involved in this paper. The youngest was 20 and the eldest 62. All had some experience performing either as a choral singer or soloist. All sang the vowels (i), a front vowel; (uh), a neutral vowel; and (aw), a back vowel

The Motor or the Breath

It is common for the pedagogue to ask for more breath support, or "support the voice.". The term "support" metaphorically refers to a multitude of physical actions whose exact interpretation depends on the singing school the teacher represents. What is demanded is a greater vocal intensity which in turn improves the formant energy and narrows the vibrato's amplitude.

In figure #1 below, the lower left hand windows show vibrato and breath intensity of a soprano singing on the pitches C5 and F5 respectively. On the right are two windows which show the formant structure (the undulating lines), while the peaked red lines show the various harmonics involved in the sample taken from the left hand window's gridlines. Height of harmonics is given at the bottom stating frequency up to 5.0 kHz; intensity is indicated on the left showing values from -20 to +100 dB.

The top left hand picture shows that the pitch does not always begin in the same location while the rising endings of the utterance indicate glottal tension. The lower illustration shows that the singer cannot break off and re-begin the utterance on the higher pitch, indicating a breath renewal problem. These observations open up the lesson to areas where problems may exist - mainly breath and posture in this instance, with additional tongue retraction, indicated through the low formants.

The right hand pictures show that the energy of the formants is high on the lower pitch (C5 upper right hand picture), and is low on the higher pitch (F5). To say the voice would not carry, is not true, but the timbre, of the sound is seriously altered, making vowel identification difficult. The high dB assures loudness and audibility. Figure #1 below depicts Soprano #1 singing (i), (uh), and (aw) on C5 and F5.

Fig.#1
C5
F5

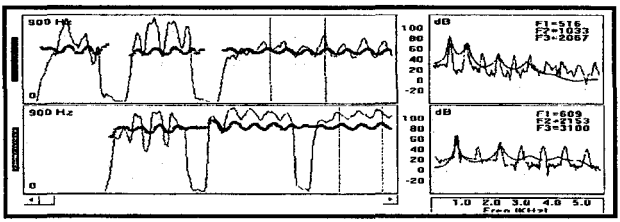
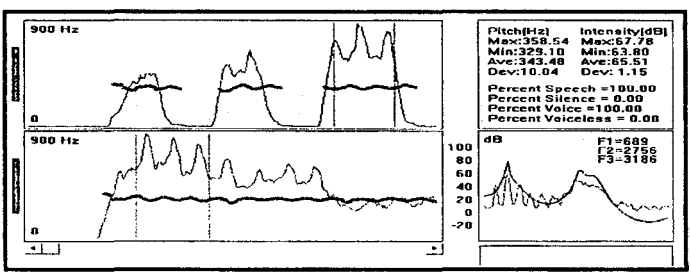


Figure #2, a tenor, repeats the pitches but exemplifies different vocal problems. His formants appear to be stronger, and his vibrato is less wide, but there is tension at the beginning of the utterance, as shown in the lower left hand frame through a skip in the line. Within the gridlines, his formants are strong and reflect a balanced sound. However, the tension in the breath and neck would remove some of the vocal beauty.

Noteworthy is the richer harmonic structure compared with the soprano voice in Figure #1. This is characteristic of the male voice. As one speaks or sings lower, the harmonics increase.

Fig. #2
C 4

F4



The automatic analysis portion of the chart provided in the upper right hand corner shows no breathiness within the selected part of the utterance (100 per cent voice with no voicelessness); it also shows that the singer's vibrato (represented as Deviation of 10.04 Hz) is within acceptable norms, which range from 8 to 15 Hz, depending on pitch level.

Given the results of the digital analysis, a check of the singer's breath application would be in order. Obviously, the above mentioned skip comes from laryngeal malfunction. The presence of the pitch skip proves how delicate the balance is between breath and vocal function.

The singing world is filled with different schools of breathing. Thomas Hixon (1973:85[1] says that "It is possible to move air in and out of the lungs using a number of relative displacements of the thoracic cage and diaphragm." If this is the case, then the

[1] Hixon, T., 1973, Respiratory Function in Speech, in Normal Aspects of Speech, Hearing and Language. Engelwood Cliffs, N. J.: Prentice Hall Inc.

choice ought to centre on a displacement of air resulting in a steady flow of air to the larynx, resulting in turn in an agreeable vibrato and a rich harmonic structure. Overall, the breath would not create tension posturally nor in the throat or the vocal tract. This is important as any perturbations which might originate are corrected through the breath.[2]

Hixon's approach does not emphasize the singer's posture. A postural approach, such as that of the famous American pedagogue Richard Miller, claims that "...The axial body (head, neck, and torso) must be well aligned, there should be no elevation or lowering of the chin, a relatively high sternal position is essential to such alignment." R. Miller (1993:20)[3]

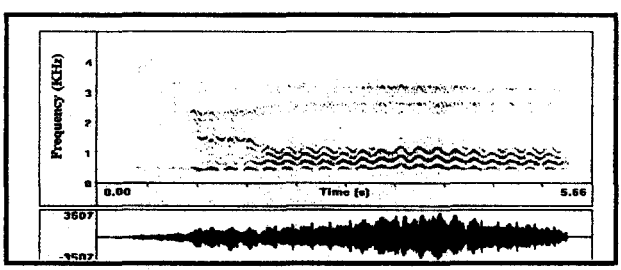
If one accepts Miller's suggested postural alignment, then the relative number of choices of displacement mentioned by Hixon would be greatly reduced. As already mentioned, tonal quality and vibrato are seriously affected by how the breath is applied and under what postural alignment.

The Resonator or the Vocal Tract

The human quality of the human voice results from postural alignment, breath, laryngeal function and vocal tract configurations. Vocal energy results from a combination of actions between the lips, tongue, jaw, soft palate. The removal of tension creates a coordinated flow of action-coarticulation-releasing a greater energized sound: coarticulation which means "The overlapping of articulatory adjustments for a sound of speech with the preparatory adjustments for a subsequent sound."[4]. This action gives flow to speaking and singing.

The tongue can give tremendous clarity to speech when retraction is avoided and the main body remains relaxed in the proper vowel position throughout, i.e. filling the mouth along the sides as well as in the front. Also, when lip rounding is required for the back vowels, if it occurs without stiffening and pulling down of the cheeks, then a resonance is maintained.

Fig. #3



[2] Dejonkere, P. H., Minoru, Hirano, Sundberg, Johan, 1995, Vibrato. San Diego, London. Singular Publishing Group, Inc.

[3] Miller, Richard, 1993, Training Tenor Voices. New York, Oxford, Singapore and Sydney: Schirmer Books, Maxwell Mac Millan International.

[4] Perkins, William H., Kent, Raymond D., Functional Anatomy of speech, Language, and Hearing. Austin, Texas; Proed.

Figure #3. Baritone singing (i), (uh), and (aw) on A3. Note the formants as they change for the vowels. This is brought about through the necessary tongue postures and the lip rounding for the schwa (uh) and the back vowel (aw). Both utterances are the same pattern and pitch, but have differing F1 and F2 formant locations.

Formants

A formant is a vocal tract resonance shown as intensity peaks in the frequency curve. They are calculated using three dimensional geometry of the entire vocal tract. The most important formants for the singer are F1, F2, and F3. (I exclude here FO which is the basic pitch.) F1, the first formant, is the first area of resonance found above the fundamental, FO; F2, the second formant, is the second resonance above FO. Although there are other measurable formants above these, F1, and F2 are essential for vowel identification. A third area of resonance not usually found in daily speech but essential to the carrying power of the singing voice is F3, or the "Singer's Formant." This energy peak carries the voice through and over orchestral accompaniments. It is sometimes called the "ring," or the "ping" in a voice. (It is also found in actors' voices.) This energy peak lies in varying areas depending upon voice category: 2700 - 3400 Hz for baritones and tenors, and 3400 - 3900 for mezzos and sopranos. These numbers are arbitrary according to vocal production and size of the instrument, e. g. mezzo versus a light soprano, or a spinto tenor and a bass.

Formant location within the vocal tract is dependent upon three major factors: "the place of the major constriction within the vocal tract, the degree of constriction at that point, and the area and length of lip constriction" (Minifie 1973:248)[5] Other factors such as age and sex play an equally important role in determining vocal formants. It is essential for reasons of projection and vocal beauty that a voice contain all formants at all times. Lack of these energies is quite often the difference between an amateur and professional voice user. No untrained voice contains all of these energies in all of the vowels or their combinations. It is the role of the pedagogue to re-shape the various parts of the singer's instrument, thereby enabling formant creation. Shaping includes such regimens as posture, watching for and correcting unnecessary physical movements, tensions, etc. All of the technical instrumentation mentioned to date is of enormous potential in this working through of vocal production.

Vowels

These are the energy bearers of the vocal sound. Phonetic science has classified them according to tongue position: front, back, high, and low. However, long before this occurred, the Italians simply observed them as chiaro or oscuro elements - light or dark. They were wise enough to realise every vowel contained elements of both.

[5] Minifie, Fred D., 1973, Phonation. In Normal Aspects of Speech, Hearing, and Language. Englewood Cliffs, New Jersey. Prentice Hall, Inc.

The formants F1 and F2 appear at different Hz values (see Figure 3) due to the altering constrictions within the vocal tract and the varying lip positions - width and distance apart. Kent in an important study has this to say:

> Front vowels are associated with fairly wide F2 -F1 separation, back vowels with fairly narrow F2-F1 separation. Therefore, F2 -F2 (sic) correlates with advancement or retraction of the tongue. High vowels are associated with a low F1, low vowels with a high F1. Therefore F1 frequency correlates with tongue height (or jaw opening). The effect of lip rounding is to lower all formant frequencies. In English, only the back vowels and the r-colored vowels are rounded. Kent, R.D. 1993[6]

Following these basics is essential to healthy vocal production in singing.

Registers

Registers "make a profound difference in quality, pitch range, and loudness." (Perkins & Kent, 1986, p. 101[7] It is important for voice teachers to recognize where certain physical alterations take place in the vocal range (e.g. the passaggio) in order to equalize the vowel sounds. It is the evening out of this area which is vital for upper voice singing. Not to equate the harmonic structure of the sounds through adjusting mouth opening would result in uneven timbres.

Finding the registers is most simply explained by a clinician. "If you start singing as low a pitch as you can and gradually ascend to the highest possible pitch , there will be two points within the range at which the transition to the next highest pitch cannot be made smoothly. These are transitions between voice registers."[8]

Changing Registers

The register change becomes obvious to the listener because of the dramatic change in sound (timbre) which is quite often accompanied by a sudden lifting of the head in amateurs. It is these sudden changes which a pedagogue must smooth over if the voice is to be even. In figure #4 below, the soprano offers a relatively smooth transition downwards from F5 to bB4. However, the vibrato is too wide and the formants show irregular changes in the in the resonance balancing; nonetheless, the pitch, despite these shortcomings, was carried out without striking timbre changes. This occurred because the

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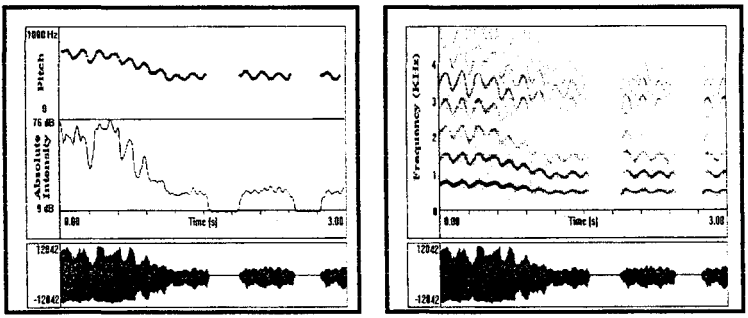
[6] Kent, R. D., 1993. 97-117. Vocal Tract Acoustics, J. of Voice, Vol. 7, No. 2

[7] Perkins, William H., Kent, Raymond D., Functional Anatomy of Speech, Language, and Hearing. Austin, Texas; Pro-ed.

[8] Broade, David J., 1973, Phonation, p. 153. In Normal Aspects of Speech, Hearing and language. Engelwood Cliffs, New Jersey: Prentice Hall, Inc.

Figure #4. Soprano #2 singing (aw) from F5 to bB4-5 note series.



mouth aperture as she sang downward was correctly adjusted.

This altering of the mouth opening in the passaggio range of the voice agrees with a famous pedagogue's statement: "Gradual opening of the mouth alters relationships among harmonic partials of the spectrum but the same posture of the tongue, lips, and zygomatic (area of the cheekbone) muscles are retained while defining the vowel." (Miller: 39&49[9]) The reverse is applicable when descending.

Vibrato

This is probably the most contentious area of vocal production. For that reason alone it is better dealt with scientifically. One of the main reasons for cultivating an even and non-wobbly vibrato is described in a statement by Sundberg. " ...vibrato tones are produced with a lesser degree of glottal adduction than nonvibrato tones."[10] This lesser degree of glottal adduction in desirable. Greater glottal adduction requires greater laryngeal tension, resulting in "pressed" phonation. Sundberg goes on to state that "It is certainly a basic condition for creating an esthetically and artistically satisfactory result that difficult tasks are solved without apparent difficulty."[11]

In the past, great care was taken to ensure a pleasing vibrato to ensure beauty and vocal energy which would allow the singer to perform strenuous tasks without unduly taxing their reserves. Today, the microphone supplies the energy. Masters such as Giovanni Battista Lamperti's comments recorded in William Brown's diary of his teachings, Vocal Wisdom, make us aware of how the old Italian masters considered vibrato and its qualities.

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[9] Miller, Richard, 1993, Training Tenor Voices. New York: Schirmer Books, Inc.
[10] Sundberg, Johan 1993. Acoustic and Psychoacoustic Aspects of Vocal Vibrato. In San Diego, London, Singular Publishing Group, Inc.
[11] Ibid.

It is not difficult to sing from one tone to another, if there is a common quality of vibration in the two tones, tho' the resonance changes. Resonance always changes. Vibration never. (Lamperti, 1891-93: p.98)[12]

The energy in regular vibrato is constructive. The violence in irregular (vibrato) energy is destructive. (Lamperti, 1891: p. 49)[13]

In figure #5 below, Singer #5, a young baritone, sings (aw) and (yaw) on A3 without vibrato. Note the high breath pressure (subglottal) as indicated on the Absolute Intensity graph below the unwavering vibrato line. It is interesting to see that the small indications of vibrato showing the stiffness in the laryngeal area are partially overcome by the instrument's natural inclination to vibrato.

Fig. #5

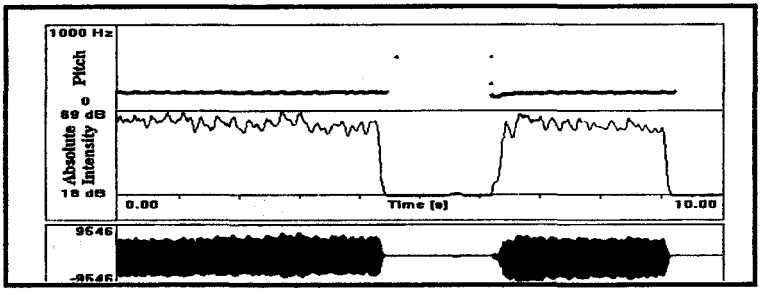
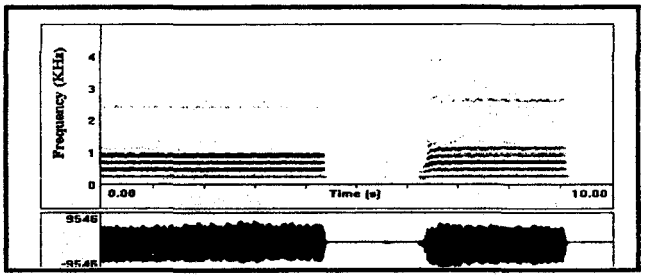


Figure #6 displays the harmonic structure of the same vocal utterance as Figure #5.

Fig. #6



Note that in the second sound the formants are stronger due to the presence of the consonant (y) making the utterance into (yaw). The glide tends to make the vocal tract more relaxed and positively influence the vowel.

[12]Brown, William, Vocal Wisdom, p.98. Axioms from Giovanni Battista Lamperti's Teachings. New York: A Crescendo Book, 1933.
[13]Ibid

In the figures below, singer # 6 sings (i),(uh), and (aw) and goes from A3 to C#4 and back at the end of the utterance. Note the regularity of the vibrato, the maintained energy and the lower Absolute Intensity (reflecting lower subglottal breath pressure) than in the vibratoless singing of the previous figures.

Figure #7

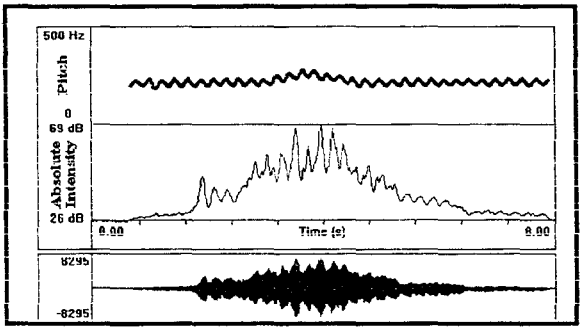
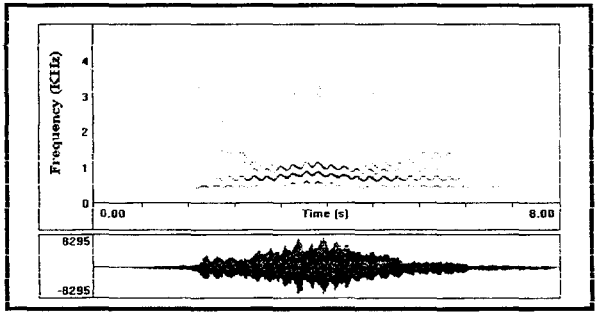


Figure #8, a harmonic analysis of the same vowels as sung above.



Note the changing formant formations, the regularity of the vibrato and the height of the strongest formant F3 at around 3,000 Hz. Also noteworthy is the manner in which the pitches are changed, which directly relates to Sundberg's statement pertaining to difficult tasks being solved without apparent difficulty. Here Sundberg's statement pertaining to regular vibrato is applicable.

Summary

The goal of this paper has been to show that technology confirms and sometimes points out details which go unobserved during the evaluation of a vocal utterance. These elements are important as they often point the way to an improved pedagogical approach,

or to the acquisition of a valuable vocal energy or more a aware physical stance. In any case, technology with its objective quantification can improve one's approach to vocal energy which in turn, increases the impact of interpretation. Both vocal energy and interpretation are inextricably linked. Without vocal energy, the meaning of the moment is lost.

Although using digital technology makes arduous learning demands on the pedagogue, it is time well spent. New pedagogical approaches and a greater insight into the student's vocal dilemmas come through the new knowledge. Connections between the physical and the acoustical are less remote. For this reason, technologic instrumentation is a boon to anyone who can coordinate its usage into their concept of a 21 Century voice studio.

Italian Word-Initial Consonant Clusters in Optimality Theory

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Despite the attention given to optimality theory (OT), only a small portion of prosodic theory has been addressed under this framework. It is my intention to discuss the implications of OT when it is applied to word-initial consonant clusters in Italian. Davis (1990) describes the restrictions placed on Italian word-initial consonant clusters by outlining syllable formation constraints and a language specific minimal sonority distance which is measured between two adjacent consonants. I n this paper, I demonstrate that OT theory cannot apply a sonority hierarchy (or margin hierarchy).within the onset consitituent. That is, the theory cannot compare two adjacent elements within one constituent. By adding an affinity constraint, possible onsets and possible nuclei can be established under OT. Furthermore, lists of possible C_1s and C_2s can be provided; however, the model cannot ensure that minimal sonority distancing will be fulfilled.

1.0 INTRODUCTION

In recent years Optimality Theory (OT) has become a dominant paradigm within the study of phonology. Despite the attention given to OT, there are many areas of phonology to which it has yet to be applied. A small portion of prosodic theory has been addressed within the optimality paradigm, such as accounting for basic CV syllable structure. However, it seems that more marked syllable structures have not yet been translated into OT. It is my intention to discuss how OT accounts for consonant clusters in word-initial position. In the interest of brevity I will focus on the word-initial consonant clusters in Italian. Davis (1990) explains that initial consonant clusters in Italian can be well described through the use of Steriade's syllable formation rules and a language-specific minimal sonority distance between two adjacent consonants. This proposition is easy to comprehend and emphasizes the explanatory importance of sonority hierarchies in phonology. Translating this solution into optimality theory has proven to be difficult. Optimality theory addresses phonological issues from a different perspective than other current theories such as lexical phonology or autosegmental phonology. Under OT, Universal Grammar consists largely of a set of constraints regarding the well-formedness of language. It will be demonstrated that the inventory of constituents is more restricted under OT. In particular, the onset constituent appears to be impenetrable in OT. A sonority hierarchy can define possible onsets and nuclei

within a language. However, the sonority hierarchy cannot be employed inside the onset constituent within OT.

This paper is organized as follows: in section 2.0, the data set under discussion is presented. Additionally, Davis' (1990) explanation of this data is demonstrated within a rule-governed approach. An explanation of the very basic Italian syllable structure follows in section 3.0. Both CV syllables and the relationship between onsets and nuclei will be outlined within optimality theory, leading to an explanation for word-initial clusters in Italian. In section 4.0 a new constraint is proposed to help account for the minimal sonority distance of Italian consonant clusters. The final tableau demonstrating the OT translation is also presented in this section. Finally, in section 5.0, some of the problems created by an OT analysis for Italian clusters will be included in the summary.

2.0 THE DATA AND PRESENT ANALYSIS

The data set being utilized for this paper was intended to demonstrate the distribution of the definite masculine article allophones in Italian. However, this paper will be addressing this data in a more general manner. Italian possesses the consonant clusters given in (1).

(1) Consonant clusters in Italian
bl, br, pl, fr, dr, tr, kl, kr, gl, gr, pn
(Davis, 1990:43)[1]

Examples of the consonant clusters present in Italian are given below in (2).

(2)

il blocco	'the block'	il braccio	'the arm'
il clima [kl]	'the climate'	il cratere [kr]	'the crater'
il drago	'the dragon'	il flutto	'the surge'
il frutteto	'the orchard'	il globo	'the globe'
il grado	'the grade'	il plotone	'the platoon'
il premio	'the prize'	il traffico	'the traffic'
il pneumatico	'the tire'		

(Davis, 1990:44)[2]

Davis (1990) describes well-formed consonant clusters in Italian by using Steriade's syllable-formation rules in combination with a language specific sonority hierarchy.[3] Instead of maintaining a universal sonority hierarchy, Davis proposes the language-specific sonority hierarchy found in (3).

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[1]Glides are not included in this discussion because their consonantal status is controversial. It appears that glides are treated as vowels in Italian. Additionally, s+C sequences are not dealt with in this paper. See Kaye (1992) for problems reagrding these clusters.
[2]Examples of consonant clusters that are not permitted in Italian were not available. However, Davis (1990) mentions that the list in (2) is an exhaustive list of Italian consonant clusters.
[3]Davis' (1990) proposal focuses on word-initial consonant clusters but it can be easily applied to word-internal clusters as well. Because this paper discusses word-initial clusters only, a description

(3) Italian Sonority Hierarchy

voiceless stops	voiced stops	noncoronal fricatives	coronal fricatives	n	m	liquids	vowels
1	2	3	4	5	6	7	8

(Davis, 1990:45)

Steriade's syllable-formation rules work in conjunction with this hierarchy:

(4) Syllable-formation Rules

a. CV rule: A syllable is created consisting of an onset and a rhyme, where the rhyme consists of a vowel, and the onset consists of the consonant immediately preceding the rhyme.

b. Onset rule: The consonant immediately preceding the onset created in the rule above becomes a member of the onset. However, this is subject to a language-specific minimal sonority condition. In Italian, the minimal sonority distance is four.

(Davis, 1990:46)

In other words, if two adjacent consonants in word-initial position do not have a minimal sonority distance of four (based on Davis' (1990) scale) then that consonant cluster will not be permitted word-initially in Italian.

3.0 BACKGROUND OPTIMALITY THEORY

In order to meaningfully translate the Italian consonant cluster sonority hierarchy into OT, basic syllable structure and sonority hierarchies within OT must also be outlined.

3.1 Italian in Basic Optimality Theory

Before the translation of well-formed consonant clusters can be discussed, it is necessary to outline the very basics of the syllable structure of Italian within OT. This preliminary analysis will include only simple onsets, and not Italian consonant clusters. Prince and Smolensky (1993) outline eight basic syllable structure constraints that are necessary for characterizing a language's prosodic structure.

(5) **ONS**
Syllables must have onsets.

(6) **-COD**
Syllables must not have codas.

(7) **PARSE**
Underlying segments must be parsed into syllable structure.

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of word-medial clusters will not be presented.

(8) **FILL**
Syllable positions must be filled with underlying segments.

(9) **NUC**
Syllables must have nuclei.

(10) ***COMPLEX**
Mo more than one C or V may associate to any syllable position.

(11) ***M/V**
V may not associate to Margin nodes (Ons and Cod).

(12) ***P/C**
C may not associate to Peak (Nuc) nodes.

Prince and Smolensky (1993) maintain that the four constraints listed above in (5) to (8) can be relatively ranked in any dominance order for any particular language. These are applied to Consonant-Vowel (CV) strings within a given language. The constraints in (9) to (12) parse the CV strings into syllables. These constraints are universally fixed in superordinate positions relative to the constraints in (5) to (8).

Prince and Smolensky (1993) propose the following order of constraints for a language which requires nuclei but has both optional onsets and codas.[4] Disregarding branching onsets, this is the set of constraints that apply in Italian.

(13) **(NUC,*COMPLEX,*M/V,*P/C) »PARSE »FILL »ONS »-COD**[5]

Codas and onsets are optional in Italian, hence both **PARSE** and **FILL** dominate **ONS** and **-COD**, . Since the coda position is not of concern in this paper, it will no longer be included in the discussion. However, the other three constraints, **PARSE**, **FILL**, and **ONS**, are necessary for an account of consonant clusters in Italian, as will be demonstrated below.

3.2 The Onset-Nucleus Relationship

This section provides a portion of the background optimality theory necessary to translate Italian consonant clusters into OT. Prince and Smolensky (1993) focus their discussion of onset-nucleus relationships within OT on Berber syllabification. In Berber, any segment except for [t] can appear as the nucleus of a syllable. In order to explain Berber syllabification, Prince and Smolensky (1993) use the nuclear harmony constraint.

[4]See Prince and Smolensky (1993) for details on why this particular ranking of constraints is required.
[5]Because vowels are not a concern in this paper, 'V' represents all vowels in the constraints being described.

(15) The Nuclear Harmony Constraint (**HNUC**)

A higher sonority nucleus is more harmonic than one of lower sonority. This constraint picks out the most sonorous element possible to be the nucleus of a Berber syllable, in relation to all of the other constraints utilized for Berber syllabification. For a language such as Italian, where vowels make up a large majority of nuclei, **HNUC** is too binding; not all segments can appear as nuclei and not all segments can appear as margins. What is more appropriate in the context of Italian is a more specific sonority hierarchy much like that proposed by Davis (1990) in section 2.0. In OT, the hierarchy takes a slightly different shape. The OT sonority hierarchy for onsets in Italian can be depicted in two forms which are found in (16).[6]

(16a) Margin Hierarchy
***M/V » *M/r » *M/l » *M/m » *M/n » *M/f » *M/d »*M/t**

(16b) Peak Hierarchy
***M/t » *M/d » *M/f » *M/n » *M/m » *M/l » *M/r » *M/V**

The first set of constraints simply lists the segments which can appear in onset position from the least harmonic candidate to the most harmonic candidate. The second set lists the least harmonic to most harmonic peak position elements.

Prince and Smolensky (1993) explain that one of the most important questions regarding the relation between individual segments and syllable position is the following: for any given segment, is the association to a peak or to a margin? Prince and Smolensky propose another constraint to answer this question.

(17) Syllable Position Affinity
If in a given language P/X > M/X, or equivalently *M/X » *P/X, then X is a peak-preferring segment; otherwise X is margin preferring.

Those elements appearing as onsets and those appearing as peaks are formally separated by the constraint in (18).

(18) **Affinity Parameter**

π_{Aff} is located as follows between two adjacent sonority levels, that of the most sonorous margin-preferring segment and that of the least sonorous peak-preferring segment:

$$\max_r \{|r|: *P/r » *M/r\} < \pi_{Aff} > \min_V \{|V|: *M/V » *P/V\}$$

[6]Peak and margin harmonies are also possible alternatives but are not necessary for the purposes of this paper.

In other words, the most sonorous margin in Italian, /r/, and the least sonorous peak, /V/, are separated by π_{Aff}. The Affinity Parameter divides the sonority hierarchy into possible onsets and possible nuclei.

With this understanding of constraints regarding onset-nucleus relationships, it is now possible to provide an explanation for the appearance of word-initial consonant clusters in Italian.

4.0 A POSSIBLE SOLUTION

How then, can consonant clusters requiring a minimal sonority distance be incorporated into the optimal Italian syllable? It seems reasonable to begin by examining the basic syllable structure constraints in (5) to (12). ***COMPLEX** in (10) claims that only one C or V may be associated with any syllable node. Further, Prince and Smolensky (1993) state that this constraint is fixed in a superordinate position in relation to the other constraints mentioned. In order to include consonant clusters in the Italian well-formed syllable constraints, ***COMPLEX** will have to be ranked fairly low in relation to the other constraints involved since branching onsets cannot be permitted in a given language otherwise.

With ***COMPLEX** lowly ranked, it is now possible to permit two consonants in the onset position. However, this does not restrict how these consonant clusters may appear in a given language. For example, both [bl] and [nl] would be permitted under the present system, where only [bl] is a possible cluster in Italian. It is necessary to design a way in which a minimal sonority distance of four can be achieved within OT. At first glance, this problem seems nearly impossible to solve. There is a large gap between the constraints **HNUC** and **Margin Hierarchy**. Under OT it seems that the simplest language descriptions result from the two extremes: complex structures such as syllables in Berber, and simple CV syllable structures. However, a solution is possible if a new constraint is created using an analogy with onset-nucleus relationships. Recall the **Affinity Parameter** outlined in (18). This constraint defines the possible onsets and nuclei in a given language. This is exactly the type of restriction required to define the permissible consonant clusters of Italian. It is necessary to separate the consonants (C_2C_1) which are permitted to appear in C_1 position from those that can appear in C_2 position. The π_{Aff} is said to appear between two sonority levels. Another **Affinity Parameter** must be posited in order to explain consonant clusters. Further, this second **Affinity Parameter** is more restricted than the first; this second constraint may only exist in the presence of a consonant cluster.

(19) **Affinity Parameter for Consonant Clusters**

π_{Aff} is located as follows between two adjacent sonority levels, that of the most sonorous leftmost margin-preferring segment and that of the least sonorous rightmost margin-preferring segment:

$$\max_t \{ltl: *M_1/t \gg *M_2/t\} < \pi_{Aff} > \min_n \{lnl: *M_1/n \gg *M_2/n\}$$

With this constraint in place, the OT constraints for Italian consonant clusters would take the following order:

(20) **PARSE , FILL} » *P/C_2 , *M/V » *P/C_1 » *M/C_1 » *M/C_2 » *COMPLEX » *P/V**[7]

In the tableau in (22), the constraints for Italian consonant clusters are applied.

(22) Tableau for initial cluster in Italian *blucco*, 'block'[8]

/blV/	Parse	Fill	*P/b	*M/V	*P/l	*M/l	*M/b	*COM PLEX	*P/V
+blV́						*	*	*	*
bolV́		*!				*	*		*
‹b›lV́	*!					*			*
óblV́		*!				*	*	*	*
bĺV				*!	*		*		
B̀lV́			*!			*			*

In what follows, the motivation behind the ranking of these constraints will be presented. Additionally, a brief explanation of the violations for each candidate is offered.

The constraints, **PARSE** and **FILL**, must be ranked highly because both deletion and epenthesis are not permitted in Italian consonant clusters. Following these constraints are ***P/C_2(b)** and ***M/V** which demonstrate that [b] is a poor peak and vowels should not appear in onset position. ***P/C_1(l)** is dominated by ***P/C_2(b)** and ***M/V** because it is more preferred to have [l] in a peak position than to have [b] in a peak position or a vowel in a margin position. The ordering of ***M/C_1(l)** and ***M/C_2(b)** is crucial to this analysis. It is preferable to have a less sonorous consonant in the margin position, therefore the more sonorous consonant must have a higher ranked constraint than the less sonorous consonant. Further, the **Affinity Parameter for Consonant Clusters** is activated due to the presence of a consonant cluster. This constraint separates [b] and [l] into the correct C_1 and C_2 positions. The constraint, ***COMPLEX**, is dominated by all of the above constraints, given that consonant clusters appear. Finally, ***P/V** is of very little importance in comparison to the rest of the constraints because vowels in peak positions are optimal.

With an understanding of the motivation for this particular set of constraints, each candidate's crucial violation (!) may be briefly discussed. The candidates will be addressed beginning at the top of the tableau with the bottom candidate being discussed last. The optimal candidate (represented by an apple), blV́, only violates

[7]Obvious constraints are not included in this ranking of constraints. Only relevant constraints are discussed.

[8]These consonant clusters are assumed to be tautosyllabic and will not be discussed in this paper.

the lowest constraints within the set. As such, these constitute very minimal violations. The second candidate, b´lV́, has an empty nucleus violating **FILL**, which is among the highest ranked constraints in this set because Italian does not permit deletion. **PARSE** is violated by the third candidate, ‹b›lV́, which is also one of the highest ranked constraints since epenthesis does not occur in Italian. The fourth candidate, ´blV́, has a crucial violation similar to the second candidate; it violates **FILL**. ***M/V** is crucially violated by the fifth candidate, bĹV, because the vowel appears in a margin position. Also notice that ***P/l** is violated by this candidate. Finally, B́lV́, the sixth candidate, crucially violates ***P/b** which is the third highest ranked constraint. These violations demonstrate that the above ranking of constraints creates the correct surface structure for an Italian consonant cluster. Unfortunately, this application of OT is not without problems.

5.0 DISCUSSION AND SUMMARY

Presently in optimality theory, a sonority hierarchy is considered useful in deciding what position is most harmonious for a particular segment. For example, a sonority hierarchy can be employed within OT to demonstrate why [t] makes a poor nucleus yet makes an optimal onset in most of the world's languages. Further, OT can explain why one nucleus is better than another, within a possible set of nuclei. However, OT cannot employ a sonority hierarchy (or margin hierarchy in this case) within a given constituent. In other words, the theory cannot compare two adjacent elements within one constituent. This problem is apparent when attempting to translate minimal sonority distance requirements for consonant clusters within the onset of a syllable. Even when an affinity constraint as in (19) is created, the problem cannot be solved entirely. The minimal sonority distance in Italian is four, based on the scale in (3). This scale is relational: [p] can appear with [l], however, [f] cannot appear with [l] because four segmental levels do not appear between [f] and [l]. In OT, lists of possible C_1s and C_2s can be provided, however, the model is not robust enough to ensure that the minimal distance will be fulfilled. It remains unclear how this problem should be approached.

Overall, the OT analysis of Italian consonant clusters does not possess the simplicity and explanatory power of Davis' (1990) proposed solution. Optimality theory has great potential in explaining a large amount of phonological phenomena. However, explaining the finer details of areas such as prosodic structure needs refinement.

REFERENCES

Davis, S. 1990. Italian onset structure and the distribution of *il* and *lo*. Linguistics 28:43-55.

Itô, Junko. 1988. Syllable theory in prosodic phonology. New York: Garland Publishing Inc.

Kaye, J. 1991/1992. Do you believe in magic? The story of s+C sequences. SOAS: Working Papers in Linguistics and Phonetics 2. pp. 293-313.

Kenstowicz, M. 1994. Phonology in Generative Grammar. Cambridge: Blackwell Publishers.

Prince, Alan and Paul Smolensky. 1993. Optimality Theory. Rutgers University ms.

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On Superiority Effects in Russian

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Abstract

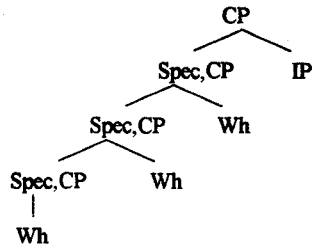
In this paper I argue that Russian is a [-multiply filled Spec,CP] language: in Russian multiple wh-questions only one wh-word appears in Spec,CP, the rest are adjoined to IP. However, unlike other [-multiply filled Spec,CP] languages, Russian exhibits Superiority effects, which, according to Rudin (1988) are characteristic of [+multiply filled Spec,CP] languages, but not of [-multiply filled Spec,CP] ones. I show that, given a few assumptions, the Russian data can be accounted for by the Weak Crossover Principle which was used by Hornstein (1995) to explain Superiority effects in a number of languages. To the extent that the analysis is successful, it provides evidence that a [-multiply filled Spec,CP] language can be subject to the Superiority Condition.

1. Introduction

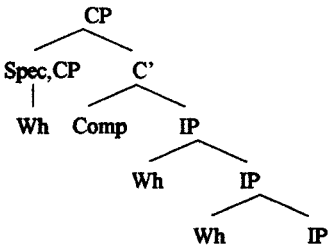
In recent years much progress has been made in the study of wh-movement in multiple wh-fronting languages. It has been argued by Rudin (1988) that these languages do not form a uniform type. Instead, they can be divided into two types based on the landing sites of the multiply fronted wh-phrases: [+ multiply filled Spec, CP] ([+MFS]) languages and [-multiply filled Spec, CP] ([-MFS]) languages. The former includes Bulgarian and Romanian. The latter includes Serbo-Croatian, Polish and Czech.

According to Rudin, languages of the [+MFS] type have an S-structure (a SPELL OUT structure, in current Minimalist terms) like (1a), where all of the fronted wh-words are adjoined in Spec,CP, while those of the [-MFS] type have one like (1b), where only one wh-phrase appears in Spec,CP, the rest are adjoined to IP:

(1)a. $[_{CP}\,[_{Spec,CP}$ WH WH WH] $[_{IP}$ ...] [+MFS] languages



b. $[_{CP}\,[_{Spec,CP}$ WH] $[_{IP}$ WH WH ...]] [-MFS] languages



Rudin's assumption that the two types of multiple wh-fronting languages have different S-structures (SPELL OUT structures) allows her to make a number of interesting predictions that the data from the languages she examined appears to support.

Rudin demonstrates systematic differences in extraction possibilities for multiple Wh-words, Wh-island effects, clitic position and occurrence of parentheticals and other material within the fronted Wh-sequence and the strictness of word order in multiple Wh-constructions in the two types of languages.

Rudin summarizes the systematic differences between the two groups of languages as follows:

Table 1

	[+MFS] languages		[-MFS] languages		
	Bulgarian	Romanian	Serbo-Croatian	Polish	Czech
Multiple WH extraction from a clause	+	+	-	-	-
Wh-island violations	+	+	-	-	-
Clitics follow first Wh-word	-	-	+	+	+
Parentheticals, adverbs, particles after first WH	-	-	+	+	+
Free nom/ACC Wh-word order	-	-	+	+	+

Rudin suggests to account for the differences between [+MFS] and [-MFS] languages by a parameterized Condition on Spec, CP adjunction which prohibits adjunction at different levels of the grammar.

(2) CONDITION ON SPEC,CP ADJUNCTION
*[$_{\text{Spec CP}}$ α Spec,CP]
(nothing may be adjoined to Spec,CP) (at level X of the grammar)

According to Rudin, since [+MFS] languages allow adjunction to Spec, CP at S-structure (at SPELL OUT), any number of wh-phrases can pass through this position. Thus, multiple extraction and wh-island violations are allowed. The clitic, parenthetical, adverb and particle placement in these languages provides evidence that the wh-words in Spec,CP act as a unit. On the other hand, [-MFS] languages prohibit adjunction to Spec, CP at S-structure (at SPELL OUT). Multiple extraction and wh-island violations in these languages are not allowed, since such movement violates Subjacency. The clitic, parenthetical, adverb and particle placement in these languages shows that the wh-words do not form a constituent.

It is a familiar fact that in multiple wh-questions Russian fronts all wh-phrases in overt syntax. However, it is not immediately evident to which of the two types of multiple-wh-fronting languages Russian belongs: while it appears to pattern like [-MFS] languages with respect to some diagnostics employed by

Rudin, it exhibits Superiority effects which, according to Rudin, are characteristic of [+MFS] languages, but not of [-MFS] languages.

In this paper I will show that Russian is a [-MFS] language and I will offer a Minimalist compatible analysis of Superiority effects in Russian.

2. Russian in the Classification of Multiple Wh-fronting Languages

Russian multiple wh-questions display the following characteristics.

i. Russian resists multiple wh-extraction from a clause.

In fact, any extraction at all from a finite clause is normally ungrammatical. However, subjunctive clauses do allow wh-movement across a clause boundary.[1] Example (3a) is grammatical. An otherwise identical sentence with two wh-phrases fronted out of the clause is not:

(3) a. Kogo$_i$ ty xočeš, ctoby Ivan priglasil t_i ?
whom you want that Ivan invited
'Who do you want Ivan to invite?'

b.* Kogo$_i$ kuda$_j$ ty xočeš, ctoby Ivan priglasil t_i t_j?
who where you want that Ivan invited
'Who do you want Ivan to invite where?'

ii. Russian does not allow wh-island violations. Neither questioning or relativization is possible from inside a wh-question, as sentences in (4) illustrate.[2]

(4) a.*Čto$_i$ on sprosil kto pročital t_i ?
what he asked who read
'What did he ask who read?'

b.*...kniga$_i$, kotoruju on sprosil kto pročital t_i...
book which he asked who read
'.....the book which he asked who read....

iii. Clitics, parentheticals and adverbs can follow the first wh-word.

Unlike other Slavic languages, Russian does not have pronominal clitics. However, it uses a clitic to mark the Subjunctive mood. The subjunctive marker *by* , which usually appears after the verb, can also appear in clause-second position,

[1] For a possible explanation of the difference between indicative and subjunctive clauses with respect to extraction possibilites see Bailyn (1995b):

[2] In fact, we have seen that Russian generally does not permit wh-extraction in any case.

following either the first word or the first major constituent. The sentences in (4a, b) show that it can appear after the first word of a clause-initial AP or immediately after this constituent. The same options are available when the first constituent is an NP or PP. Sentence (4c) shows that the options are limited to the position after the first word or the first XP.

(4) a. Kakim by zanjatym ty ni byl, ty dolžen posvonit' svoim roditeljam.
how BY busy you are you must call your parents
'No matter how busy you are you must call your parents.'

b. Kakim zanjatym by ty ni byl, ty dolžen posvonit' svoim roditeljam.
how busy BY you are you must call your parents
'No matter how busy you are you must call your parents.'

c. *Kakim zanjatym ty by ni byl, ty dolzen posvonit' svoim roditeljam.
how busy you BY are you must call your parents

In multiple wh-questions the subjunctive marker *by* can appear after the first of the wh-words, but not after the second one, indicating that the first wh-word alone comprises a major constituent (Spec,CP), but the first two together do not, as they would if they were both in Spec, CP.

(5) a. Kto by čto posmotrel?
who BY what watch
'Who would watch what?'

b.*Kto čto by posmotrel?
who what BY watch

Sentences (6) and (7) give additional information about the constituent structure of wh-phrase sequence in Russian multiple questions. They show that the wh-phrase sequence can be interrupted by a parenthetical or an adverb.

(6) Kto, po vašemu, čto sdelal?
who according to you what did
' Who, according to you, did what?'

(7) Kto pervyj kogo udaril?
who first whom hit
'Who hit who first?'

iv. The word order of the fronted wh-phrases is restricted. If there is a subject and non-subject wh-phrase in a sentence, the subject wh-phrase comes first. comprises a major constituent (Spec,CP), but the first two together do not.

(8) a. Kto čto sdelal?
who what did
'Who did what?'

b.*Čto kto sdelal?
what who did

(9) a. Kto kuda pošel?
who where went
' Who went where?'

b. *Kuda kto pošel?
where who went

Sentences (8) and (9) provide evidence that the order of wh-phrases in Russian multiple questions is subject to the Superiority Condition, as formulated by Chomsky (1973).

(10) *The Superiority Condition*
a. No rule can involve X, Y in the structure
...X...[...Z...WYV...]...
where the rule applies ambiguously to Z and Y, and Z is superior to Y.
b. the category A is 'superior' to category B if every major category dominating A dominates B as well but not conversely.

However, the restricted word order of wh-phrases in Russian is not always obvious. Discourse functions play an important role in determining the word-order of fronted wh-phrases. For example, sentences with *which* phrases do not obey the Superiority Condition. According to Pesetsky (1987), *which* phrases are universally discourse-linked (D-linked) and do not undergo movement.[3]

Thus, (11) is grammatical:

[3] D-linking of wh-phrases, according to Pesetsky (1987), means that the range of the felicitous answers is limited to the entities already introduced in the discourse.

(11) Kakuju rabotu kakoj student sdelal?
which job which student did
'Which job did which student do?'

The context of an utterance can force a D-linked reading on wh-phrases that are not inherently D-linked:

(12) At the party the children played games, sang songs and danced.
Čto kto delal?
what who did
Who did what?

In any case, strictness of word order of wh-phrases in multiple questions does not appear to be a reliable diagnostic for determining whether a particular language is of a [+MFS] or [-MFS] type. Boscovic (1997) shows that the word-order of wh-phrases in multiple questions in the Serbo-Croatian is actually fixed and subject to the Superiority condition in cases of genuine wh-movement.[4] Cheng (1991) points out that Polish speakers do not agree with respect to the ordering between subject and object wh-phrases. Some have a strict ordering between the two and others have free ordering. With respect to ordering between arguments and adjuncts, these speakers have a strict ordering: arguments precede adjuncts.

For purposes of comparison between Russian and other multiple wh-fronting languages, I provide a modified version of Table 1 with Russian added.

[4] Boscovic (1997) points out that Rudin discusses the ordering of wh-phrases in short-distance matrix questions, but does not discuss it with respect to constructions involving multiple long-distance extraction. Long-distance extraction appears to be very different from short-distance extaction with respect to the ordering of fronted wh-phrases: with short-distance extraction both subject-object and object-subject order of fronted wh-phrases is allowed, whereas with long-distance extraction only subject-object order is allowed, i.e. the Superiority conditions holds. Boscovic argues that in short-distance matrix multiple questions no wh-phrase undergoes movement to SpecCP; all fronted wh-phrase are adjoined.

Table 2

	[+MFS] languages		[-MFS] languages			
	Bulgarian	Romanian	Serbo-Croatian	Polish	Czech	Russian
Multiple WH extraction from a clause	+	+	-	-	-	-
Wh-island violations	+	+	-	-	-	-
Clitics follow first Wh-word	-	-	+	+	+	+
Parentheticals, adverbs, particles after first WH	-	-	+	+	+	+
Free nom/ACC Wh-word order	-	-	+	+	+	-

In view of the facts outlined above I claim that Russian is a [-MFS] language, i.e. it does not allow adjunction to Spec, CP at SPELL OUT[5].

3. Superiority Effects as Weak Cross Over

Let us consider again a typical instance of superiority effects displayed in (8), repeated below as (13).

(13) a. Kto čto sdelal?
who what did
'Who did what?'

b.*Čto kto sdelal?
what who did

Attempts have been made to reduce the contrast observed in (14) to some version of ECP. However, they all proved to be empirically inadequate.[6]

[5] We will see later that Russian does not allow adjunction to Spec,CP at any level of the grammar.

Moreover, they are based on mechanisms not available in the current theoretical framework.

Hornstein (1995) argues that superiority effects are actually manifestations of Weak Cross Over. There are various reasons for pursuing this analysis.

First, it appears to offer broad empirical coverage. Among other phenomena, it successfully accounts for alleviation of superiority effects through the addition of a third wh-phrase, as I will show below.

Second, Hornstein's analysis fits rather nicely with the Minimalist program. Hornstein adopts Chomsky's (1993) theory of movement. Following Chomsky, he assumes that a full copy of a moved constituent is left at the launching site. At LF all copies but one must be deleted. Hornstein's analysis is based on economy of derivation and provides support for Chomsky's (1993) suggestion that interpretation of wh-in-situ phrases does not involve movement at LF.

An informal definition of Weak Cross Over is given in (14)[7].

(14) A pronoun cannot be linked to a variable on its right
*Q...pronoun...vbl...
|_____↑

(14) correctly predicts the ungrammaticality of (15a). Its LF structure is given in (15b).

(15) a. *His$_i$ mother kissed everyone$_i$.
b. [$_{IP}$ everyone$_i$ [$_{IP}$ his$_i$ mother kissed t_i]]
|____*wco____↑

In (15) the variable is the trace left by the LF movement of the quantifier *everyone*. The pronoun *his* is linked to a variable on its right, in violation of the WCO Principle.

Sentence (15) contrasts with (16).

(16) a. Everyone$_i$ kissed his$_i$ mother.
b. [$_{IP}$ everyone$_i$ [$_{IP}$ t$_i$ kissed his$_i$ mother]]
↑_____|

In (16) the pronoun *his* is not linked to a variable on its right and does not violate the WCO Principle.

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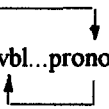
[6] Rudin (1988) uses the split ECP theory proposed by by Aoun, Hornstein, Lightfoot and Weinberg (1987) to account for superiority effects in some multiple wh-fronting languages. See Cheng (1991) for discussion of this analysis.

[7] Hornstein (1995) eventually provides a more formal statement of WCO in terms of c-command. The informal definition is sufficient for the discussion in this paper.

Hornstein argues that there are advantages to using linking, as opposed to straightforward coindexation. One of the advantages becomes apparent if we consider the structure in (17).

(17) ....pronoun^1...vbl...pronoun^2...

Assume that the pronouns in (17) have bound variable interpretations. On a standard indexing approach to antecedence this implies that all three expressions are coindexed. Since *pronoun*^{1} is coindexed with the variable on its right, a WCO effect should arise. In contrast, a linking approach allows us to avoid a WCO effect with the linking shown in (18).

(18) 

The prediction is borne out. Compare (19a) and (19b)

(19) a.*His$_i$ mother gave his$_i$ picture to every student$_i$
b. His$_i$ mother gave every student$_i$ his$_i$ picture

(19a) has a structure like (20) at LF.

(20) ....pronoun^1... pronoun^2 ...vbl

In (20) there is no way of linking either pronoun to the variable without inducing a WCO effect: the variable is on the right of both potential linked pronouns.

(19b) has a structure like (17) at LF. No WCO effect arises. This follows from a linking approach to WCO.

Chierchia (1991) ties the availability of pair-list readings in sentences with both wh-phrases and quantifiers to WCO effects. Consider sentences (21a) and (21b) with respect to availability of pair-list readings.

(21) a. Who does every man love?
b. Who loves everyone?

Both a pair-list and individual reading are available for (21a). Thus, the answers 'His mother' and 'Mary' are both felicitous. The former one maps one individual (which is a value for the variable bound by *everyone*) to a second individual (that person' mother), while the latter identifies one individual that all

people love. On the other hand, (21b) does not have a pair-list reading and can only be answered by providing a name of one individual that loves all people.

Chierchia (1991) suggests that the traces of wh-phrases involved in pair-list readings consist of an empty element with a functional index and an empty element with an argument index. The idea is that the empty element with the argument index acts as a bound pronoun, while the empty element with the functional index is bound by the raised wh-word.

Given these assumptions, the LF representation for the pair-list reading of (21a) is as follows:

(22) $[_{CP}$ who$_i$ $[_{IP}$ every man$_j$ $[_{IP}$ t_j love $[pro_j$ t_i $]$ $]]]$

In (22) the argument-indexed pronoun is bound by a quantifier, but is not linked to a variable on its right. The WCO Principle is not violated.

A sentence like (21b) on the pair-list reading will have the following structure:

(23) *(WCO)$[_{CP}$ who$_i$ $[_{IP}$ everyone$_j$ $[_{IP}[pro_j$ t_i $]$ love $t_j]]]]$

In (23) a pronoun is linked to a variable on its right and the structure violates the WCO Principle.

Thus, we see that the asymmetry in interpretation of (21a) and (21b) can be reduced to a WCO effect: the pair-list readings in Wh/quantifier sentences are excluded in precisely the environments where the WCO Principle is violated.

Hornstein extends the WCO account of quantifier/wh interactions to Superiority effects in multiple questions. He claims that all multiple questions obligatorily receive pair-list readings. Thus, an appropriate answer to (24) consists of a complete list of buyer/buyee pairs.

(24) Who bought what?

Hornstein assumes that the pair-list interpretation in multiple questions like (24) parallels the pair-list reading in sentences like *'What did everyone buy?'* in which the quantifier *everyone* generates a set of buyers and the wh-phrase inquires what each of them bought.

Hornstein assumes that the wh-phrase in Spec, CP functions as a list-generator, on par with quantified expressions like *everyone* in sentences with pair-list readings, while the in-situ wh-phrase is a functionally interpreted expression, i.e. contains a null pronominal element coindexed with the wh-phrase in Spec, CP.

Given these assumptions, the LF structure of (24) does not violate the WCO Principle:

(25) $[_{CP}$ who$_i$ $[_{IP}$ t$_i$ bought what=[pro$_i$ N]]]

Within this approach (26a), which is a typical example of the Superiority Condition violation, is ruled out because the null pronominal element in the in-situ wh-phrase is linked to a variable on its right and induces a WCO effect. The LF representation for (26a) is provided in (26b).

(26) a. *What did who buy?
b. *(WCO)$[_{CP}$ what$_i$ $[_{IP}$ who=[pro$_i$ N] bought t$_i$]]]

Note that Hornstein's analysis outlined above implies that there is no wh-raising to Spec,CP at LF. This is a desirable result from the Minimalist point of view. Recall Chomsky's (1993:32) assumption that the raising of a wh-operator is driven by morphological necessity. The wh-feature is universally strong and must be eliminated through checking in the checking domain of C by SPELL OUT[8]. There is no need for wh-movement at LF. [9]

Hornstein shows that all cases of Superiority can be successfully accounted for by WCO.[10] In section 4 we will see how this approach can be used to account for superiority effects in Russian.

4. Superiority Effects in Russian

In section 2 I showed that in most cases Russian patterns like [-MFS] languages, but, unlike other [-MFS] languages, it has restricted wh-phrase order in multiple questions. In this section I explore whether Weak Cross Over can shed some light on the peculiar behavior of wh-phrases in Russian multiple questions.

Following Rudin (1988), Hornstein (1995) assumes that [-MFS] languages do not display superiority effects in multiple questions, as the Polish examples in (27) illustrate.

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[8] Presumably, in languages like Chinese and Japanese there is overt wh-movement as well - in this case movement of an empty operator. See Chomsky (1993:26).

[9] In this context the reason for movement of wh-phrases not located in Spec,CP in [-MFS] languages is unclear and I leave it open here. See Boscovic (1997) for evidence that the driving force behind fronting of the wh-phrases not located in Spec,CP is independent of the wh-feature.

[10] See Hornstein (1995) for details.

(27) a. Kto co robil
who what did
b. Co kto robil
what who did

He suggests that one way to cancel WCO and eliminate superiority would be to have multiple generators. If non-inherently d-linked operators must be in an A'- position to get a d-linked reading and adjunction to IP is A'- movement, both wh-phrases in [-MFS] languages are in A'- position at SPELL OUT and are potential generators. At SPELL OUT the sentences in (27) have the following structures:

(28) a. [$_{CP}$ kto$_i$ [$_{IP}$ co$_j$ [$_{IP}$ kto$_i$ robil co$_j$]]]
b. [$_{CP}$ co$_j$ [$_{IP}$ kto$_i$ [$_{IP}$ kto$_i$ robil co$_j$]]]

To get a well-formed LF we must delete either wh-phrase and interpret its trace functionally. Thus, at LF we get structures (29a) and (29b) for sentences (27a) and (27b) respectively.

(29) a. [$_{CP}$ kto$_i$ [$_{IP}$ [$_{IP}$ t$_i$ robil [pro$_i$ N]]]]
b. [$_{CP}$ [$_{IP}$ kto$_i$ [$_{IP}$ t$_i$ robil [pro$_i$ N]]]

Both structures have a generator, both structures obey the WCO Principle. Therefore, neither should display superiority effects. Thus, according to Hornstein, the fact that [-MFS] languages have their wh-phrases moved to A'- positions in overt syntax cancels superiority effects in these languages.

In section 2 we have seen that there is growing evidence that, contrary to Rudin's (1988) claim, the ordering of multiple wh-phrases in [-MFS] languages is restricted. This is clearly the case in Russian.

In order to correctly account for the Russian data using Hornstein's (1995) approach, we must take a stronger view and make a distinction between A' - positions with respect to availability of d-linked readings of wh-phrases. Provided only wh-phrases in Spec, CP are allowed to be d-linked and act as generators, the Russian data is straightforwardly accounted for by WCO.

Consider the following sentences.

(30) a. Kto čto kupil?
who what bought
'Who bought what?'

b. *Čto kto kupil?
what who bought

At SPELL OUT the sentences in (30) have the following representations:

(31) a.[$_{CP}$ kto$_i$ [$_{IP}$ čto$_j$ [$_{IP}$ kto$_i$ kupil čto$_j$]]]
b. [$_{CP}$ čto$_i$ [$_{IP}$ kto$_j$ [$_{IP}$ kto$_j$ kupil čto$_i$]]]]

Given the assumption that being in Spec,CP is necessary to obtain a d-linked interpretation, after the wh-phrases in the IP-adjoined positions are deleted and their traces are interpreted functionally we get the following LF representations for sentences in (30):

(32) a.[$_{CP}$ kto$_i$ [$_{IP}$ [$_{IP}$ t$_i$ kupil (čto=)[pro$_i$ N]]]]
b.*(WCO) [$_{CP}$ čto$_i$ [$_{IP}$ [$_{IP}$ (kto=)[pro$_i$ N] kupil t$_i$]]]]

The ungrammatical sentence (30b) violates the WCO Principle, since the null pronominal element in the functionally interpreted trace of the deleted wh-phrase *kto* is linked to a variable on its right.[11]

In section 2 we have seen that the context of an utterance can trigger a d-linked reading of wh-phrases that are not inherently d-linked. I argue that these contextually d-linked phrases can function as generators on par with inherently d-linked wh-phrases, i.e. they can get a d-linked reading without being in Spec,CP.

Let us consider example (12) again, repeated here as (33).

(33) At the party the children played games, sang songs and danced.
Čto kto delal?
what who did
Who did what?

The structure of the multiple question in (34) at SPELL OUT is given in (34).

(34) [$_{CP}$ čto$_i$ [$_{IP}$ kto$_j$ [$_{IP}$ kto$_j$ delal čto$_i$]]]

[11] We have seen that it is not necessary to invoke movement at LF in order to interpret all wh-phrases in Russian or any other language, for that matter. This fact calls for a modification of Rudin's (1988) Condition on Spec,CP Adjunction. There is no need to specify the levels of the grammar at which adjunction to Spec,CP is prohibited. It appears that if adjunction to Spec,CP is prohibited in a particular language, it is prohibited throughout the derivation.

Given the assumption made above, in the course of derivation the wh-phrase in Spec,CP is deleted and its copy is interpreted functionally. The wh-phrase in the IP-adjoined position , by assumption, is contextually d-linked and functions as a generator.

In this case the LF presentation of (33) is as follows:

(35) $[_{CP}\ [_{IP}\ kto_j\ [_{IP}\ t_j\ delal\ (\check{c}to=)[pro_j\ N]]]]$

The generator *kto* binds the implicit pronoun in the functionally interpreted trace of the deleted *cto*. The structure does not violate the WCO Principle and is grammatical.

The above analysis makes a prediction that in those cases where the Superiority Condition appears to be violated in [-MFS] languages, the wh-phrase adjoined to IP gets a contextually d-linked reading. More data is required to determine whether this prediction is borne out. [-MFS] languages other than Russian must be closely examined in terms of contextually d-linked readings.

It appears that distinction between A'-bar positions is also necessary in order to account for mitigation of superiority effects in Russian clauses with three wh-phrases. Given this distinction, Hornstein's analysis of superiority and a linking version of WCO can account for alleviation of superiority effects in Russian clauses with three wh-phrases.

Consider sentences in (36).

(36) a.*Čto kto kupil tam?
what who bought there
'Who bought what there?'

b. ?Čto kto gde kupil?
what who where bought
'Who bought what where?'

In these sentences the wh-phrase in Spec,CP acts as the generator for the pair-list interpretation. The wh-phrases adjoined to IP are deleted and their traces are interpreted functionally, i.e. they involve implicit pronouns linked to the generator's variable.

Sentence (36a) has the LF structure (37) which violates the WCO Principle.

(37) *(WCO)$[_{CP}\ cto_i\ [_{IP}\ [_{IP}\ (kto=)[pro_i\ N]\ kupil\ t_i\ tam]]]]$

Let us consider (36b) now. The traces of two wh-phrases adjoined to IP are interpreted functionally. The presence of a second functionally interpreted wh-trace mitigates the effects of WCO. The structure is well-formed with the linking indicated in (38).

(38) $[_{CP}$ čto$_i$ $[_{IP}$ $[_{IP}$ $[_{IP}$(kto=)[pro$_i$ N] kupil t$_i$ (gde=)[pro$_i$ N]]]]]

Given Hornstein's assumptions, it is also possible to interpret Russian *which*-phrases without resorting to the mechanism of unselective binding.[12].

Superiority effects appear to be canceled in (39). (39) is grammatical.

(39) Kakuju knigu kakoj student kupil?
which book which student bought
'Which book did which student buy?'

Recall that, according to Pesetsky (1987), *which* phrases are universally d(discourse)-linked, whereas simple wh-phrases *who* and *what* are normally not d-linked. He suggested that non-d-linked wh-phrases are assigned scope via movement at LF, while d-linked in-situ wh-phrases are able to receive interpretation without wh-movement, thanks to the mechanism of unselective binding. Lack of uniform interpretation of wh-phrases seems to be an unwelcome result of Pesetsky's proposal.

Hornstein (1995) offers an alternative explanation. He argues that in multiple questions *which* phrases are inherently d-linked, while simple wh-phrases like *who*, *what*, etc. must be in an A'- position, i.e. in Spec,CP, in order to be d-linked. A d-linked interpretation is required for the pair-list reading which is obligatory in multiple questions. Interpretation of the in-situ wh-phrases is achieved through linking as described above.

Let us consider two possible derivations for (39).

Assuming that *kakoj student* is an inherently d-linked *which* phrase and does not have to move, (39) has the following representation at SPELL OUT.[13]

(40) $[_{CP}$ kakuju knigu$_j$ $[_{IP}$ kakoj student$_i$ kupil kakuju knigu$_j$]]

[12] The mechanism of unselective binding was first proposed by Baker (1970) and adopted by Pesetsky (1987). The mechanism of unselective binding is implemented by coindexing a wh-phrase with the Q morpheme found in the C of interrogative clauses.

[13] Presumably, the object *which* phrase moves to check the strong wh-feature of the complementizer.

At LF we delete the wh-phrase in Spec,CP and interpret its copy functionally. *Kakoj student*, by assumption is a generator. It binds the null pronoun element in the functionally interpreted wh-phrase. The relevant LF structure is licit, it does not violate WCO.

(41) $[_{CP}[_{IP}$ kakoj student$_i$ kupil (kakuju knigu=)[pro$_i$ N]]]

Recall, however, that, for reasons that are not clear, all wh-phrases in Russian multiple questions have to move at SPELL OUT. It is plausible that, after all, both *which*-phrases move at SPELL OUT in Russian. In this case the structure of (40) at SPELL OUT is as follows:

(42) $[_{CP}$ kakuju knigu$_j$ $[_{IP}$ kakoj student$_i$ $[_{IP}$ kakoj student$_i$ kupil kakuju knigu$_j$]]

The inherently d-linked *which* phrase in the IP-adjoined position functions as a generator. The *which*-phrase in the Spec,CP position is deleted and its trace is interpreted as a functional expression. The resulting well-formed LF structure for (40) is as follows:

(43) $[_{CP}[_{IP}$ kakoj student$_i$ $[_{IP}$ t$_i$ kupil (kakuju knigu$_j$)=[pro$_i$ N]]]]

Further evidence that inherently d-linked *which*-phrases move at SPELL OUT in Russian comes from sentences like (44).

(44) Kakoj student$_i$ kakuju knigu$_j$ t$_i$ kupil t$_j$?
which student which book bought
'Which student bought which book?'

It is obvious in (44) that both *which*-phrases move at SPELL OUT: the subject *which*-phrase moves to the Spec,CP and the object *which*-phrase moves to the IP-adjoined position.

Further research into the driving force behind the movement of wh-phrases that end up in positions other than Spec,CP is crucial for a better understanding of Russian multiple questions.

5. Conclusion

In this paper I have examined the structure of Russian multiple questions. I have argued that Russian is a [-MFS] language and offered a non-ECP, Minimalist compatible account of Superiority effects in Russian based on the Weak Cross

Over Principle used by Hornstein (1995) to explain superiority effects in a number of languages.

I have shown that Hornstein's theory can account for the Russian data only if we distinguish wh-phrases in A'-positions with respect to their ability to generate pair-list readings and allow only wh-phrases in Spec,CP to be d-linked, provided they are not inherently d-linked or contextually d-linked.

On the other hand, we have seen that discourse functions play an important role in determining the word-order of fronted wh-phrases. If we allow wh-phrases to assume the role of a generator in contexts which limit the set over which the wh-phrase ranges, we can account for apparent violations of the Superiority Condition in these contexts.

The analysis presented in this paper may shed light on the contradictory data provided by speakers of some other [-MFS] languages. It provides evidence that a [-MFS] language can be subject to the Superiority Condition and suggests that the relevant data in these languages be closely examined in terms of discourse-linked readings.

I have shown that, given the assumptions adopted in this paper, Hornstein's theory can be successfully used to account for alleviation of superiority effects with the addition of a third wh-phrase and lack of superiority effects with inherently d-linked phrases in Russian multiple questions. I have also shown that, given the obligatory fronting of all wh-phrases in Russian multiple questions, it is possible that the inherently d-linked Russian wh-phrases behave differently from their English counterparts in that they move at SPELL OUT.

A welcome result of the analysis is that it allows us to dispense with the mechanism of unselective binding which was offered by Pesetsky (1987) to account for apparent violations of the Superiority Condition in sentences with inherently d-linked wh-operators and treat all the wh-phrases in a uniform way.

The analysis outlined in this paper also provides evidence in support of Chomsky's (1993) suggestion that in order to be interpreted wh-operators need not move at LF.

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References

Aoun, Joseph, Hornstein, Norbert, Lightfoot, David, and Weinberg, Amy: 1987, 'Two types of Locality', *Linguistic Inquiry* **18,** 537-577.

Baker, C. L.: 1970, 'Notes on the Description of English Questions: The Role of an Abstract Question Morpheme', *Foundations of Language* **6**, 197-219.

Bailyn, John Frederick: 1995a, "Underlying Phrase Structure and "Short" Verb Movement in Russian', *Journal of Slavic Linguistics* **3(1)**, 13-58.

Bailyn, John Frederick: 1995b, 'A Configurational Approach to Russian "Free" Word Order', Cornell University, Ph.D dissertation.

Bond, Victoria: 1997, 'Multiple Questions in Russian', IATL **4**, The proceedings of the Twelfth Annual Conference. The Hebrew University of Jerusalem.

Boscovic, Zeljko: 1997, 'Superiority Effects with Multiple Wh-fronting in Serbo-Croatian', *Lingua* **102** , 1-20.

Cheng, Lisa: 1991, 'On the Typology of Wh-questions', Cambridge, Massachusetts Institute of Technology, Ph.D dissertation.

Chierchia, Gennaro: 1991, 'Functional WH and Weak Crossover'. In: *The Proceedings of the Tenth West Coast Conference on Formal Linguistics*, ed. Dawn Bates, 75-90, Stanford: CSLI.

Chomsky, Naom: 1973, 'Conditions on Transformations'. In: S.R. Anderson, P. Kiparsky (eds), *A Festschrift for Morris Halle*, 232-286. New York: Holt, Rinehart, and Winston.

Chomsky, Noam: 1993, 'A Minimalist Program for Linguistic Theory', in K. Hale, S.J. Keyser (eds.), *The View from Building 20*, Essays in Linguistics in Honor of Sylvain Bromberger, Cambridge, MA: MIT Press, 111-176.

Hornstein, Norbert: 1995, 'Logical Form. From GB to Minimalism', Cambridge and Oxford: Blackwell Publishers.

King,Tracy Holloway: 1995, 'Configuring Topic and Focus in Russian. Stanford:CSLI Publications.

Komorovski, Ileana: 1989, 'Discourse and the Syntax of Multiple Constituent Questions', Cornell University, Ph.D dissertation.

Pesetsky, David: 1987, 'Wh-in-Situ: Movement and Unselective Binding', in E. Reuland and A.G.B. ter Meulen (eds), *The Representation of (In)definiteness*, MIT Press, Cambridge, Mass., 98-129.

Potter, Brian Charles: 1997, 'Wh/Indefinites and the Structure of the Clause in Western Apache', University of California, Los Angelos, Ph.D dissertation.

Rudin, Catherine: 1988, 'On Multiple Questions and Multiple Wh-fronting', *Natural Language and Linguistic Theory* **6**, 445-501.

The University of Calgary Phonetic Inventory: An instructional tool for students and teachers of phonetics.

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This article is an overview of a multimedia phonetics program being developed at the University of Calgary under the supervision of Doctor Michael B. Dobrovolsky as an instructional supplement to introductory phonetics courses. The program's name is the **University of Calgary Phonetic Inventory**, or **UCPI**. UCPI is a program being developed under funding to Professor Dobrovolsky of the Linguistics department from LEE, the University of Calgary's Learning Enhancement Envelope program. As a tool to help develop the phonetic perception of budding linguists, UCPI will provide students with a large quantity of transcription practice through exposure to digitally recorded word lists in different languages. It will also include a series of tutorials to guide them systematically through the topics covered in an introductory phonetics course.

BACKGROUND

UCPI is not the first phonetic program to be built for the purpose of instruction. The previous computer programs available to phonetics students at the University of Calgary are "Sounds of the World's Languages" and its complement, "A Course in Phonetics," both of which were developed by Peter Ladefoged and associates at the UCLA Linguistics department for somewhat similar purposes. Many features of these two programs have been incorporated into UCPI. Other phonetics software includes the University of Victoria Phonetics Database and IPA Tutorial, and the Oxford University Press CD-ROM Database of Western European languages.

Sounds of the World's Languages (SOWL)

This program has a fairly simple point-and-click interface. On entry, you are presented with a list of all the languages demonstrated in the program. You pick a language, and an information screen pops up. After learning a little about the language's background and the properties demonstrated in this particular word list, you can go to the sounds by clicking on another button. The word list itself is presented in a slightly different format for every language, depending on what is being demonstrated. All words are displayed in phonetic transcription, with an English gloss accompanying. You simply move the cursor over the transcription and click, and the word is played back. There are also buttons to allow you to listen to a series of words—for example, all the "front vowel" examples in a language—and to listen to all the words. The transcriptions accompanying the sounds give the students some exposure to the practice of phonetic transcription, though no option is present for the students to test themselves.

There is some inconsistency in SOWL's transcriptions. For example, there are very detailed transcriptions of the clicks in !Xoo but phonemic (not phonetic) vowel

transcriptions in Turkish. Another problem with this program is that some languages have very few words demonstrated, making it difficult for students to get a "feel" for the phonotactics of the language. An example of this is Japanese, which only has three words shown.

Positive features of this program include an IPA cross-reference function, so students can look up languages that demonstrate a particular sound—for example, high front rounded tense vowels. Also, its map system allows students to view languages' geographical locations, and lets them access nearby languages. The section titled "Sounds Index" permits students to look up languages that demonstrate specific phonetic properties, such as clicks or front rounded vowels. There is another fun feature—recording and playing back the student's own voice—but this function is not reliable enough on our computers to be very useful.

A Course In Phonetics (ACIP)

ACIP is a theoretical accompaniment to the SOWL program. ACIP focuses on teaching the students about the articulation of sounds, and having the students practice these sounds themselves. It is organized in a format similar to that of a textbook, due to the fact that it is ancillary to Ladefoged's text, *A Course In Phonetics*. The click-and-point interface, like the other program's interface, takes the user to sound demonstrations of the concepts being covered. Unfortunately, the majority of the demonstration sounds are either from English or are invented. This makes it less helpful for students who want to learn to discriminate sounds in real languages and in languages exotic to English.

Together, the SOWL and ACIP programs form a fairly good supplement to an introductory phonetics course. Indeed, the user is are meant to be able to move between the two at the click of a button, to combine their power, though this feature doesn't always work in our computer lab. Many of the handy, helpful features of these programs have been incorporated into our UCPI, such as the point-and-click language lists, the phonetic property index, and the backup course system.

Language and Sound

Aspects that were perceived to need improvement, such as the inconsistent transcriptions and the sometimes limited lists of words, prompted Dr. Dobrovolsky to try developing his own instructional language program and database. Under several STEP grants, a phonetic inventory of languages was researched and recorded, and a beginning was made to tie this database to a new computer program of Dobrovolsky's "Language and Sound." This was meant to have consistently more data for the user to read, listen to, and transcribe. A start was made, and some improvements were worked out. Unfortunately, this program was restrained by the same limitations as SOWL and ACIP, since all were developed on the Macintosh platform in HyperCard, which is a high-level but somewhat simplistic development tool. That is why, in the initial planning of UCPI, Authorware was chosen. Authorware is a package for developing multimedia material of the type that was desired in UCPI.

UCPI

In organizing UCPI, we took the best aspects of the other programs and tapped the expanded powers of multimedia to create an interactive program to teach students the main concepts of phonetic theory and transcription. As yet, the program is not complete, though only a few cosmetic alterations remain to be done before the content—the words from all the languages that have been recorded—can be fitted in. I will provide a brief run through the main sections of the program, to give the reader an idea of the nature of this program. Unfortunately, no written article can do a multimedia program justice.

When the user first opens the program, an introductory page appears which described the main options to the user, so first-time users do not need to spend hours getting acquainted with the program before actually using it. The main sections of the program are:

(1) Language List
(2) Phonetic Properties Tree
(3) Backup Course
(4) Help System
(5) Glossary
(6) IPA Charts
(7) Individual Language Word Lists and Custom Word Lists.

(1) Language List

As with the SOWL program, there is a list of languages. If the user knows which language to access, a simple click brings up a page of information on that language, including such figures as the phonetic inventory of that language. From here, another click brings up the list of words from that language. I will return to the word list in section (8).

(2) Phonetic Properties Tree

Another way that students can access the languages stored in the database is through the Phonetic Properties Tree, which is based loosely on the Sounds Index of SOWL. Since students studying phonetics would tend to go through a course one aspect of languages at a time, rather than one language at a time, the Phonetic Properties tree lets students seek out those languages that demonstrate, for example, a three-way VOT contrast. The structure of the Properties Tree is designed to reinforce students' understanding of the relationships between various aspects of languages.

Since it is a large section, covering almost sixty different properties of languages, there are some easy-to-learn conventions for moving around, which are explained in detail in the Help System.

(3) Backup Course

This section corresponds roughly to the UCLA's "A Course In Phonetics". It is not an entire, independent phonetics course in itself. It is rather meant to be a supplement—a series of tutorials to reinforce classroom instruction. It is presented in a logical progression of lessons that covers all of the major topics addressed in an introductory phonetics course. It is not tied to a specific textbook, and so is hopefully useful to more than just the one instructor and course here at the University of Calgary. Following is an outline showing the structure of the course:

0 Overview
1 Airflow Coordination
1.1 Airflow introduction
1.2 Lungs and breathing
1.3 Larynx and phonation
1.4 Airstream mechanisms
2 Articulation
2.1 Articulation introduction
2.2 Manner of articulation
2.3 Place of articulation
2.4 Secondary articulations
3 Trills, Taps, and Flaps
3.1 Trills, Taps, and Flaps introduction
3.2 Trills
3.3 Taps
3.4 Flaps
4 Vowels
4.1 Vowel introduction
4.2 Spectrograms
4.3 Vowels as acoustic regions
4.4 Cardinal vowels
4.5 Secondary properties
4.6 Diphthongs

(4) Help System

For users who are very unfamiliar with computers, we have attempted to make the program as straightforward as possible, with tips and hints shown from time to time. However, when these hints are insufficient, the Help System is just a click away. This section of the program contains an expanded explanation of every section of UCPI, and will hopefully be sufficient for any user to use the program.

(5) Glossary

The glossary is an idea that arose from a presentation of the program earlier in the year. It has not been implemented yet, but the idea is to give users access to the concepts, in a manner similar to that of the Index of a textbook. It will be a list of terms that are covered in the Backup Course, and possibly also of languages demonstrated and phonetic properties covered. A single click will take the user to the corresponding point in the program, whether within the Backup Course, or at a language's information page, or somewhere in the Phonetic Property tree.

(6) IPA Charts

The International Phonetic Alphabet is the standard used in the transcriptions in UCPI. As such, this section of the program is a complete list of symbols and diacritics

from the IPA. The charts are an adaptation of the IPA chart (revised to 1993, corrected 1996) and the IPA charts in Pullum and Ladusaw's *Phonetic Symbol Guide*. Since the IPA symbols are simply shown, not typed by the user, this section is correspondingly succinct.

(7) Individual Language Word Lists and Custom Word Lists

The word lists are essentially the heart of UCPI. There will be a Language Word List for each of the languages stored in the program. Here, students will be able to learn more about the sounds and patterns of that language, as well as finding items to construct their Custom Word Lists out of. The Custom Word Lists are lists the users build themselves out of words from various languages. A student could, for example, collect words with clicks, or uvular sounds, or any other property that is relevant to the study of phonetics, from as many languages as UCPI contains to demonstrate those.

We have included many of the basic playback functions that the SOWL program has. The options for playback are listed in Table 1. Note that the "Speech Sample" and "Add to Custom List" buttons are only available in the Language Word List section, and the "Delete from Custom List" button is only available in the Custom Word List section.

Table 1.

Button Name	Type	Function
1. Play All	Simple button	Plays all the words in the list sequentially.
2. Speech Sample	Simple button	Plays the sample of spontaneous speech.
3. Compare Two	Checkbox	Allows user to compare minimal pairs.
4. Three Repetitions	Checkbox	Causes every word played to repeat three times.
5. Broad Transcription	Checkbox	Displays broad transcription of word selected.
6. Narrow Transcription	Checkbox	Displays narrow transcription of word selected.

To play a single word once, the user simply finds that word in the word list (under its English gloss) and uses the mouse to click on it. The word is played back. If the "Three Repetitions" checkbox is checked, the sound plays three times. The rest of the buttons are equally self-explanatory in their names, as Table 1 shows. The options to display or hide the transcriptions help students test their transcription skills easily, at either the broad, easier level or the narrow, more precise level of detailed transcription. Using the "Compare Two" checkbox, users can listen to minimal pairs to further hone their listening skills. The "Speech Sample" button plays back a stretch of continuous, spontaneous speech in the given language, to give users a feel for the rhythm and sounds of that language. Clicking on "Play All" will take the user through a recitation of the entire list of words, one after another, to summarize the list before and after the actual transcription practice, or simply to further become used to the sounds of that language in a general sense. The last of the functions to be discussed here are that users, after constructing their own lists, can save them on the hard drive. These can then be accessed later, along with the Preset Custom Lists, which the builders of the program will be setting to demonstrate some of the phonetic properties covered.

CONTINUING WORK

The main programming of UCPI has nearly been completed. Once this is finished, all that will remain is for the sound reels that have been recorded by the phonetics lab to be transferred to the computer, and the final tests to be made. The current tentative schedule is to have this completed over the winter term—January to April 1998—and ready for use by May. Once completed, the program will be released on CD-ROM for both IBM compatible and Macintosh computers, and sold at cost to students of the University of Calgary. We also intend to make it available to other institutions, as we believe its use will not be limited to a single curriculum.

REFERENCES

Ladefoged, Peter and Ian Maddieson. 1996. *The sounds of the world's languages.* Cambridge, Massachusetts: Blackwell Publishers Inc.

Ladefoged, Peter. 1982. *A course in phonetics* (Second Edition). New York: Harcourt Brace Joranovich.

Pullum, Geoffrey K. & William A. Ladusaw. 1996. *Phonetic symbol guide.* Chicago: The University of Chicago Press.

UCLA Linguistics Department. 1991. 'Sounds of the world's languages'. HyperCard stacks. Los Angeles: UCLA.

UCLA Linguistics Department. 1992. 'Sounds of a course in phonetics'. HyperCard stacks. Los Angeles: UCLA.

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Var mı, yok mu? ("Does it or doesn't it exist?"): The Altaic dilemma (or: Aru, nai?)

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0 INTRODUCTION: WHAT IS A LANGUAGE FAMILY?

This paper is an overview of arguments for the relatedness of the two languages demonstrated in the title - Turkish and Japanese - and the series of language groups between the two, including the rest of the Turkic languages, the Mongolian and Manchu-Tungus families, and Korean, the close sister of Japanese. Before diving into the specific arguments for and against relatedness of the languages in question, it may be beneficial to think about what we mean by a language family.

We as linguists have a fairly rigorous way to define the spoken language of a person in a systematic way. After that point, we tend to get confused. What is a language, as spoken by a community? How is it different from a dialect? A *language family* is generally defined as a group of one or more languages, all directly derived from a single common historical language by means of natural historical-linguistic changes. Out of this definition, we can build methods of determining members of a common linguistic heritage - a language family - even when the parent language is no longer spoken in its original form. The problems with the definition of language families are that, first, the definition of a *language* is problematic at best, and second, not every language is derived from a single previous language. Take the case of creoles: most people, Bickerton (1990), Lefebvre and Lumsden (1990) among them, agree that Haitian Creole was born of both Fon-Ewe *and* French. Whatever the details behind the birth of this creole, it indisputably arose from processes as natural as those that generate other languages, such as English, from previous languages, such as proto-Germanic. If you agree with Lefebvre and Lumsden that this creole is simply the result of an intense case of lexical borrowing (coupled with the phonological simplification characteristic of pidgins and creoles), where the words of the superstratum language are imposed on the syntax and morphology of the substratum language, then it isn't even remarkably different from English, in which there is a high proportion of French words superimposed on the Germanic core. With respect to the family discussed in this paper, Japanese shows evidence of being an ancient creole created by contact between an Altaic language and an Austronesian language (Shibatani 1990). Even if this were true, though, the Altaic components are meaningful to an analysis of the Altaic language family.

Even given the uncertainty of creoles, though, we are confident that, generally, members of a language family can be said to be derived from one *core* language. The process of divining which languages are members of a family is still confounded by the fact that nothing can be actually tested and proven (or disproven). We can only gather evidence from all the various traces that a past civilization leaves - biological traces in the genes of descendent peoples, archaeological traces of migrations from a common point, cultural traces such as religion, and linguistic traces in their speech. As linguists, we approach this problem with a focus on the speech of the modern descendants of the

ancient unity, but we must always keep an eye on the other aspects. To ignore a crucial piece of evidence just because it is not within one's field of specialty is to devalue the entire endeavour, which is, at best, already a matter of very educated guesswork.

With this in mind, I will introduce the topic of this paper. Among historical linguistic studies, there is a great range of theories - from the firmly and almost universally accepted Germanic family, which includes mainly the German languages, Scandinavian languages, and English, to the almost universally denied Nostratic, a language family purported to reach across Europe, Asia, and India. Somewhere between these two extremes of certainty is Altaic. The Altaic family is a hypothesized genetic unity including the subfamilies of Turkic, Mongolian, and Manchu-Tungus, as well as the fringe languages of Japanese and Korean. The great geographical expanse of these languages encourages scepticism until one considers that Indo-European is said to reach from Icelandic to Hindi[1]. The origin of the Altaic family has been established in the vicinity of the Altai Mountains, from which the family gets its name. Menges (1968) gives a more thorough description of this origin, and the issue of the name "Altaic" (see section 5 of this paper). The initial divergence of the Altaic languages can be traced back about four millennia, to the beginning of the second millennium B.C., so there have been plenty of time effects and language contacts to obscure the nature of the original Altaic language and make the investigation of that language all the more interesting.

Having had less attention in studies of historical linguistics than Indo-European, the existence of the Altaic family is still hotly debated among scholars. Individuals such as Sir Gerard Clauson and G. Doerfer deny its existence outright and strive to explain the correspondences among the given languages away in other ways. Sceptics like Robert Austerlitz and A. Róna-Tas withhold judgement on complaints that reliable evidence is far too scant to conclude anything yet. Others, such as Nicholas Nicholai Poppe and Roy Andrew Miller, have applied modern comparative methods to the problem and decided that a genetic unity does, indeed, exist, and all that remains to be done is to flesh out the nature of that unity and, eventually, reconstruct the proto-language that birthed the modern descendants.

With that, an overview of the issues involved in the Altaic debate is in order.

1 OVERVIEW

The languages of the Altaic family have been alternately proposed as members of various far-flung families. Shibatani (1990) lists a number of theories which have received varying levels of acceptance, all suggesting where Japanese came from. The list ranges widely: the Altaic connection, with which this paper is principally concerned; the Malayo-Polynesian connection; the Indo-European connection; and other ideas connecting Japanese with Sumerian, Greek, or others. The Altaic and Malayo-Polynesian (or Austro-Asiatic) hypotheses seem to be the most widely accepted, leading to two more possibilities that Shibatani mentions: one is that Japanese "consists of an Austronesian

[1] Miller (1991a & 1991b) makes much of the fact that the opponents of the Altaic hypothesis ignore parallels to the well-established and accepted Indo-European.

substratum and an Altaic superstratum"; and the other is that it is a hybrid between these two families - something like an ancient version of the creoles mentioned earlier. This is supported by Loveday (1996), who only regards two hypotheses as being very viable: 1) that Japanese emerged from a pidginization and creolization environment when proto-Austronesian met proto-Altaic; and 2) that Japanese has a strong Altaic base, with a large number of Austronesian borrowings early on. Shibatani (1990:105) lists a few isoglosses which prove that, at the very least, historical contact resulted in some degree of borrowing from Austronesian into Japanese.

Alternative explanations of the origin of the other Altaic languages - Turkic, Mongolian, Manchu-Tungus - are rare. Anti-Altaic consensus seems to be that cognates across these languages are borrowed from a central *proto-Turkic* (which appears, coincidentally, to have much in common with the reconstructed proto-Altaic, according to Miller's 1991 paper). This is problematic because of the great geographical range of the family - from Turkey to the exceptionally isolated islands of Japan. Evidence of peripheral retention also highlights the anti-Altaic arguments as unnecessarily complex. So for now, the only hypothesis (and, as Miller (1991a) points out, such historical reconstructions must always remain hypotheses) that exists to be seriously considered, at least with respect to Turkic, Mongol, and Tungus, is the Altaic hypothesis, and the details of reconstruction pertaining to that.

1.1 Phonology and the Lexicon

In order to figure out the system of phonological correspondences between members of a language family, a significant base of cognates must be known. To establish a significant base of cognates in such an old language family as Altaic, some pattern of phonological correspondences must be known. This "chicken-and-the-egg" problem can be daunting, and it has, indeed, left its share of casualties in the form of sceptics and doubters along the development of the Altaic question. However, with a careful combination of inductive and deductive reasoning, study of the Altaic languages has brought forth a reliable set of correspondences from which a larger common lexicon can be hunted down, which will lead to a more thorough understanding of the phonological relationships.

This problem of cognate scarcity is daunting enough, considering the geographical expanse that the family covers. But on top of that is the fact that many of these cognates can be demonstrated to be more recent borrowings between the languages. However, by a concentrated effort to focus only on the (admittedly problematic) core words - kinship terms, body parts, and so forth - this smokescreen of borrowings can be at least somewhat cleared up. **Section two** deals with the various phonological and lexical arguments as put forward by both the Altaicists and the anti-Altaicists.

1.2 Morphology

Though lexical items are relatively easy to borrow, affixes are not. For this reason, morphological correspondences can provide very firm evidence for genetic affinity. Since phonetic changes tend to warp affixes greatly, a good basis of phonological

changes (**section two**) is very helpful before diving into the quagmire of determining morphological cognates. There are a number of such cognates that have been demonstrated among the Altaic languages. These will be discussed in **section three.**

1.3 Syntax

Unfortunately for comparativists, not all areas of linguistic typology can give us reliable backing in proving or refuting the existence of a language family. Syntax is one of those questionable areas. Just because two languages show a head-final, SOV word order doesn't necessarily mean they are related. The fact that the Indo-European languages generally demonstrate SVO word-order is probably due more to the fact that they have had a lot of areal contact than the fact that they are historically related, according to Ritter (pers. com.). Similarly, though the Altaic languages tend to be SOV, this by itself does not support the hypothesis. **Section four** addresses this problem, but only briefly because the syntax is neither a good argument for nor against the relatedness hypothesis.

1.4 Non-linguistic arguments

No language develops in isolation from other factors. Speakers of descendent languages are almost always descendants of the speakers of the original language. Migrations are subject to geographical influence, and they leave their mark on the land as well as the cultures and languages they come in contact with. Evidence such as genetic comparisons between speakers of languages, archaeological proof of migration, and so forth help us to support or refute statements about the linguistic history of languages. For these reasons, linguists must be able to look beyond the language of a people to the whole picture, including all of these factors in the establishment of a viable hypothesis of language genesis. **Section five** will provide an overview of these issues and what they tell us about the origins of the Altaic languages.

2 PHONOLOGY AND LEXICON

2.1 Phonology against lexicon

When dealing with such an ancient linguistic unity as Altaic, lexical cognates can be quite obscured by phonological shifts. They have also become more scarce, due to large amounts of loanwords, from within and from without the Altaic sphere. The change can be seen, in fact, in the title to this paper. The Turkish phrase and the Japanese phrase are literal translations of each other, and happen to contain two cognate words - the existential affirmative and negative. Japanese has (at least in the informal register used here) lost the question particles, which may not be directly related to the Turkish ones after all, and other phonetic events have further twisted the similarities until, to the untrained, or even reasonably sceptical eye, the phrases bear little resemblance other than meaning. The Altaic roots of the "*var*"/"*aru*" and "*yok*"/"*nai*" isoglosses shown by Miller (1971) are given in the morphology section of this paper. In order for Miller and colleagues to derive those morphological tendencies, though, a system of phonetic

correspondences was required. In order for a system of phonetic correspondences to be found, a sufficient base of cognates had to be found. To find these cognates, some understanding of the phonetic correspondence was needed. Among the 'casualties' that this dilemma has caused is the eminent Sir Gerard Clauson, whose disillusionment is described in Miller (1991a) as being a result of his inability to read an ancient Mongol text with his thorough knowledge of modern Turkish. However, once individuals such as Ramstedt, Poppe, and later Miller (1971) had plowed through massive amounts of data and come up with some correspondences, all that truly remained to pin down were the details. Some of those details are described below.

2.2 Cognate scarcity

As a result of phonetic change, borrowings, and semantic shift muddying the waters of comparison, Altaicists must be especially careful in selecting their motes of evidence to prove the ancient unity. The Altaic sceptic, Róna-Tas, introduces his 1975 article with a list of reasons why a given word may be cognate between two languages:

> 1. Historical contacts, 2. Areal convergencies, 3. Typological parallelisms, 4. Convergencies of independent origin, 5. Chance, 6. Genetic relationship. Our approach to the correspondences due to genetic relationship can be scientifically justified only if we go ahead and remove the correspondences caused by the first five other reasons. (Róna-Tas 1975:201)

This list is quite similar to one proposed by Doerfer, an anti-Altaicist, which is reviewed in Miller's summary of the Altaic debate (1991a:300-301). Doerfer's reasons are essentially the same as those of Róna-Tas, except that he neglects to mention the typological parallelisms - such as the fact that agglutinating languages will tend to have vowel harmony, as is exemplified in the Altaic family. The claim by Róna-Tas that we must rule out all other possibilities before we can say for certain that a word is a legitimate historical cognate is valid; because nothing is absolutely certain in the field of historical reconstruction, it is important to temper the possibility for random mistakes by being as critical as is practical. The scarcity of cognates we have, due to the expanse of time over which the Altaic languages have been diverging, is enough of a problem - we do not want to pollute it with an incautious analysis of those few that do exist.

2.3 Issues of phonological correspondence

The practice of establishing cognates between languages is not simply a matter of finding words that sound similar and have similar meanings. In order to rigorously defend the relatedness of languages, a *regular* system of phonetic correspondences must be found among words from the different languages. Except for a few pseudo-linguists who throw out wild proposals on such newsgroups as R. F. Hahn's well-intentioned *AltaiNet*, most linguists will agree that this is necessary when reconstructing a proto-language. However, regular phonetic correspondences are not enough. Róna-Tas (1975) demonstrates this in a specific investigation of a word borrowed from Mongolian to

Chuvash since the divergence of the Altaic languages. It is daunting to try to approach the matter of comparison in the face of the possibility that any cognate may be a borrowed word. However, given some set of rules by which we can sort out borrowed words from true historical cognates, this smokescreen that is a favourite argument of anti-Altaicists can be cleared somewhat.

One of these rules is the idea of *core words* - words that are less susceptible in languages to borrowing than others. Among these words are terms for body parts, which Miller (1991a:296) assures us constitute one of the most reliable sources of cognates among the Altaic languages. These words are generally used much more frequently than other words, and also tend to be among the closed-set lexical categories: prepositions, pronouns, determiners, and such. Among Altaic languages, pronouns are especially handy. Not only do they demonstrate phonological correspondences, but they reflect a syntactic peculiarity of proto-Altaic, as demonstrated by Miller (1971:155-178), that further cements the argument of historical relatedness.

Another way of winnowing out borrowings from true Altaic cognates is to refer to the concept of *peripheral retention*, as Miller (1991a:305) does. The basis is that recent history has shown that peripheral forms of a language will tend to preserve older forms, while the inner languages will be more innovative. The argument for comparative reconstruction is that, if you see a common form at the geographical edges of a language family, and a different form - often more innovative than the other - exhibited in the inner languages, then it is more likely to be derived from a common ancestral form, later changed in the central region of the family, than to have been borrowed from one end straight to the other end of the geographical area. An example of peripheral retention in Altaic is the four-liquid system of proto-Altaic and its reflexes in the modern languages. This will be discussed in the next section.

2.4 List of phonological correspondences

Miller (1971) has summarized the reconstruction work so far in the Altaic languages, especially with respect to Japanese. In his appendix, he lists the known information about the proto-Altaic phonetic system and the reflex forms in the descendent languages. He claims that proto-Altaic had a system of nine vowels with a two-way length contrast and eighteen consonants. This set of phonemes is shown in table 1.

Table 1: The phonetic set of proto-Altaic.[2] (adapted from Miller 1971:49-50)

Consonants:

p b	t d	ʧ ʤ	k g
	s		
m	n	ɲ	ŋ
	l_1 r_1	j	

l_2	r_2

Vowels:

i	y	ɯ	u
i:	y:	ɯ:	u:
e	ø	ɘ	o
e:	ø:	ɘ:	o:
	a		
	a:		

Note: The precise phonetic nature of the l_2 and r_2 is uncertain.

Of these consonants, most are unremarkable, having undergone little change besides some standard processes of lenition, gliding, and palatalization in the various Altaic languages. The **p* in initial position has become a fricative in many languages, including Japanese and Turkish. It has remained as *p* in other languages - specifically the Tungus languages of Goldi, Olcha, and Orok; and Korean. The Japanese, Korean, Manchu, and Mongolian examples in (1) show their reflexes (Old Japanese *F*, Korean *p*, proto-Korean-Japanese **p*, Manchu *f*, Mongolian *Ø* from proto-Altaic word-initial **p*):

(1) pA **pyl* > Mo. *ylije-* 'blasen', Ma. *fulgije-* 'id.', K *pul-*, MK *pil-* 'blow', OJ either *Fuk-* 'blow' (pKJ **pɔlg-*) or *Fur-* '(rain, snow) fall, come blowing' (pKJ **pɔr-*), or possibly even with OJ *Fir-* 'break wind'. (Miller 1971:52)

The two velar phonemes, **k* and **g*, have remained virtually unchanged, except that in Mongol and Turkish they have split into a fronted pair and a back pair of allophones, corresponding to the tongue position of the immediately following vowels (Miller 1971:52).

More interesting is the problem of the unique four-liquid contrast that has been established for proto-Altaic. Early research in this field revealed a correspondence between Chuvash, Mongol, and Manchu-Tungus forms with *l* and Turkic, Korean, and Japanese forms with *š* or *s*. Some of these reflexes are shown in examples (2) to (4).

(2) pA **dal$_2$i-* > Mo. *dalda* 'heimlich, verborgen', MMo. *dalda* 'Schirm, Schutz', Ma. *dali-* 'verdecken, die Sicht verdecken, verbergen, verheimlichen', Ev. *dal-* 'bedecken', OT *yaʃur-* 'verdecken, verheimlichen', OJ *yasi-rø* 'enclosure for worship of native deities; later, buildings erected within that enclosure'. (Miller 1971:116)

(3) pA **al$_2$* ~ **pal$_2$* > Uig. *aʃuq* 'to hurry, be quick', Tar. *aldɨra* id., OJ *Fasir-u* 'run', K *pal* 'foot', pKJ **vaʃyi* or **(p)aʃyi* (Miller 1975:166)

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[2] To be notationally accurate, all of these phonemes would be asterisked as hypothetical. The asterisks have been omitted here as they would unnecessarily clutter the diagram.

(4) pA *bal_2- > Tk. *baʃ* 'Kopf', Chu. *pusʲ* 'Kopf, Anfang', Go. *balča, balǰa* 'Kopf, Gesicht', K *məli* 'Kopf', OJ *Fasi-ra* 'main pillar, support of a building' (*-ra* in OJ is a locative suffix) (Miller 1971:118)

Likewise, the languages of Chuvash, Mongol, and Manchu-Tungus (the "inner languages" when discussing peripheral retention in the Altaic family) demonstrate an *r* where the others (the "outer languages") have *z* (or, in the case of Japanese, other alveolar consonants). Examples (5) and (6) exemplify this correspondence.

(5) pA *$omor_2u$ > Tarj, Turk *omuz* 'shoulder', Chu. *ămăr* 'chest, breast', Khak. *omɪrɪɣ* 'front part of the chest (of horses)', Mong. *omuruɣu(n)* 'sternum, clavicle; breast', OJ *omotaka-* 'horse with head held high' (Miller 1975:162)

(6) pA *$ɲaːr_2$ > Mo. *nirai* 'fresh, new, newborn', Ma. *ɲaːrxun* 'green, fresh, new', Chu. *sʲur* 'spring (season)', OT *jaz* 'spring (season)', OJ *natu* 'summer', K *yəlim*, MK *nyəlim, nyələm* 'summer', pKJ **nʏalɔm* (Miller 1975:159)

Comparing the reflexes of *l_2 and *r_2 in the modern languages to the reflexes of *l_1 and *r_1, we see that there must have been a contrast, even though the nature of that contrast (allophonic or phonemic) and the precise phonetic nature of *l_2 and *r_2 is not known. Example (1) above shows how *l_1 (often, as here, transcribed simply as **l*) has descended unchanged into the modern languages, allowing for the fact that Japanese and Korean have each developed a system of only one liquid. Examples (7) and (8) show a parallel example for *r_1.

(7) pA *er* > Mo., MMo. *ere* 'Mann', Chu. *ar* 'id.', OT *er* 'Mann, Gatte' J *aru, are* 'that one' (Miller 1971:122)

(8) pA *$\widehat{dʒ}ur$- > pKJ **turxye*, MK *tulh* 'two', J *ture* 'companion' (Miller 1971:122)

This system of four liquids is summarized in table 2, along with the standard transcription symbols for the proto-Altaic forms. Please note that, though *l_1 and *r_1 are considered to be phonetically a standard liquid and rhotic, the phonetic nature of *l_2 and *r_2 are by no means certain - ideas range from phonetically parallel forms such as Doerfer's *$\underset{\frown}{l}iɛ$ and *$\underset{\frown}{r}iɛ$, cited by Miller (1991a:315) to something like *$ɬ$ for *l_2 and *$ɮ$ for *r_2.

Table 2: Altaic four-liquid reflexes. (from Miller 1971:122)

proto-Altaic	Tk.	Chu.	Mo.	Tg.	pKJ	K.	J.
*r_1	*r*	*r*	*r*	*r*	**r(x)*	*l(h)*	*r*
*r_2	*z*	*r*	*r*	*r*	**r*	*l*	*r,t*
*l_1	*l*	*l*	*l*	*l*	**r*	*l*	*r*
*l_2	*š*	*l*	*l*	*l*	**š*	*l(s,h)*	*s(i)*

At first it was thought that perhaps the phonetic processes of *lambdacism* (changing from *š* or *s* to *l*) and *rhotacism* (changing from *z* or similar sounds to *r*-like sounds) were taking place. Alternately, it was proposed that the reverse processes of *sigmatism* (the reverse of lambdacism) and *zetacism* (the reverse of rhotacism) may more accurately describe the alternations seen. Subsequent work, notably that of Talât Tekin (1975), has established that the latter is more firmly supported by the evidence. The precise relationship between the *l* and the *r* that became sigmatized (or in some instances, *shigmatized*) and zetacized and their counterparts which did not is still uncertain, as noted by Miller (1996). The symbols l_2 and r_2 are used on the basis that their phonetic nature is probably fairly closely related to that of their counterparts, l_1 and r_1, whose reflexes in the descendent languages are pretty uniformly just *l* and *r*, respectively. However, beyond this somewhat general description that $*l_2$ has something to do with *l* and $*r_2$ had something to do with *r*, nothing concrete is known.

Despite the details remaining to be nailed down, though, the matter of zetacism and sigmatism remains a quite convincing argument for the existence of an earlier Altaic unity. Just the fact that two languages such as Turkish and Japanese both preserve evidence of a previous four-liquid contrast - a rare occurrence in the world's languages - is enough to make us take note. Adding to this the almost trivially straightforward correspondences that Miller (1971) and others have established for the other consonants, as well as other evidence referred to in this paper, it is difficult to believe otherwise than that these two languages, along with the numerous others between them, are part of an ancient linguistic unity.

2.5 Conclusion - validity of correspondences

Taking the example of the four-liquid system (whose precise phonetic details are uncertain but not necessary to demonstrate relatedness), we can show that peripheral retention has given us a secure morsel of evidence in support of the Altaic theory. If we accept that the languages are historically related, we can imagine a situation where, as the languages began to diverge geographically, carrying with them a phonological system which contrasted two *l*-like sounds and two *r*-like sounds, a shift began at the core of the language which neutralized the contrast, collapsing these contrasts into one *l* and one *r*. This innovation spread out, stopping at the edge of the historical Turkic languages (we can see that the Turkic fringe language of Chuvash experienced this innovation, whereas the other Turkic languages did not) and at the Manchu-Tungus languages at the other end. This left the periphery - the rest of the Turkic languages, and proto-Korean-Japanese - with the contrast, which then phonetically diverged in processes that have been labelled 'zetacism' and 'sigmatism', *preserving the contrast*. The alternative, which the anti-Altaicists espouse, is that the proto-Turkic language, from which all "Altaic" borrowings are said to originate, lent words into proto-Mongol, which then passed them on to proto-Manchu-Tungus, and from there proceeded to proto-Korean, and was somehow passed across to the islands to end up in proto-Japanese. Then, by some incredible coincidence, the intervening language families merged these four liquids into two, and the two ends - the source of the borrowings and the farthest-removed languages from it - developed parallel forms different from that. This is a perfect example of why

we invoke the idea of peripheral retention to defend the existence of a language family, where in its absence all manner of complex nonsense would be proposed to account for the forms. From these correspondences - listed in table 2 and exemplified in items (1) through (8) - we can define the periphery and core of Altaic with respect to the collapse of the liquid system as follows. The periphery - the languages preserving the four-way contrast - consists of the Turkic languages except Chuvash[3], and Japanese. The core, or inner languages, are Chuvash, the Mongol languages, Manchu, Goldi (a Tungusic language), other Tungusic languages (not demonstrated here), and Korean. The fact that we can delineate the periphery with respect to this change - with allowances for the fact that the border between inner and outer languages may have had subsequent influence back and forth - is strong evidence for the relatedness of the entire range of languages here.

3 DISCUSSION OF MORPHOLOGICAL ISSUES

3.1 Importance of morphology.

Morphology, as was mentioned above, can be a significant factor in telling whether or not languages are related. Of the six sources of lexical cognates listed by Róna-Tas (1997:201), chance and genetic affinity are the only two which are at all likely to apply to morphological cognates. There are exceptions to this, of course, but these are far more rare than the borrowing of lexical items. Miller (1991a:308-9) praises Ramstedt for his work on establishing a list of morphological correspondences between the Altaic languages. This does, indeed, bode well for the Altaic hypothesis.

3.2 List of established morphological correspondences.

In his 1971 book examining the Altaic linguistic family in light of Japanese correspondences, Miller lists a number of significant morphological correspondences. The support this gives for the Altaic hypothesis is undeniable. Two examples are the morphemes of existence, shown in examples (9) and (10), both from Miller (1971:37,284):

(9) pA **er-* > OT *bar-*, J *ar-u* affirmative existential: 'to have, to be, to exist'
(10) pA **ja-k-* > OT *joq*, J *na-k-* negative existential: 'to not have, to not be, to not exist'

From the OT *bar*, we get the modern Turkish *var*, which in the title of this paper corresponds to the Japanese *aru*. The OT form *yoq* is the modern *yok*, which parallels the Japanese *nai*, derived from *na-k-*.

Miller also gives an involved description connecting Japanese interrogatives to the other Altaic languages. Miller's argument centers around the fact that both Turkish and

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[3] Example (4) seems to be an exception to the evidence that Chuvash is a *core* language. Perhaps this is from influence from the other Turkic languages.

Japanese show reflexes of the proto-Altaic "what?" morpheme, **ja:(-n-)*. From this form, Old Turkish *ne, nen* (Turkish *ne*) and Japanese *nani, nan-* are descended, with the same meaning (Miller 1971:196-8). The incorporation of these and other question morphemes into words of the descendent languages is the subject of an extended discussion by Miller. He shows how the proto-Altaic **ja:* form, in various suffixed constructions, has come down into other Altaic languages on page 190 of his book: pA **ja:g-*, to Mongolian *jayun* "what?"; pA **ja:n-*, to Mo. *jambar* (Middle Mongolian *jan*) "what kind of, what sort of?"; pA **ja:m-*, to Evenki *e:ma* "what kind of?"; pA **ja:du*, to Evenki *e:du*, Lamut *ja:du* "why?", and Goldi *xaidu* "where?".

Other morphological cognates are demonstrated in Miller's work, such as the gerund form of verbs, whose Japanese and Old Turkish cognates are shown in example (11). The Turkish form is used in adverbs of manner. The Japanese is labelled *gerund*, but Miller says that this may be misleading - its usage is almost identical, semantically, to the Turkish form.

(11) pA **-ti* > OT *-ti/-ti, -di/-di*, J *-te, -de* (Miller 1971:285-292)

Another correspondence, also shown by Miller, is that of the instrumental morpheme, shown in example (12).

(12) pA **-n + te* > OT *-da,-de,-ta,-te*, J *ni te* (from intermediate **ni ta*), pTung **d͡ʒi* > Ma. *de* (Miller 1971:285-292)

Here, you can see that the Turkish and Manchu-Tungus forms have lost the initial proto-Altaic **-n*, but semantic arguments support that it was there in the proto-Altaic forms.

In his paper reviewing the work in and against the Altaic field, Miller refers the reader to Ramstedt and Poppe's work establishing the set of morphological correspondences among the Altaic languages (Miller 1991a:309). The correspondences given here add up to a convincing argument for the Altaic unity, especially considering that most of them show direct correspondences between the two most distant languages of the family - Turkish and Japanese.

3.3 Conclusion of morphological evidence

As has been shown, there are secure morphological correspondences among the Altaic languages. In the face of evidence such as these morphemes listed above, as well as other correspondences that have been established by Altaicists such as Ramstedt, Poppe, and Miller, it is very difficult to deny that these languages are genetically related. The fact that the phonetic differences among these morphemes correspond to the established phonetic correspondences between these languages only reinforces the continuity that has proceeded from the original proto-Altaic language down to the modern languages.

4 DISCUSSION OF SYNTACTIC ISSUES

In his overview of Altaic linguistics, Miller (1991a:308 and 1991b:33) laments the fact that the syntactic issue has been virtually ignored by all sides of the Altaic debate. At most, it is often mentioned that the languages in question demonstrate SOV word-order. Miller goes beyond this to say that the Altaic languages are similar in a more significant sense than that - they are all characterized "by a highly specific variety of nominal predication". Though it is an interesting point that Miller raises, McLennan (1996) demonstrates that this sort of syntactic classification is more a reflection of the common universal grammar than a result of genetic correlations. So although the commonality among the Altaic languages on this point is interesting, it can carry little if any weight in an argument for or against genetic unity.

Although any analysis of the Altaic languages is bound to mention syntactic properties, since syntax is an integral part of any language, this mention cannot go beyond the level of description. Shibatani (1990:96) includes a list of properties that are said to be common among the proposed Ural-Altaic family. Since these properties are mainly syntactic and therefore typologically immaterial to discussions of monogenesis, and since a dismally small number of Ural-Altaic cognates, mostly questionable, exists, this family has received even less recognition than Altaic. The syntax argument just doesn't work.

5 DISCUSSION OF NON-LINGUISTIC ARGUMENTS

The fact that the Altaic peoples have been nomadic throughout recorded history makes it difficult to establish any archaeological certainties about them. There were no great Altaic cities, no lasting sedentary agricultural societies . . . none of the things that distinguish sea-side civilizations and those that live on arable, productive land. Menges, in his 1968 study of the Turkic peoples, is forced frequently to define the Turks (and their ancestors, the "Altaijans") in terms of the civilizations that border them and how the Altaijans have affected these cultures. Also, as far as recorded history goes, these neighbouring people - the Chinese, the Indo-Europeans, the Dravidians, and so forth - are the ones we must rely on for written evidence of the "barbarians" who lived in the open expanses of Inner Asia. These accounts are generally vague and subjective, which is understandable but frustrating. We cannot use them to trace the various groups of Altaijans back to one original nation of people (or alternately, to distinct nations or communities, as the anti-Altaicists would expect).

The establishment of historical movements is perhaps best approached from the point of view of a linguist, as by Menges (1968). He explains how certain linguistic borrowings across the borders between Altaic and Indo-European in the west, and Uralic in the north, give some evidence to the times and extent of contact between these groups. Given that the languages are the largest bodies of data that seem to have survived from those ancient days of the Altaic unity, it is not very surprising that linguistic evidence constitutes the bulk of relatedness arguments. The internal structure of the Altaic family, for example, is clearly delineated into the Turkic, the Mongolian, the Manchu-Tungus, and the Japano-Korean groups. This would tend to imply an early divergence where the

proto-Altaic-speakers drifted apart into roughly four linguistic communities. Miller (1971:44) diagrams this, suggesting that proto-Altaic first divided into a western and an eastern dialect. The western one developed into the modern Turkic languages. The eastern grouping further divided, leaving proto-Mongol and another community which diverged into proto-Tungus and proto-Japano-Korean. These divisions are based almost entirely on linguistic evidence, though this series of divisions and subdivisions suggests a geographical expansion away from a homeland in the area of the Altai Mountains. The geographical origin of the Altaic languages and peoples is supported by Menges:

> For the times prior to the separation and differentiation from the primordial nucleus groups of Altajic, which were later to become the four[4] Altajic divisions mentioned above, a habitat must be assumed which probably comprised all of the Central Asiatic steppes, so that the term "Altajic" languages is actually justified, since it designates that group of languages spoken around the Altaj Mountains, in a wider sense of the term, in this case on the steppes extending to the south around the Altaj. . . . The term Altaj and Altajic is very handy if understood in the above-defined, larger, not too literal sense. (Menges 1968:57)

The internal relatedness of the various branches of Altaic - Turkic, Mongol, Manchu-Tungus, and Japano-Korean - seems fairly well-established, and based as well on existing historical records and archaeological evidence. The Turkic languages in particular are the most researched, least disputed group. The Mongol languages, to the east of these, are also internally secure in their relationship. Beyond that, the Manchu-Tungus family is a unit. Martin (1991) uses his in-depth knowledge of the languages to further cement the almost universally accepted fact that Japanese and Korean form a loose sub-family. Japanese is problematic in this matter, since it has a number of isoglosses with the Malayo-Polynesian languages, as demonstrated by Martin (1991:105).

Using these four groups to develop intermediate proto-languages - proto-Turkic, proto-Mongol, proto-Tungus (also called proto-Manchu-Tungus), and proto-Japano-Korean - would seem to be a natural way to progress toward a reconstruction of the original Altaic language. However, as Miller (1991a:299) complains, Altaicists are accused of using three jokers to win the hand (excluding proto-Japano-Korean). While it is true that with every stage of historical separation, the possibility of error increases, the result of such thorough comparative methods of reconstruction as have gone into the establishment of these three proto-languages (as well as the proto-Korean-Japanese that Martin's work helps to establish) can hardly be compared to drawing random wildcards.

At the east end of Altaic, the position of Korean and especially of Japanese in the historical structure of the family is uncertain. Korean, being more closely tied, geographically, to the Asian continent and the other Altaic languages, seems to

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[4] Menges (1968:56-57) includes the Hunnic group as a fourth branch of Altaic, in the south and southwest of the original Altaic geographical area, but that is not dealt with here, because this group is not mentioned in any of the other literature. Also, he excludes the Japano-Korean languages with little more than a comment of dismissal.

demonstrate a more firm connection to the Asian languages than does Japanese. This may also be due to the fact that, as Shibatani (1990:103-114) explains, Japanese seems to demonstrate significant layers of isoglosses with other languages, among which are Dravidian, Austronesian, and Papuan. Knowing whether the Japanese language is, at its core (whatever that means), an Altaic language, or a language from one of these other sources, is not essential to our purposes here, since as Poppe points out in the introduction to Miller's 1971 book, the Altaic stratum of Japanese can still help us reconstruct this ancient language.

6 CONCLUSION

6.1 Summary of arguments.

Though plagued with layer on layer of borrowings, the lexical issue is addressed, and a firm base of common words is established, from which is built a system of phonetic etymologies to reconstruct the original proto-Altaic forms. With this grip of the phonetic nature of the proto-language, we can proceed to further flesh out our knowledge of the proto-language by examining morphological cognates, which are naturally less subject to borrowing than lexical items, though more susceptible to phonetic mutation over time. Though syntactic typology does little to help prove genetic relatedness or to reconstruct the proto-forms, it is reassuring to know that the Altaic languages do not differ significantly on this point. Beyond the language, we can use biological and socio-historical evidence as further support for the idea that the languages are members of the same family.

Taking all of this evidence together, it is clear that there was once a linguistic unity - a **proto-Altaic** - from which the modern language groups of Turkic, Mongolian, Manchu-Tungus, and Japano-Korean are descended. The precise nature of this proto-language is still being uncovered through tested and true methods of comparison and reconstruction, as the Indo-Europeanists have done with their currently less debated language family. The great time that has elapsed since this unity diverged confounds our efforts, so that there will always be some uncertainty over the nature of proto-Altaic. But that it existed, we can be fairly certain. It does not seem premature to predict that Altaic will soon take its place among the firmly established language families, such as Indo-European and Dravidian.

6.2 Discussion of approaches to language comparison.

In the study of the linguistic unity of these languages, and the reconstruction of the proto-language, it is important to pool our efforts. So perhaps this is the time to note some of the different approaches to the Altaic problem. There are linguists such as Sir Gerard Clauson, who according to Miller (1991a:294-5) seems to have been convinced of the unrelatedness of the Altaic languages because his knowledge of Turkish was of no avail in trying to read the *Secret History of the Mongols* (a text written in Middle Mongolian in the thirteenth or fourteenth century, later romanized). With him we may group Doerfer, whose lexical counterarguments to relatedness tend to involve more attention to

dictionary translations than to semantic and phonological similarity. These linguists demonstrate a dismaying disregard for established scientific methods, and should perhaps be paid the attention that such an approach merits.

Others, such as Robert Austerlitz and A. Róna-Tas, exercise a healthy, open-minded scepticism. This can be respected, since though they reserve judgement, they seem interested in the inductive method of gathering all the evidence possible, then evolving a hypothesis out of it; the others deduce, first fixing an idea in their minds, then gathering only the evidence they believe will support their idea.

The optimists - Roy Miller, Nicholas Poppe, G. J. Ramstedt, and so forth - form the other end of the spectrum, having accepted Altaic as proven on the basis of current evidence and proceeding from there to establish more detailed correspondences. It is from these people that the bulk of lexical, phonological, and morphological support for the Altaic hypothesis has come.

A balance between the logical sceptics and the logical optimists should keep the study of Altaic relatedness on an even keel, and produce a solid body of work that will, hopefully, establish a realistic and thorough view of one more aspect of the linguistic heritage of our species.

6.3 What is a language family? (revisited)

This question is returned to now because, despite all of the near-certainties and thoroughly scientific paths of inquiry that have formed the science of comparative linguistics, it still remains to be seen exactly how and why languages develop. A short list of questions regarding this problem is given by Austerlitz (1991:361):

- *Filiation*: How do dialects become languages, if this is how languages are born?
- *Meaning change*: What are its societal preconditions?
- *Panchronic rules for sound laws.*
- *Pathways of loans.* Which foreign words (*Fremdwörter*) become loanwords (*Lehnwörter*) and which do not?

All of these are relevant to Altaic, and indeed to all language families. First, how does a single language develop into separate, mutually unintelligible languages? Second, what motivation is needed for cognate words in these separate languages to shift in meaning? In what manner do sounds change over time? And finally, how do we dig through the layers of loanwords to reach the pure ore of proto-language cognates beneath? All of these questions are important, and not all of them have been sufficiently answered for us to be able to travel smoothly back along the history of languages. Until they are, languages such as proto-Altaic, which at second glance almost certainly existed, may remain the limit of our range of historical reconstruction.

REFERENCES

Austerlitz, Robert. 1991. 'Alternatives in long-range comparison'. In Lamb et al (eds), 353-364.

Berta, Arpad, Bernt Brendemoen, & Claus Schonig (eds). 1996. *Symbolae Turcologicae*. (Swedish Research Institute in Istanbul, Transactions vol. 6) Stockholm: Almqvist & Wiksell Internat.

Bickerton, Derek. 1990. 'Haitian demographics and creole genesis'. In Canadian Journal of Linguistics 35(3):217-219.

Lamb, Sydney M. & E. Douglas Mitchell (eds). 1991. *Sprung from Some Common Source: Investigations into the Prehistory of Languages*. Stanford, California: Stanford University Press.

Lefebvre, Claire & John Lumsden. 1990. 'Reply to Bickerton'. In Canadian Journal of Linguistics 35(3):221-224.

Ligeti, Louis (ed). 1975. *Researches in Altaic Languages*. (Proceedings of 1971 PIAC) Akadeiai Kiado, Budapest.

Loveday, Leo J. 1996. *Language Contact in Japan: A Socio-linguistic History*. Oxford, New York: Oxford University Press.

Martin, Samuel E. 1991. 'Recent research on the relationships of Japanese and Korean'. In Lamb et al (eds), 269-292.

McLennan, M. Sean. 1996. *The Split VP Hypothesis, Verbal Nouns, and Japanese*. An Honours Thesis. University of Calgary Linguistics Department.

Menges, Karl H. 1968. *The Turkic Languages and Peoples: An Introduction to Turkic Studies*. Wiesbaden: Otto Harrassowitz.

Miller, Roy Andrew. 1971. *Japanese and the Other Altaic Languages*. Chicago, USA: The University of Chicago Press.

Miller, Roy Andrew. 1975. 'Japanese-Altaic lexical evidence and the Proto-Turkic <<zetacism-sigmatism>>'. In Ligeti (ed), 157-172.

Miller, Roy Andrew. 1991a. 'Genetic connections among the Altaic languages'. In Lamb et al (eds), 293-327.

Miller, Roy Andrew. 1991b. 'Anti-Altaists Contra Altaists'. In Decsy, Gyula & A.J.E. Bodrogligeti (eds). Ural-Altaic Yearbook, Volume 63

Miller, Roy Andrew. 1996. 'Trk. $*l_2$, $*r_2$ and Korean'. In Berta et al (eds), 157-167.

Poppe, Nicholas. 1975. 'Altaic linguistics - an overview'. In Jakobson, Roman & Shiro Hattori (eds), Sciences of Language. Tokyo Institute for Advanced Studies of Language.

Ritter, Elizabeth. 1992. 'Cross-linguistics evidence for number phrase'. In Canadian Journal of Linguistics 37(2):197-218.

Róna-Tas, A. 1975. 'The Altaic theory and the history of a Middle Mongolian loan word in Chuvash'. In Ligeti (ed.), 201-211.

Róna-Tas, A. 1991. *An Introduction to Turkology*. (Studia Uralo-Altaica No. 33). Attila Jozsef University, Szeged.

Shibatani, Masayoshi. 1990. *The Languages of Japan*. (Cambridge Language Surveys). Cambridge: Cambridge University Press.

Sinor, Denis (ed). 1990. *The Cambridge History of Early Inner Asia.* Cambridge: Cambridge University Press.
Tekin, Talât. 1975. 'Further Evidence for <<Zetacism>> and <<Sigmatism>>'. In Ligeti (ed.), 275-284.

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The Acquisition of Voicing Contrasts in Word-Initial Obstruent Stops

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This paper presents two different perspectives on the acquisition of voicing in word-initial stops, in order to determine the patterns that children follow when acquiring the voicing contrasts of a language. The first contains a discussion based on voice onset time (VOT), the most commonly used method of testing voicing contrasts in speech. According to Macken and Barton (1980), "VOT refers to the time interval between the release of stop closure and the onset of vocal fold vibration." This section also includes a brief discussion on the influence of certain contexts during voicing acquisition. The last perspective is based on the underspecification theory presented from a nonlinear point of view, a more recent approach to phonology that relies heavily on distinctive features, in this case the features [voice] and [spread] under the laryngeal node.

The majority of data in this paper comes from English. However, other studies on voicing acquisition from various languages will be included in order to compare and contrast the voicing process cross-linguistically, to see whether there is a similar pattern among children, regardless of their input language. These other languages include Spanish, Thai, Cantonese, Mandarin, Hindi and Polish.

This paper will also argue that cross-linguistically the voiceless member of a stop pair is more common than the voiced member, and it is also acquired earlier by children. The evidence from languages like English, where the voiced member is predominant in both children's and adult output speech, challenges this statement. Therefore I think that it is important to address this statement with respect to the English language.

Terminology which will be used throughout this paper includes the three universal categories of stops: voiced stops, unaspirated voiceless stops and voiceless stops. The classification of each of these three stops is based on the length of time between the release of oral closure and the onset of glottal pulsing, or VOT. All languages show roughly the same distributions along the VOT continuum for all three categories of stops. According to adult data, voiced stops result in glottal pulsing occurring simultaneously or shortly after the release and show negative values along the voicing continuum, 'voicing lead'; voiceless unaspirated stops occur between 0-25ms after the release, 'short lag voicing'; voiceless stops occur between 40-100ms after the release, 'long voicing lag'. Any child, regardless of the language that they are first exposed to, will establish these three categories with a similar VOT value for each of them. These generalizations made by the child will eventually take on the categories of their input language.

What is known about the voicing of stops in the adult language is that different languages vary in the amount of contrasts that they allow word-initially. For example, English and Spanish differentiate between two different voicing contrasts of stops word-initially, whereas Thai distinguishes between all three of the universal voicing categories. Hindi is one of the rare languages that actually makes four voice contrast distinctions in word-initial position because it includes voiced aspirated stops, which are not included as one of the universal voice contrast categories.

Each child portrays three stages in the process of voicing contrast acquisition:

(1) No voicing distinction in terms of VOT most sounds produced between 0-30ms, 'short lag stops'.

(2) Distributions of voicing overlap, which means that a distinction is made by the child, but is not perceivable by the listener. This occurs because the contrast falls within the adult's perceptual boundaries of only one phoneme (generally voiced). This is considered the exploration stage because the VOT means for both the voiced and voiceless stops fluctuate in the child's speech because the child has not achieved total control over the laryngeal and supraglottal functions.

(3) Contrast is established. The voiced member of the pair is firmly established but the voiceless member still shows some variation. The child first overshoots the adult values of the voiceless stops by producing them with major long lag voicing before shortening the values back towards the adult target. This stage is also characterized by an increase in the long lag voicing values (as already stated) and a decrease in the voicing lead values.

VOICE ONSET TIME ANALYSIS

For clinical purposes, it is important to be able to establish a set of norms categorizing the ages when a child of a specific language should acquire a voicing contrast. To specify the exact age when a child accurately achieves the adult target voicing values is almost impossible considering the variability within each individual child. All children cross-linguistically show overlap when acquiring the voicing contrast.

English data:

The most appropriate indicator of the age of voicing contrast acquisition in English is based on the acoustic differences between phonologically contrastive pairs, such as /p/ and /b/. The earliest age shown for a child to establish the voice contrast is 1;5, but consistent progress is not noted until the age 2;0. Prior to this stage of contrast realization the children will produce most of their stops within the short lag voicing range (voiceless unaspirated). In general, based on the results of many studies, most children will acquire a stable voicing contrast by age 2;6, with the voicing contrast first appearing at the alveolar place of articulation. By the age of 3;0, the voiced member of a contrastive pair has a similar short voicing lag pattern to that of adults, but the voiceless counterpart still has a more widely dispersed VOT range.

Spanish Data:

Spanish only uses a two way voicing contrast in word initial stops, which include voicing lead (voiced) and short voicing lag (voiceless unaspirated). The voiced sounds consist of two allophones: a stop and a voiced spirant. The spirants occur more frequently than the stops in Spanish, however most descriptions of the language derive the spirants from the stops with the rule of spirantization. This rule is questionable because children acquire the spirant phones before the stop phones; thus it would be more plausible to have an allophonic rule of stopping rather than spirantization. As well, children seem to establish the voicing contrast earlier in spirants than in stops. Based on

the above assumptions, it is obviously more useful in Spanish to use the feature [continuant] when determining the acquisition process of voicing as compared to using VOT. Thus, VOT isn't as critical to the child's underlying voicing specifications as frication. Children learning Spanish do not show any evidence of acquiring a voicing contrast until after the age 4;0. This seems problematic when compared to the English data because English children have generally established adult like voicing qualities by this age. An explanation for the late age of voicing acquisition in Spanish may result from the production of voicing lead stops being more difficult to learn. However, as seen from data on Hindi, this may not be the case, because voicing lead is the second contrast acquired by Hindi children. The conclusion from this as stated earlier, is that VOT is not the most prevalent factor when determining the age of voicing acquisition in Spanish children. One similarity though between English and Spanish children is that both acquire the short lag voicing first.

Based on cross-linguistic data it is apparent that children can discriminate between short lag voicing and long lag voicing regardless of whether this distinction is made in their input language, whereas, in order for a child to distinguish between lead voicing and short lag voicing the child must have experience with a language that shows this specific contrast. This supports the Spanish data that voicing lead stops are the most difficult to produce. The data on lead voicing vs. short lag voicing is criticized because the difference in voicing is difficult to portray, and there has not been sufficient data found to adequately support this claim.

Thai Data:

Thai represents all three voiced stops in word-initial position. According to Gandour and Petty (1986) Thai children acquire most of the voicing contrast in their language by age 3;0, except for the pairs [b vs. p] and [d vs. t], but by age 5;0 all of the voicing contrasts have been acquired. Once again as compared to both Spanish and English the short lag stops are acquired first by children learning Thai. The distinction between the voiced (lead voicing) and voiceless unaspirated stops (short lag voicing) is acquired late, which supports the notion summarized by the Spanish data, that lead voicing is more difficult to acquire than long lag voicing. This statement has proved to be problematic due to the fact that it is supported by the Spanish and Thai data, yet contradicted by the Hindi data. Obviously more studies need to be done on this topic in order to determine which side of the argument is stronger. An explanation for the late acquisition of lead stops in Thai may be due to the underlying specifications of the features that pertain to the voice contrast, which would appear in a nonlinear analysis.

Cantonese Data:

Cantonese differentiates between short lag voicing (voiceless unaspirated) and long lag voicing (voiceless aspirated) in word initial stops. Like English children, Cantonese-speaking children show contrast recognition of these two stops by an early age. By age 2;2 children show a significant VOT contrast for alveolar stops. Soon after, between the ages of 2;6 - 4;0, the children produce consistent voicing contrasts at all places of articulation, but the contrasts are not totally adult-like. Prior to a child achieving the voice contrast realization, they show high amounts of overlap between the

ranges of VOT values of the two stops. This is similar to the pattern demonstrated by English children. As well, the Cantonese children generally produce a widespread pattern of VOT values for all the three possible stops, before restricting their productions to generally those in the short lag range. This is an interesting fact, because there is no evidence of voicing lead in the adult language, yet the child uses this in variation when acquiring their language. Once again this coincides with the above data from the other languages, that short lag voicing is acquired first. Aspiration was the last component of voicing to be acquired by the Cantonese subjects studied. One note regarding children acquiring Mandarin Chinese, is that they learn to produce aspiration rather early in their speech, between age 1;11 - 2;2.

From the above data it is obvious and well documented that the early acquisition of short lag voicing by children shows a universal pattern. One basis for supporting the early acquisition of voiceless unaspirated (short lag) stops cross-linguistically is that they are less complex to articulate, as compared to the voiceless aspirated (long lag) and voiced (lead) stops. Two independent articulatory gestures are needed in order to accurately produce a stop consonant; articulations allowing stop closure and release, and initiation of the vibration of the vocal cords. Production of the stops in the long lag range and lead range on the VOT continuum require more fine controlled timing between the laryngeal and stop closures. As well, adduction of the vocal cords from open to closed (oscillating) position requires more complex muscle activity during production. Timing constraints are the most important factor associated with the emergence of adult productions because a child must gradually refine these constraints in order to stabilize their productions, when acquiring all aspects of phonology. The data from Spanish and Thai point out the fact that the acquisition of voicing does not come early in all languages, which leads to the conclusion that the age of acquisition is not only variable across each individual child but it is also variable across languages.

Many studies on the contextual effects on voicing acquisition have been published. For example, segments produced in isolation show longer VOT values than segments produced spontaneously in conversation. As well, across languages, voiced segments are less common in word-final position. This may be due to glottal control differences which result in voiced segments occurring more frequently in word-initial position. The lexicon has also proved to influence a child's phonological acquisition. Tyler and Edwards (1993) proved that before contrast realization of voicing occurs, English children restrict their correct productions of voiceless stops to old words (ones already present in their system) as opposed to new words (those just entering their system). They assumed that because the old words were produced more frequently, they had a better chance of containing tokens portraying the correct emergence of voiceless stop production. After contrast realization of voicing occurs, children produce most of the voiceless tokens correctly regardless of whether the words are old or new.

NONLINEAR ANALYSIS: UNDERSPECIFICATION THEORY

The underspecification theory allows direct reference to the features specifically involved with voicing in one's speech. The features that are important in acquiring a voicing contrast are situated under the laryngeal node of the feature tree. It is important

to note that the phonological information is underspecified whereas the phonetic output is specified. The underspecification theory data that is used for English comes from the well-known study of Amahl (age 2;2). This view accounts for the acquisition of correct voice features, in order to establish a voicing contrast in the language. At the earliest stage of a child's acquisition, [voice] is shown as non-contrastive in the child's underlying representation. The basis for this assumption is that voiced and voiceless obstruent stops in English occur in complementary distribution in the child's repertoire, therefore there is no voice contrast throughout the different word positions. That is, the voiced obstruents are found in prevocalic position (both word-initially and word-medially) and the voiceless obstruents are found in word final position. To account for this distinction both of the [voice] values are underspecified in the child's underlying representation of all word positions. The following underlying rule is proposed by Dinnsen (1996) in order to fill in the corresponding values of the voice feature. "Given a prevocalic obstruent stop that is underspecified for [voice], the default value to be filled in is [+voice]; elsewhere, the default value is [-voice]." Due to the fact that all obstruent stops are underspecified for [voice], the voicing value of the stop is realized in the child's underlying representation with the above rule. Rice (1996) states that, "In the absence of distinctive laryngeal contrasts, stops are relatively free in their laryngeal realization." This indicates that a distinction under the laryngeal node is not introduced until the child's voicing contrast becomes adult-like. Once the contrast is established, the amount of variation in the child's speech decreases because only one of the stops is marked for voicing. All children will first show variability when acquiring a language because they have to deal with the allophones of segments.

At the age of 2;4 the feature [voice] became contrastive in Amahl's underlying representation but this did not result in the correct productions of all his stops. Dinnsen (1996) states that the phonetic realization of a voicing contrast does not occur until 2;7 when the voice contrast reaches the adult target system and becomes stable.

Three different accounts for the underspecification of [voice] are given in order to explain what happens within Amahl's representations of the [voice] feature underlyingly, and it will become evident as to which account Dinnsen supports.

The Contrastive Specification account argues that when the [voice] contrast is introduced into a child's system, both of the contrastive [voice] values must be specified. This causes all the obstruent stops to change from being underspecified for [voice] to becoming specified for either [+voice] or [-voice]. If this were the case then Dinnsen's rule would no longer apply to the child's system. This account would cause the prevocalic stops, which are indeed realized as voiceless in the target speech to become specified for [-voice], but the other prevocalic stops which remain voiced in Amahl's inventory would need to be specified as [+voice]. Thus, this result would cause a contradiction which contrastive specification cannot account for.

The context free Radical Underspecification account refers to only one of the voice contrast values becoming specified underlyingly and allows you to eliminate the predictable information. With reference to markedness in nonlinear phonology, those sounds first acquired by a child are unmarked and portray the '-' value whereas the sounds acquired later by a child are more marked and portray the '+' value. These assumptions cause the prediction that the [+voice] value would be specified due to the

unmarked status of [-voice] obstruents. Thus, [-voice] would end up being the default feature used to illustrate all of the underspecified obstruents. This hypothesis does not cause problems for the change in voicing of stops in word final position but it does create a problem prevocalically. Many of the stops which remain voiced prevocalically in the child's speech would have to change underlying from unspecified to specified for [+voice]. The feature change would occur underlyingly without a phonetic change. With regard to the prevocalic stops that did change phonetically to voiceless, a phonetic change would occur without an underlying change. Since the underlying and phonetic changes are not in accordance with each other, they both violate the compatibility assumption.

The Compatibility Assumption states that segments are only allowed to take on the underlying specifications if the specification agrees with the target value.

The context-sensitive Radical Underspecification account can solve the problems of the other two accounts, and is thus supported by Dinnsen as a plausible explanation of a child's underlying feature system when acquiring the feature [voice]. This account gives a better justification because it conforms to the contextual constraint and compatibility assumption by allowing both of the contrastive values to be specified underlying but in different contexts. When the voicing contrast is introduced to the child only the words that change phonetically would also change underlyingly. For example, if the prevocalic stop becomes voiceless it will change from being underspecified underlyingly to becoming specified for [-voice]. The other prevocalic stops which don't change to voiceless will stay underspecified with the default [+voice], as stated by Dinnsen's rule above. The difference is that [-voice] would be the underlyingly specified value for prevocalic stops and [+voice] would be the underlyingly specified value for final stops.

Use of underspecification theory when acquiring a voicing contrast leads to the conclusion that all the stop obstruents in the child's underlying representation will remain underspecified for [voice] even after the contrast is fully acquired. The earlier stated rule will then supply the child with the default values.

Some problems arise in the nonlinear theory with regard to the features under the laryngeal node in a child's underlying representation. Specifically, a problem with markedness occurs regarding the feature [+voice]. When referring to markedness, the frequent phonemes are the ones less marked, containing the '-' value. These unmarked phonemes are acquired first when acquiring a language, because the unmarked values are a part of Universal Grammar, and do not need to be learned. Because [+voice] is the more marked feature we would assume that it is acquired last by the child and the [-voice] feature is acquired first, but of course this appears contradictory to what happens during voice contrast acquisition in English. Thus, a problem is created. Based on this assumption that voiceless obstruents appear more frequently than voiced obstruents in many of the worlds languages, how does one explain the predominance of voiced stops in English? There are two logical answers to this question. The first is based on the introduction of the feature [spread] under the laryngeal node and the second is based on my own idea as to the misconception of the feature [voice].

Firstly, one solution to this problem is to introduce the feature [spread], which represents post-lexical aspiration. If the spread feature plays a role in the child's acquisition process, it can be used to explain the confusion that arises regarding the

feature [voice] under the laryngeal node. In fact, [spread] is only necessary in aspirated languages such as English and Cantonese for the sole purpose of defining the post-lexical aspiration of word-initial voiceless stops.

Davis (1995) states that the pertinent surface representation of the contrast lies within the feature [spread], rather than [voice]. She states that a child first produces the contrasts of the [spread] feature before [voice]. This could be used to explain the early occurrence of unaspirated voiceless stops, because they are less specified than the aspirated stops which need the extra [spread] feature under the laryngeal node in order to be realized. Thus, the less specified segment would be acquired earlier, as it has proven to be. The major difference between the [spread] and [voice] features is that [spread] has larger lag time differences than [voice] and it is easier for children to distinguish between pairs of sounds that involve a longer lag time. Davis uses three hypotheses as a basis for determining which will provide the most accurate account for describing the child's stages of development when acquiring a voice contrast.

The Voiced Distinction Hypothesis states that [voice] is more salient to a child learning a language than the feature [spread]. As well, phoneme pairs which consist of different specifications of [voice] are acquired earlier than those pairs with the same voicing distinction, with no regard to the feature [spread].

The Spread Distinction Hypothesis is the opposite to the above. The surface feature [spread] is considered the most salient as opposed to [voice] in the child's representations. This hypothesis does in fact account for an English child's early acquisition of contrastive VOT productions.

The last hypothesis is the Acoustic Difference Hypothesis. It states that the order in which a child acquires a voicing contrast is determined solely by the acoustic properties of the contrasts, with no regards to features. Precisely, the lag time VOT values that show a large difference between two members of a contrastive pair are acquired first by the child, before the contrasts that show only small differences between VOT values. Thus, if a child has acquired the VOT values showing just a small difference, they will have already established the VOT values with a large difference in their inventories. English children acquire the large difference in lag time VOT values by approximately age 2;0.

The Acoustic Difference Hypothesis is supported by the data in Davis' study, which shows that a child acquires a productive voice contrast based on the acoustic differences in the adult target speech. This hypothesis may be more useful to explain cross-linguistic differences than the notion previously assumed, that the differences were based on the phonological complexities of each language.

Spanish and English children have identical underlying representations of the [voice] and [spread] features (neither language has [spread] underlyingly), but the difference lies in their surface representations. English has a surface contrast of the spread feature, and the '+' value for voice is optional, thus the Spread Distinction Hypothesis would apply here. Spanish has the feature [-spread] for both stops therefore it is the voice feature that is relevant to the surface contrast. Thus the Voice Distinction Hypothesis would more accurately describe the contrasts which occur in Spanish. According to Davis, the Acoustic Difference Hypothesis could account for the voicing in both of these languages. Data from Hindi backs up the Acoustic Hypothesis because

Hindi shows both contrasts of [spread] and [voice] on the surface, so it doesn't conform to either the Voice or Spread hypotheses. It is here where Davis obtained the data which proves that contrasts with large lag differences are acquired early across languages.

Based on the above information it may be plausible to assume that the spread contrasts are acquired earlier than the voice contrasts, because English children acquire the voicing contrast earlier than Spanish children. This is another possible explanation for the late acquisition of a voicing contrast in Spanish, but there are also a few other logical reasons. Late production in Spanish could be caused by the stop and fricative allophone alternations, something that is not present in the English language. Also as summarized earlier, two constituents of a contrastive pair are acquired early if they show a large difference in lag time. This large difference is due to the contrastive spread features for voiced and voiceless stops. Spanish doesn't show a contrast of the spread feature whereas English does, so this therefore supports the earlier acquisition of voicing in English.

The average difference in lag time between a short lag and long lag pair in English is 60ms, whereas in Spanish the difference between a lead vs. long lag pair is only 29ms. Thus, Spanish voicing contrasts are acquired later due to the smaller difference in lag times as compared to English. The reason why the Spanish lag times are smaller than those of English comes back to the [spread] and [voice] features. Since the Spanish stops show the same [-spread] feature their articulatory gestures are also the same, thus the VOT difference in Spanish is caused by the different articulations for the [+voice] and [-voice] values, making the difference in lag time shorter.

English [k] and [g] have basically the same lag time differences as Hindi [k^h] and [k], therefore children should acquire these contrasts around the same age, and they do. This once again supports the Acoustic Hypothesis as defined by Davis.

The answer that I formulated provides a solution to the markedness problem in English and explains why it is in fact the voiceless member of a contrastive pair that appears more frequently across languages. After extensive study, it seemed evident to me that the problem does not exist within the markedness theory but it is derived out of the terminology used to explain the voicing contrast distinction. In general, adult speakers of English produce their voiced stops in the short lag region according to VOT measurements. Short lag voicing is the region on the voicing continuum for voiceless unaspirated stops, so the English voiced stops aren't in fact [+voice] as many would presume.

The symbols that are used in English to represent the voiced and voiceless segments are based on broad phonetic transcriptions and can be quite misleading. What occur most frequently in word-initial position are the voiceless stops [p t k], and not the voiced stops [b d g]. In order to determine how the voiceless stops [p t k] differ from [b d g], the former pair are classified as tense and the latter as lax. One could then presume that the contrast in English stops is caused by tenseness rather than voicing. This highlights another possible explanation for the stated problem, but there is insufficient data on this exact hypothesis to allow for further discussion. In non-aspiration languages, such as Polish, this problem does not arise, because they have only fully voiced members and voiceless members of a contrastive pair. This information is useful in order to explain why the feature [-voice] is termed the unmarked value according to the nonlinear theory.

Markedness is seen as a problem in the theory because most adults assume that the "voiced" stops being produced word-initially are in fact voiced. It is the terminology that leads to this sort of confusion, because in fact it is a voiceless unaspirated stop, termed voiced, that is being produced word-initially by adult speakers of English. The assumption that cross-linguistically children acquire the short lag voicing (voiceless unaspirated) stops first, does support the markedness theory that [+voice] is the marked value and [-voice] is the unmarked. The term aspiration also causes some confusion (only in languages where aspiration applies), and that is why the [spread] feature is necessary as well as the [voice] feature under the laryngeal node. Thus, the default node in a child's speech consists of [-voice] and [-spread] which surfaces as the voiceless unaspirated stop. The statement that voiceless stops are more frequent in the majority of languages can now be regarded as true, rather than questioned.

This paper has argued that children, regardless of the language they are acquiring, follow a similar pattern when acquiring a voicing contrast in word-initial stops. It is evident that cross-linguistically the short lag stops (voiceless unaspirated) are the earliest acquired member of a contrast, regardless of the actual age of acquisition by a child. The age of acquisition is shown to vary due to the specific factors that affect each individual language, as in Spanish and Thai. Both the voice onset time analysis and the Underspecification Theory have proved to accurately describe what occurs within a child's system as they acquire a voice contrast. VOT is obviously the most salient method of measuring the acquisition process of the child due to the well-documented studies that support it. The Underspecification Theory is also quite sufficient when explaining what occurs in the underlying representations of a child's speech, but this theory seems to have a few flaws which need further research in order to make the data more consistent. I think that one of the major problems in the nonlinear theory arises from the definitions of the features under the laryngeal node. This area of the theory must involve more explicit explanations in order to provide an understanding of what is actually happening within the child's underlying system. This way, people are not misled by the chosen terminology.

This paper has demonstrated that a single method or theory cannot describe the acquisition of voicing in every language. Rather, research in each language must rely on a specific method that is best suited to it to accurately measure voicing contrasts.

REFERENCES

Barton, D. & Macken, M.A. An instrumental analysis of the voicing contrast in word-initial stops in the speech of four-year-old speaking children. Language and Speech. **23**(1980), 159-169.

Bernhardt, B. & Stoel-Gammon, Carol. Nonlinear phonology: Introduction and Clinical Application. Journal of Speech and Hearing Research. **37**(1994), 123-143.

Bernhardt, B. & Gilbert, John. Applying linguistic theory to speech language pathology: The case for nonlinear phonology. Clinical Linguistics and Phonetics. **6**(1992), 123-145.

Bond, Z.S & Wilson, H.F. Acquisition of voicing contrast by language delayed and normal speaking children. Journal of Speech and Hearing Research. **23**(1980), 152-161.

Clumeck, H., Barton, D., Macken, M.A & Huntington, D.A. The aspiration contrast in Cantonese word-initial stops: Data from children and adults. Journal of Chinese Linguistics. **9**(1981), 210-225.

Davis, Katharine. Phonetic and phonological constraints in the acquisition of voicing: Voice onset time production in Hindi and English. Journal of Child Language. **22**(1995), 275-305.

Dinnsen, D.A. Context sensitive underspecification and the acquisition of phonemic contrasts. Journal of Child Language. **23**(1996), 57-79.

Gandour, J. & Petty, S.H. The acquisition of the voicing contrast in Thai: A study of voice onset time in word-initial stop consonants. Journal of Child Language. **13**(1986), 561-572.

Gilbert, John H.V. A voice onset time analysis of apical stop production in three-year-olds. Journal of Child Language. **4**(1977), 103-110.

Ingram, D. (1992). In C.A Ferguson, Lise Menn & Carol Stoel-Gammon. Phonological development: Models, research, implications. York Press, Maryland. Ch.14.

Johnson, C.E & Gilbert, J. (1996). Underspecification and markedness in normal and disordered phonological development. In Children's Language: **Vol.9**. New Jersey, Lawrence Erlbaum Associates, Publishers.

Keating, P.A. Phonetic and phonological representation of stop consonant voicing. Language. **60**(1984), 286-319.

Kewley-Port, D. & Preston, M.S. Early apical stop production: A voice onset time analysis. Journal of Phonetics. **2**(1974), 195-210.

MacKain, K.S & Stern, D.N. (1980). The concept of experience in speech development. In K.E Nelson, Children's Language: **Vol.5**. New Jersey, Lawrence Erlbaum Associates, Publishers.

Macken, M.A & Barton, D. The acquisition of the voicing contrast in English: A study of voice onset time in word-initial stop consonants. Journal of Child Language. 7(1980), 41-74 & 433-458.

Rice,K. (1996). Aspects of variability in child language acquisition. In B. Bernhardt, J. Gilbert & D. Ingram, Proceedings of the UBC international conference on phonological acquisition. Somerville, Cascadilla Press.

Tyler, A.A & Edwards, M.L. Lexical acquisition and acquisition of initial voiceless stops. Journal of Child Language. **20**(1993), 253-273.

Zlatin, M.A & Koenigsknecht, R.A. Development of the voicing contrast: A comparison of voice onset time in stop perception and production. Journal of Speech and Hearing Research. **19**(1976), 93-111.

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HUMOUR

Student Bloopers

The following is a compilation of amusing student errors; the contributors remain anonymous!

- Prescriptive grammar was developed in English to improve upon Middle Ages English.
- "d"s and "t"s are known as "stop" consonants...in saying them the lips actually touch some part of the upper mouth.
- We no longer speaks (sic) Chaucer english (sic) maybe we'll evolve to a rap english.
- Prescriptive grammar says its' (sic) wrong not to be taught.
- Activities must be revolent (sic) to the students (sic) needs.
- It hypostulated (sic) that things similar in L1 and L2 would be easy.
- Descriptive grammar is linguistical language.
- Prescriptive grammar believes that grammar should be described.
- You keep talking about my child's infectional morphology, but she's not sick.

CWPL STYLE SHEET

Documents should be submitted as camera ready hardcopies in accordance with the requirements outlined below. A copy should also be submitted on disk. **The editors reserve the right to return any submissions which do not adhere to the style sheet herein.**

1.0 Manuscripts on disk

Manuscripts should be produced on a Macintosh computer in the following format using Microsoft Word for text and Superpaint or Macdraw for tables, graphs, etc. Disk format required is 3.5 inch and high density. If this is not possible, please contact the editors regarding alternate arrangements. If the disk is to be returned a self addressed envelope should be sent also.

2.0 Manuscript Conventions

2.1 All material, including extended quotes, footnotes, references, etc. should be single spaced except for indented quotes and examples, (see section 3 below).

2.2 Each article should begin with the title, name of the author, and institutional affiliation or place of residence, all typed on separate lines with no spacing between these lines. Titles should be short, descriptive, and straightforward.

2.3 All footnotes, references, tables, diagrams, maps, etc. should NOT be on separate sheets but should be placed in their appropriate locations.

2.4 Section headings are required. Main headings should be bolded but not all-caps and underlined: e.g. **Introduction**. Section sub-headings are optional, but no more than one level of sub-headings should be used. Sub-headings should not be all-caps but should be bolded, e.g. **Sentence Types.** There should be no spaces between section headings and text.

2.5 **All text should be fully justified** including abstracts, text body, footnotes, references, etc

3.0 Text Conventions

3.1 Linguistic forms cited within a sentence in the text should be set apart from the text. Recommended conventions are as follows.

Forms cited in phonetic transcription should be enclosed between square brackets.
Forms cited in phonemic transcription should be between slant lines.
Other cited forms (e.g. underlying forms) should be underlined.
Authors may specify other transcriptional devices such as vertical lines, curly brackets, obliques, etc.

3.2 Glosses of linguistic forms should be enclosed between single quotation marks, which are not otherwise used: e.g. /amihkw/ 'beaver'. Double quotation marks should be used only for short quotations, reported conversation and the like.

3.3 The abstract and extended quotations of more than three typed lines should be set apart from the main text by double spacing both before and after the quotation, should be single spaced, and with both the left and right margins indented five spaces. No quotation marks of any sort should be used.

3.4 Sets of examples or example sentences should be numbered serially with Arabic numerals closed in parentheses. If several such examples are grouped together, the entire group is identified by an Arabic numeral, and the individual sentences by lower case letters, e.g.:

(5) a. John loves Mary.
b. Mary is loved by John.

Rules set off from the text should be similarly numbered, e.g.:

(3) C --> [-vce]/_____#

4.0 Table/Figure Conventions

4.1 Number figures and tables consecutively (figures separately from tables) with Arabic numerals. All figures and tables should be placed in their respective places within the text.

4.2 A brief title for each table/figure that makes the data intelligible without reference to the text may be used. Longer explanatory material should be typed as a footnote to the table, not as part of the title.

4.3 Column heads should be short, so as to stand clearly above the columns.

5.0 Footnote Conventions

5.1 Footnotes should be located at the bottom of the page. They should be typed beginning with a raised number with double spacing between each note.

5.2 Footnotes are not used for bibliographical reference. They should be brief, ancillary comments on the main text and not extended discussions.

5.3 Footnotes should be numbered consecutively throughout the text. A footnote number in the main text is to be typed as a raised number immediately following the material to which it refers, e.g.:

...the extended linkage[3] which is...

Footnotes at the end of a sentence should follow the final punctuation:

...as evidenced in Gothic.[3]

5.4 Acknowledgements should be placed immediately after the text but immediately before the references.

6.0 Reference Conventions

6.1 Complete bibliographical information is not cited in the text or as a footnote. Within the text, the author's name, the date of the work referred to, and the page number(s) (if appropriate) are sufficient. The reference should be between parentheses, e.g.:

...it has been suggested (Johnson, 1959:32) that...

If the author's name is part of the sentence, only the numbers are between parentheses, e.g.:

...Johnson (1959:32) has suggested that...

If the author's name is part of a parenthetical comment, the parentheses are omitted from the numbers, e.g.:

...some have suggested (including Johnson, 1959:32 and Smith, 1963) that...

6.2 Do not use the terms "ibid." and "op.cit." Where necessary to avoid ambiguity, repeat the full reference. Do not use authors' initials when citing references in the text unless necessary to distinguish two authors of the same surname.

6.3 Full bibliographical information for the references cited in the text should be located within the section entitled REFERENCES at the end of the paper. Entries should be single-spaced both within and between references. Works are listed alphabetically by author's last name, and chronologically when two or more works by the same author are listed, distinguished by lower case letters in the case of works published in the same year. Each entry has four elements: the author's name, the year published, the title, and the source or place of publication. Each line following the first line of an entry is indented eight spaces. Titles of books should be in italics. Titles of both books and articles should follow the convention where only the first word of the title is capitalised. All other words, with the exception of proper nouns, should be in lower case. The following patterns should be used:

Single author:

Sapir, Edward. 1921. *Language.* New York: Harcourt, Brace.

Single Editor:

Fishman, Joshua A., ed. 1968. *Readings in the sociology of language.* The Hague: Mouton.

Multiple authors:

Chomsky, Noam & Halle, Morris. 1968. *The sound pattern of English.* New York: Harper and Row.

Articles:

Jasanoff, Jay. 1978. 'Observations on the Germanic Verschärfung.' *Münchener Studien zur Sprachwissenschaft.* 37: 77-90.

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Papers should not include page numbering. Authors are, however, asked to lighly write the page numbers on the back of the pages in pencil

Left, right, top and bottom **margins** should be not less than **1.5"**.

All text should be composed using **Times, IPA Times or IPA Extended Times** font. The size of the font should be 12 point for the text, 10 point for the footnotes and 7 point footnote numbers.

8.0 Abstracts

Authors are asked to include an abstract of their paper under the title, their name and their institution. The title **Abstract** should be centred and bolded above the abstract. The first line of the abstract should not be indented like a normal paragraph. The entire body of the abstract should be indented as indicated in Section 3.3. **A separate copy of the abstract should also be submitted with the paper to be sent to a publisher of Working Paper Abstracts.**

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