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By

Sara S. Garnes, Ilse Lehiste,

Patricia Donegan Miller, Linda R. Shockey

and Arnold M. Zwicky

Department of Linguistics

The Ohio State University

Columbus, Ohio 43210

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Introduction

Most of the contributions to this volume are from the area of experimental linguistics. The volume begins with Linda Shockey's doctoral dissertation, submitted in 1973. The paper by Sara Garnes constitutes an expanded version of a paper given at the summer meeting of the Linguistic Society of America in Ann Arbor in August 1973. A condensed version of the first paper by Ilse Lehiste was presented at the 86th meeting of the Acoustical Society of America on October 30, 1973, at Los Angeles. The second paper by Lehiste and the paper by Patricia Miller appear here for the first time. The work of Ilse Lehiste and Linda Shockey was partially supported by the National Science Foundation under Grant GS-31494 #2. Sara Garnes' work was partially supported by NSF grant GS-36252.

The volume also contains two annotated bibliographies by Arnold M. Zwicky and one by Patricia Miller on topics that happen not to be directly connected with experimental linguistics, but continue a feature started in Working Papers 16.

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PHONETIC AND PHONOLOGICAL PROPERTIES OF CONNECTED SPEECH

DISSERTATION

Presented in Partial Fulfillment of the Requirements for the Degree Doctor of Philosophy in the Graduate School of The Ohio State University

By

Linda Shockey, B.A.

* * * *

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CHAPTER I

1.1. This study examines some general aspects of connected American English speech. It deals with recurrent low-level phonological processes found in connected speech and the differences in realizations of these processes in two different styles of speech (Chapter II), the interrelation of speed and style as determiners of phonological reduction (Chapter III), and the degree to which style of speaking affects the achievement of vowel targets (Chapter IV).

Numerous studies have been conducted on connected speech, usually to determine the characteristics of individual dialects of English (Stanley 1937, Hall 1943, Hubbell 1950, and Pederson 1965, to name only a few). These studies, based on data taken from a large number of subjects, characteristically consist of impressionistic phonetic analyses of recordings made of subjects reading a story, sometimes supplemented by recordings or field observations of relaxed conversations. They invariably attempt to describe all (segmental) characteristics of the dialects in question, with little emphasis being put on special properties possessed by their data as a direct result of its being naturally flowing speech rather than words in isolation. The study at hand, unlike those mentioned, singles out properties of unself-conscious speech for particular consideration. Also unlike the works mentioned, it is not concerned with arriving at a phonemic inventory for the dialects studied.

The phonological properties of informal or relaxed speech are currently under investigation by several phonological theorists, notably Labov, Zwicky, Stampe, Bailey, Harris, Dressler, and Selkirk. Bailey has discussed several low-level processes (1973, to appear) and attempts to explain the generalization of some of these through a horizontal and vertical wave theory of rule propagation, which includes as essential parameters not only relationships between and among speakers who manifest a particular phonological process, but also sociological relationships (age, status, etc.). Labov is also concerned with social determiners of variant pronunciations (1966, 1958, 1972) and attempts as well to relate synchronic variability to diachronic sound change (for a concise statement of his view, see Weinreich, Labov and Herzog in Lehman and Malkiel 1968:186). Labov et al (1972) has done extensive spectrographic studies of variable pronunciations by subjects in different social situations which he believes to reflect 'sound change in progress'. Stampe (1972) uses numerous

examples from English casual speech in developing his theory of natural phonology, especially when discussing the feasibility of rule ordering (Stampe, Chapter 2).

The other phonologists listed above have studied low-level rules in regard to generalization of application as a function of speed and/or style of speech. Harris (1969) proposes that rate is a determinant of several possible stylistic levels in modern Mexican Spanish. Zwicky (1971) discusses processes in his dialect of English which become more generally applicable along a continuum of greater to lesser formality. (I use 'formality' here as a cover term for slow speech rate and non-casual style). Also, Zwicky (1972) discusses types of and restrictions on casual speech processes. Dressler (1971) argues that the discovery of a process applying in casual or 'allegro' speech forms makes its postulation as a viable abstract rule much more plausible. Dressler also (1972) examines degrees of reduction in Viennese German, as taken from tape recordings of natural speech, and relates progressively greater reductions to lesser degrees of social pressure, with greater rate playing a somewhat secondary role. He argues for inclusion of physical postures and gestures as further determinants of speech styles. Selkirk (1972) relates increase in rate and consequent increase in phonological reduction to progressive deletion of exactly the kinds of grammatical boundaries postulated in Chomsky and Halle's (1968) phonological theory.

With the exception of Labov, the phonologists mentioned above use impressionistic phonetic transcriptions as data sources. Labov and Dressler, to the best of my knowledge, constitute the group that works from actual texts of unselfconscious connected speech; the others, while thereby arriving at valuable insights, depend upon unreliable,[1] second-hand data and self-generated data which are subjected to introspection (or judgment by native speakers if the languages are non-native to the researcher) to determine their relative speed, style, and acceptability. As discussed by Labov (Linguistic Society of America Meeting, Atlanta, 1972), an individual's intuitions about his linguistic behavior do not provide a uniformly satisfactory mirror of his actual performance. Introspection about one's own phonological behavior and the rules underlying it, while far from a useless endeavor, is in some respects like thinking about one's thought processes; it is extremely difficult to achieve a perspective which allows for objective decisions. My preference is, therefore, for extracting generalizations from spontaneous texts, which procedure has been followed in this study, as outlined below.

Chapter III examines the degree to which speed and achievement of careful speech forms are interrelated for the subjects in my study.

Lindblom (1973) has suggested that on the phonetic level a tendency toward vowel reduction is linked with increased rate of speech. Whether style of speech can be said to contribute to this tendency is apparently as yet uninvestigated. Chapter IV looks at the question of whether rate can be considered the only factor contributing to vowel reduction or whether there is possibly another variable, in some way related to style.

1.2. Experimental Technique. Since the results presented in all three major portions of this treatise are derived from the same body of data, I will now discuss the general experimental procedure used for the investigation.

1. Elicitation and recording of two styles of connected speech.

A. Conversational style.

The technique used here was designed to create the most favorable circumstances possible for carrying on a normal, relaxed conversation under conditions conducive to making acoustically satisfactory tape recordings.

Crystal (1969:96) states:

> It is well-known that most people will behave differently if they are aware of being tape-recorded, and as a result the language they use simply cannot be taken as a reliable sample of spontaneous informal conversation. Even if it seems they have 'forgotten' about the microphone, the data cannot be trusted.

If his claim is interpreted literally and acted upon, then the making of recordings in an acoustically favorable environment is effectively precluded. While many dwellings contain rooms with enough padded furniture and rugs to prevent distortion due to reverberation, one still has to deal with unsatisfactory degrees of loudness, background noise, and interruptions which occur in a normal everyday conversational situation.

It was decided therefore to make the recordings for this study in a good acoustic environment, using subjects who were familiar with recording equipment so as to minimize 'mike fright' as much as possible. Two of the subjects, RC and DJ, are recording technicians for the Ohio State Listening Center. The third subject, BN, is a graduate student in the OSU Department of Linguistics who has done work in phonetics and who has thereby become familiar with the laboratory equipment. All three of the subjects were previously known to the experimenter, so little artificiality was introduced into the situation through nervousness at dealing with an unfamiliar person. The experimenter and one subject at a time were seated in an anechoic chamber (Eckel Industries). A tape recorder (Ampex 350) was set up to record the ensuing conversation at a speed of 7.5 inches per second. An Altec 683-A microphone was used.

The usual precaution of ascertaining that the subject's mouth remain about the same distance from the microphone at all times was not enforced, so as to provide a freer atmosphere.

The subjects were encouraged to discuss any topic they wished and the experimenter prompted as needed. The subjects without exception became involved in expressing their views and seemed to feel little or no effect from the unusual environmental conditions, speaking naturally and fluently.

B. A more formal style.

It was assumed that a more formal cycle could be induced by asking each subject to read aloud. A spelling transcription was

made of approximately five minutes of the original recorded conversation, selected on the basis of being (1) a section in which the subject was doing most of the talking, and (2) a section in which the subject was quite relaxed and seemed to be concentrating on conveying his thoughts and therefore not concentrating on his speech patterns.

Each subject was asked to read the transcription of his original speech in a style that would be clearly understandable to a listener. It was suggested to each that he might try to copy the style used by a television news announcer. The speakers were specifically instructed not to overarticulate. The two technicians had no difficulty in executing the instructions. The graduate student was able to do so after a further period of discussion.

Recordings were made of the subjects reading, using the same equipment described for the first recording condition. The data base then consisted of two approximately five-minute recordings for each speaker, one or more selected portions of the original conversation and a recording of the same material being read.

Each recording was played back on am Ampex 350 recorded and the resulting signal channeled through a Frøkjaer-Jensen Trans-Pitch meter and then into a Mingograf model 42-B inkwriter set at a speed of 100 mm/sec. The result was a permanent continuous oscillogram. Wide-band spectrograms were made of all the recorded material on a Voiceprint 10-A spectrograph.

With the aid of these spectrograms, a phonetic transcription was made of all the recorded material, in IPA notation with a few modifying symbols. Each approximately 3-second section of the tape was listened to many times using a Tandberg loop repeater. The English spelling transcriptions, corresponding to the phonetic transcriptions line-for-line, make up Appendix B.

Measurements of formants 1, 2, and 3 of selected vowels (as explained in Chapter IV) were made. Durations of phrases were measured from oscillograms as explained immediately below, but durational measurements of individual speech elements were not taken from spectrograms or oscillograms, since the subjects were not controlled in any way in regard to the rate of speech used. It is known that environmental influences, position in a phrase, and rate of speech interact to affect the durations of individual speech sounds (Lehiste 1971, Gaitenby 1965, Kozhevnikov and Chistovich 1965). Therefore, it was decided that durational measurements of sounds in conversational speech would, even if averaged, provide no firm basis on which to make generalizations, especially since speech sounds differ very greatly in frequency of occurrence.

The oscillograms were used to determine speech rates. The duration of each uninterrupted speech sequence (inter-pause talkspurt, as discussed in Chapter III) was measured; the number of words contained in it was determined; and from this a calculation was made of the average rate in words per second of each span of speech unbroken by pauses. Rates were determined on the basis of number of actual English words per second, regardless of the length of the words. This procedure would obviously make a speech sequence

containing several long words appear (to a person looking only at word-per-second calculations) to be spoken at a slower rate than an equivalent-duration sequence containing only one-syllable words, even if their rate as determined perceptually or in syllables per second were in fact identical. It was concluded that this influence was not a strong one, however, since none of the speakers displayed a tendency to string together polysyllabic words. Hesitation noises such as 'uh' were counted as words, since they took up at least as much time as words with lexical content.

It should be noted that for any given speaker, the reading and conversational versions of the text were not identical in every respect for the following reasons: (1) phrasing was not always the same in both versions; (2) sometimes the conversational recordings contained utterances which were too grammatically scrambled to be read intelligibly. These were altered slightly so as to resemble possible English constructions when the transcription was made from the tape; (3) the same is true for stuttering and multiple repetition in the conversational version which were eliminated in the transcript, partly to facilitate continuous reading and partly because it was decided that the inclusion of speech errors might be interpreted unfavorably by the subjects; (4) when filler noises ('uh' and 'you know') were used to the near exclusion of recognized lexical items in conversation, some of them were omitted in the written texts, for the reasons stated in (3) above; and (5) subjects would occasionally mis-read and/or re-read portions of the script, thereby introducing new elements into the reading version of the text.

The two technicians, DJ and RC, are lifelong residents of Columbus, Ohio. All four of their parents were also born and reared in Columbus. Central Ohio is generally considered to constitute part of the upper boundary of the Midland dialect (Davis 1948). Little or no work has been published on the specific dialect area around Columbus: two characteristic dialect features of the informants are 'r-fullness', and lack of palatal onglide to [u] after alveolars. Columbus speakers frequently use non-apical [l] (written [ɫ] or [ɭ] in this paper, since it is realized as a very constricted, almost pharyngealized, high back vowel). These speakers also frequently show a raising of [ɛ] to [I] before nasals.

BN is from Brooklyn, New York. His mother was born in Patterson, New Jersey and moved from there to Brooklyn; his father was born in the Bronx and moved to Brooklyn. BN's speech has such typical New York City properties as the use of a very low rounded back vowel in such words as 'water' and 'awful' ('wɒɾɚ, 'ɔfl) (Hubbell 60) and the sporadic changing of word initial [ð] to [d]. [1](Hubbell 37). His speech is almost completely r-full, which Hubbell (46) cites as uncommon for most types of New York City pronunciation; but Weinreich et al (1969: footnote 63, p. 179) note that pronunciation of r in word-final and pre-consonantal positions is a new prestige pattern quite common in younger upper-middle-class speakers.[2]

It seems reasonable to assume that tendencies found in connected speech in these two rather dissimilar dialects might well be found in the connected speech of other speakers from these and other dialect areas.

Footnotes to Chapter I.

1. "Unreliable" is intended here in the sense that since no permanent record is available to the researcher, information such as extended environment, overall style of speech, individual speaker characteristics, and relative stress level due to position in an utterance are consequently unavailable.

2. BN recalls family pressure against the use of r-less pronunciation.

CHAPTER II

2.1. This chapter deals with some of the phonological processes which were discovered to be in effect when phonetic transcription of naturally-spoken language in two styles were analyzed (see the previous chapter for a description of the experimental technique used). The questions this chapter addresses are: (1) what are some frequently-recurring differences between a naturally-spoken corpus and an 'idealized', maximally differentiated corpus, and (2) given two styles of speech, one theoretically more formal than the other, do they differ as regards application of processes?

2.2. The data used in this investigation were taken from phonetic transcriptions made by the experimenter of the six original recordings described in Chapter I. These six phonetic texts, which comprise Appendix A, were examined in detail, and a tabulation was made of the low-level phonological processes found to occur for each speaker in each condition, as determined by comparing the actual phonetic output with the author's maximally differentiated Midwestern pronunciation.

2.2.1. The above procedure does not reflect a belief that the Midwestern dialect is an absolute standard or is somehow phonologically neutral, since the forms actually produced are not being compared to supposed Midwestern forms in detail. When I speak of an 'ideal' form, I mean a skeleton structure which contains all the segments normally realized in a careful pronunciation in a very great number of American English dialects. Granted that many small details of most precise pronunciation may differ from area to area and person to person: they are irrelevant to this study since no processes are discussed which depend on these very small differences. Only relatively gross differences between the 'ideal' form which are relatively easy to determine and which I believe to be unambiguous in most cases are covered here. The ideal pronunciation is similar in some respects to the Platonic concept of ideal:[1] several distinct maximally differentiated pronunciations of the word 'hand' exist which we all easily recognize to be tokens of the lexical item hand, just as dogs can differ from each other in many ways and yet be immediately recognizable as representatives of their class to those familiar with the concept. And just as a three-legged dog is recognized as differing from 'ideal', a realization of the word hand as [hæn] can be identified as missing a part. In other words, when an actual form differs from my most precise pronunciation of that lexical item, it will, in my opinion, differ from most people's maximally differentiated form in at least the same ways specified. Thus the ideal form corresponds in some sense to the standard concept

of 'underlying form,' but differs in that it represents the union of pronounceable forms rather than being unspecified in those respects where actual pronunciations are expected to differ.

2.2.2. Given the above remarks, it might seem unnecessary to discourse at length on the pronunciation of Midwestern American English. But in order to provide a reference for those who might want to examine what elements I consider to be present in an ideal pronunciation, I have compared below my concept of standard pronunciation with the pronunciation of words in my corpus with the Kenyon and Knott Pronouncing Dictionary of American English (1944). About 200 words of the beginning of each speaker's written text were compared with their pronunciation as listed in Kenyon and Knott, as well as selected other words throughout each text for which it was felt that there might not be a widespread standard pronunciation. Kenyon and Knott state (xxvii):

> ...for words that are in general colloquial use, it is intended to give first what is believed to be the most colloquial.

Since the less colloquial realization is often the more maximally differentiated, a pronunciation other than the first in order is sometimes considered ideal or basic. For example, the word 'difference' is listed first in Kenyon and Knott as [dIfrʌns]. Since this word may have three syllables in careful speech, the trisyllabic form is considered maximally differentiated, even though it is listed third in Kenyon and Knott. In a very few cases, my most careful style has less reduction than any form listed in Kenyon and Knott, as in the word 'prolong', which can easily be pronounced [prolaŋ] in careful speech. Kenyon and Knott list only [prə] as a possible realization of the first syllable.[2] Other differences between the Pronouncing Dictionary and the author's dialect are as follows:

1. There is some disagreement as to the quality of unstressed vowels; I occasionally indicate them as being higher than they are represented in Kenyon and Knott. Examples:

word	Kenyon and Knott	Shockey
scientist	'saIəntIst	'saiɛntIst
intelligent	In'tɛlədʒənt	in'tɛlIdənt
between	bə'twin	bi'tuin
establish	əs'tæblIʃ	Is'tæblIʃ

(Kenyon discusses the increase in frequency of [ə] in unstressed syllables in American Pronunciation 1935:318 and 321).

2. Kenyon and Knott indicate that unstressed [i] approximates [I], while I think it remains much closer to [i] (in maximally careful speech). Examples:

word	Kenyon and Knott	Shockey
usually	'juʒU̯əlI	'juʒU̯əli
frequency	'frikwənsI[3]	'fɹikʷənsi
depend	dIp̬'ɛnd	dip̬'ɛnd
remember	rIm̬'ɛmbər	rim̬'ɛmbər

(See American Pronunciation 253).

3. The stressed forms of 'of' and 'from' are [əv] and [fɹəm] for the present writer, but listed as [av] and [fram] in Kenyon and Knott (but see American Pronunciation §139).

4. The sequence 'ar' or 'arr' is often pronounced [ɛɹ] in the author's dialect; Kenyon and Knott list [ær] in such words as 'paralyzed', 'married', 'narrow', and 'comparison'. They note in section 94 p. xxxix that [ɛɹ] is "a widespread pronunciation in the North and Canada". (See also American Pronunciation 361).

5. There is an occasional disagreement as to whether unstressed [ə] plus-resonant or syllabie reconant should be considered basic, as in:

even	'ivən	'ivn
capsule	'kæpsl̩	'kæpsəl
passenger	'pæsn̩dʒər	'pæsəndər
thousand	'θaUznd	'θaUzənd

(But see §114 and American Pronunciation §321).

6. 'With' is listed as [wIð] in Kenyon and Knott, whereas I would transcribe the most careful form as [uIθ]. (Kenyon discusses the problem in American Pronunciation §141).

7. There are two words which appear in the texts for which my pronunciations are simply different:

disgust	dIs'gʌst	dIs'kəst[4]
adamant	'ædəmænt	'ædəmənt

While these small differences do exist, a very high percentage of the pronunciations listed in Kenyon and Knott do not differ from my author's judgment of my most precise style. Only (5) has implications for the rules discussed below.

2.3. The considerations involved in this study differ from more abstract treatments of phonological questions in that they do not handle facts such as that the word 'business' (in the meaning 'financial endeavor, occupation') is related to the word 'busy' and that one underlying form might conceivably have to be postulated to generate both of them. A more abstract treatment than the present one might postulate a form [bIzi+nɨs], which yields ['bIznɨs] through reduction and perhaps a syncope rule. This study accepts ['bIznɨs] as the standard, careful pronunciation of the word in modern Midwestern American English, and records only deviations from that pronunciation as low-level phonological processes. In short, this study deals not with how different surface forms might be rule-related to an abstract underlying structure,

but with how surface realizations can differ from their maximally differentiated (or 'ideal') forms. Suppose that the word 'business' were realized as [pʰiZn̥s], as might well happen considering rule F', word-initial devoicing, discussed below. It would be recorded that the initial, ideal [b] had undergone devoicing.

2.4. The following is an enumeration and discussion of the processes discovered to be in effect by examination of phonetic transcriptions. These processes will be presented in three main classes: (1) word-internal processes, (2) morphologically insensitive processes, and (3) external sandhi processes. This classification is a forced one in the respect that although many of these processes do indeed occur within the boundaries of entities normally called words, a great number of them seem to occur at the beginnings and ends of these words. This might well be considered a sandhi-type phenomenon, since it indicates that the speaker is 'aware' at some level of the word boundary, or perhaps of the possibility of sandwiching the utterance in question between periods of silence; i.e. there is an element of sequentiality which could be interpreted as non word-internal. Nevertheless, in this treatment, any intra-word processes (occurring within word boundaries) is separated from processes which occur primarily across word boundaries. The distinction shall be that if a process could occur for a word said in isolation, it will be called an intra-word process.

To list each phonological process discovered for each speaker, sketch its interrelations with other rules discovered, and discuss its implications for phonological theory is a task beyond the scope of this paper which attempts primarily to discover consistent features of connected speech. Therefore, the following sections include a statement of the most frequent processes found to be in effect: processes common to all three of my subjects which seem to play a significant role in the shaping of connected speech. This technique of describing the most frequently-applying processes is perhaps the principal difference between this study and those mentioned in Chapter I; all of the processes discussed in this chapter have received notice at some time in the literature, as referenced for individual cases below.

Although many opportunities to do so present themselves, I will not attempt to sketch the implications of these results for the various partial phonological theories now in existence. The present study is intended as an overview of major properties of connected speech as represented by my data; questions of theory should, I think, be treated separately. Consequently the results of this investigation will not be presented as supporting or disproving current hypotheses.

The processes to be discussed in section I are:

A. t > ɸ / __ #
B. t > ʔ / __ #
C. d > ɸ / __ #
D. ŋ > n / __ #
E. v > ɸ / __ #

F. $\begin{bmatrix}+\text{obstr}\\+\text{voi}\end{bmatrix}$ > [-voi] __#; #__

G. $\tilde{V}NC > \tilde{V}C$

H. $\left.\begin{matrix}aɪ\\aʊ\end{matrix}\right\}$ > a>^

I. h > ∅ / # __

2.4.1. Processes occurring within word-boundaries.

A. Deletion of word-final [t] (cf. Kenyon 1935:158, Bailey PRO:B-33). This process occurs frequently in unstressed words such as 'it' and 'but'. It is especially common when the final [t] is preceded by a resonant [l] or [n] or by the voiceless consonants [p, k] and [s]. Examples:

BN-C[5]	(12)	feet	'fi
		isn't	'Izn
		panicked	'pæ̃Ik
BN-R	(17)	about	ə'bao
		felt	'fɛl
		just	'dʒəs
DJ-C	(32)	not	'na
		spent	'spɛ^n
		start	'staɹ
DJ-R	(23)	cat	'kæ
		fast	'fæs
		respect	rIs'pɛk
RC-C	(7)	but	'bə
		wouldn't	'uʌdn
		broadcast	'bɹag kæs
RC-R	(∅)	(see below)	

Speaker DJ applies this process much more than the other two speakers. DJ and RC both show a tendency to lose word-final [t] more frequently in conversational than read speech; in fact RC shows no instances of it when reading. Speaker BN shows little stylistic difference.

B. Word-final [t] becomes glottal stop. (Thomas 1947:40, Bailey PRO:B-36, Selkirk 1972:196). This may possibly be considered an intermediate step between fully realized t and ∅. As evidence for this, there is occasionally a word-final t which gives the perceptual effect of being closed simultaneously at the glottis and alveolar ridge, especially when the t is to be released into another alveolar consonant. This possible simultaneous closure should be further investigated. The mention of a following alveolar suggests that we are dealing here with an external sandhi phenomenon: it

BN-R	(9)	used	jus
		started	ˆstaɹɾI
		wind	uIn
DJ-C	(7)	third	θɝ
		mind	maIn
		could	kə̂
DJ-R	(8)	should	ʃɹ
		sand	sæn
		head	hɛ
RC-C	(Ø)		
RC-R	(2)	changed	tʃeIndʃ
		would	uə̂

The above figures may not indicate that d-loss is at all a frequent process. This is because I have excluded the figures on 'and', which is an exceptionally frequent word and in which the final d essentially never appears. Excluding the nd clusters which 'flap' (see below, section II), the following distribution was found for the word 'and' with and without final d:

	retaining d	deleting d
BN-C	3	25
BN-R	1	20
DJ-C	0	24
DJ-R	0	24
RC-C	0	47
RC-R	0	49

(The most frequently-found realizations of the word 'and' are [ɛn] or [ə̃n] and [n̩].)

D. Word-final 'ng' becomes n. (Bailey PRO:B-18, Thomas 1947: 64, Kenyon 1935:217). This is the process known in grammar school as 'dropping the g' and spelled with an apostrophe ('singin'') by those wishing to represent informal pronunciation. It is apparently not a significant feature of this New York dialect; speaker BN shows only one instance of it.[6] Examples:

DJ-C	(11)	promising	'pɹamɨsɨn
DJ-R	(Ø)		
RC-C	(10)	going	'gouIn
RC-R	(Ø)		

seems further that the change of [t] to [ʔ] is conditioned by a following consonant or silence, the transcriptions showing only one case of its occurring before a vowel. This appears to be a case where a silence functions like a consonant, therefore the criterion for word-internal phenomena (p.) is somewhat misleading.

BN-C	(13)	right	raɪ̯ʔ
		lot	laʔ
		out	æu̯ʔ
BN-R	(14)	that	ɔɛʔ
		quote	kʰu̯oʔ
		different	'tɪfɹɪʔ
DJ-C	(7)	heat	hiʔ
		Robert	'ɹabɝʔ
		not	naʔ
DJ-R	(8)	start	staɹʔ
		can't	kæʔ
		put	pʊʔ
RC-C	(15)	got	gaʔ
		bit	bɪʔ
		eight	eɪ̯ʔ
RC-R	(26)	remote	ɹi'moʔ
		state	steɪ̯ʔ
		eat	iʔ

RC shows a marked tendency to change t to ʔ before labial elements across a word boundary, as in 'remote broadcasts' [ɹi'moʔ 'bɹagkæs], but the other subjects do not seem to share this conditioning factor (again, signs of external sandhi). The glottal stop can alternatively be realized as laryngealization. The process t > ʔ occurs also very often within a word before a syllable nasal.

Speakers BN and DJ apply this rule about the same number of times in both styles. RC applies it nearly twice as much when reading as when conversing. (This suggests that RC changes t to ʔ rather than deleting it entirely, whereas the other frequently delete. See A above.).

C. Word-final d drops. Final d is especially likely to be lost after another alveolar element (i.e. in a cluster) or before a consonant or silence. Examples:

BN-C	(10)	wide	u̯ɔɪ̯
		weekend	'u̯ikɛn
		realized	'ɹiəlaɪz
		mild	maɪ̯l

This process is included not because it ranks near the others in frequency of occurrence but because it gives a clear indication of difference in style. For the two speakers who apply it at all, it supplies an absolute distinguishing criterion between reading and conversational speech; i.e. it applies occasionally in conversation, never in reading. The process applies differentially according to grammatical class: present participles undergo it, other forms ending in -ng do not.

E. [v] drops word-finally. Word-final v-dropping is nearly restricted to the word 'of' in my texts. Speaker BN applies it once to the word 'have'; and DJ applies it twice to 'have', once to 'alive' and once to 'believe'. Following is a tabulation of the number of times [v] is retained and deleted in the word 'of' for each speaker and each style:

	v retained	v deleted
BN-C	16	10
BN-R	21	8
DJ-C	5	11
DJ-R	14	4
RC-C	7	7
RC-R	8	7

Only for DJ do we get a marked tendency toward pronouncing the word 'of' more carefully when reading.

Kenyon (1935: 182) notes that 'the v of unstressed 'of' was formerly dropped before consonants (in speech and sometimes in spelling as the n of 'an' still is.) For my speakers this feature seems to continue in the sense that there are no cases in which the [v] drops when the following sound is a vowel; of course, there are numerous cases of [v] before consonants.[7]

F. Word-final devoicing of voiced obstruents. This very common rule in natural languages like German as well as in child language (cf. Stampe 1972:1) occurs for all three speakers but is far more frequent for BN than for the other two speakers. Examples: (Element in parentheses represents immediately following segment in the text. Ø represents silence.)

BN-C	(21)	of	əv (p)
		yards	jaɹds (u)
		roads	rots (Ø)
		stands	stæ̃ts (n)
BN-R	(16)	walls	ɰaz. (I)
		needs	nids ( )
		mild	maɪlt (k)
		would	ɰʊt (s)
DJ-C	(7)	you've	jəf (g)
		said	sɛt (b)
		large	laɹdʃ (f)

DJ-R	(11)	kids	kIdz̚. (Ø)
		families	'famlis (Ø)
		changed	tʃeInz̚t (Ø)
RC-C	(4)	of	əf (k)
		is	Is (p)
		used	ju̇st (Ø)
		sounds	sɛ̃o̚unts (Ø)
RC-R	(3)	ohms	o̚ums (Ø)
		kinds	ka̚Ints (ə)
		organs	'o̚ɹgIn̚ts (Ø)

As is obvious, word-final devoicing does not require a following voiceless segment or silence, although either of these conditions creates a favorable environment for it. It is also evident that word-final devoicing is much more common for BN than for the other two speakers. BN also exhibits word-initial devoicing, while the Ohio speakers do not. Examples:

BN-C	(8)	got	(f) kat
		but	(Ø) b̥ə
		very	(s) fɛ̥ɹi
BN-R	(20)	disgusting	(i) ts'kəstIŋ
		that	(t) θæ?
		guy	(s) ka̚I

(Again the immediately preceding segment is indicated in parentheses. Ø = silence.)

G. Dropping of nasal consonants between vowels and consonants. This process occurs most frequently with nt clusters and with three-element clusters:

BN-C	(17)	don't	dõ̚t
		convinced	kɨ̚n'vĨst
		camp	kʰæ̃p
		turned	t̃d
		kind	kã̚Id
BN-R	(10)	wants[8]	ɯə̚ts
		campus	'kæ̃pəs
		different	'tIfɹĨ?
		want	u̚Ĩt
DJ-C	(25)	think	θĨ̚k
		once[8]	u̚õ̚ts
		wants	u̚õ̚ts
		unless	ə̃'lɛs
		control	kʰɨ̚t'ʰɹo̚

DJ-R	(25)	only	'õli
		changed	tʃẽIdʒd
		once	ɰə̃s
		invest	Ĩvɛs
		accident	'æxsdɛ̃t
RC-C	(7)	spent	spɛ̃ʔ
		maintenance[8]	mẽIʔnə̃nts
		print	pʰɹĨt
		transferred[8]	'tɹæ̃tsfɚd
RC-R	(16)	malignancy	mə'lIgnə̃tsi
		transmitter[8]	'tɹæ̃tsmIɾɚ
		finger	fĨgɚ

For all three speakers, there is an occasional epenthetic t in an original n-s cluster, which may create a favorable environment for the application of the nasal-dropping rule, to avoid long clusters. There are cases of labial clusters reducing (BN 'camp' 'campus') and velar clusters (DJ 'think', RC 'finger'). Also, speaker BN evidences nasal dropping before a voiced final consonant ('turned', 'kind'). (See BN-C above for transcription.)

Speaker DJ, for whom this process is the most frequent, also applies it to simple VN combinations (prolonging > pɚ'laŋĨ; intelligent > ɨn'tʰɛʊdʒɨ̃;[8] mean > mĨ' one > uə̃; young > iə̃). Since the following word frequently starts with a consonant, this may constitute a generalization of the rule across word boundaries. This process does not behave consistently as regards style; for speaker RC it applies much more frequently in the supposedly more formal style.

H. Diphthong reduction: (aI, aU ɑ̂> in relatively unstressed position). This process seems also to be affected by 'semantic stress' i.e. it applies more freely to low-information-content words than others.[9] Examples:

i. aU-reduction

BN-C	(12)	about	ə'ba>̂t
		now	na>̂
		out	a>t
BN-R	(7)	about	ə'bæt
		found	fæ>ʔ
		around	ɚ'a>n
DJ-C	(15)	about	ə'bɑ<ɾ
		out	ɑ<t
DJ-R	(10)	about	ə'bæt
RC-C	(10)	sounding	sɑ<ʔĨ
RC-R	(18)	out	ɑ<t

ii. aI-reduction (Bailey PRO:B-26, Thomas 147:153) cites [a] as a regular substitution in some Southern dialects for [a͡I]. None of my speakers possesses such a general rule--this substitution is a result of both low stress and little semantic content). Examples:[10]

BN-C	(15)	I	ɑ<
		like	lɑ<k
		kind	kæ̃n
BN-R	(10)	I'm	æ̃m
DJ-C	(25)	while	ɯɑ<ɐ̯
		sometimes	ˈsə̃ta>mz
DJ-R	(6)	kind of	ˈxɑr̃ə
		might	ma
RC-C	(21)	Ohio	əˈhɑ<
RC-R	(9)	I	a>

These reductions might well be viewed as part of the well-known tendency of present-day English vowels to become centralized when in relatively unstressed position. I feel that they are of special interest since they involve a clear perceptual monophthongization and a falling together of the diphthongs [a͡I] and [a͡U] in relaxed speech.

For the two Ohio speakers, there is quite a marked difference between conversational (more reduction) and reading (less reduction) styles for [a͡I] monophthongization; and speaker BN shows a tendency in the same direction. This generalization cannot be made, however, for [a͡U] reduction.

I. Initial h-loss. This process is mentioned very frequently in books for learners of English (Jesperson 1912 (195):47, Kohmoto 1965:79; Thomas 1947:101) is discussed at length by Kenyon (1935: 204, 105), and has been discussed more recently by Zwicky (1972:326). One would expect it to happen rather frequently, since it has been noticed so consistently. Surprisingly, it is not all that frequent.[11] The following figures give a tally of the number of times initial h is deleted for each speaker and each condition, as opposed to retentions in the second column:

	#h deleted	#h retained
BN-C	7	34
BN-R	4	43
DJ-C	9	65
DJ-R	3	65
RC-C	1	36
RC-R	4	35

These deletions all occur in the words he, her, him, has, have, and had.

2.5. Processes not sensitive to word boundary.

The processes which follow occur within words and across word boundaries. Discussed are the following:

I. Schwa loss
   1. in the environment of a resonant (other than a vowel)
   2. in the environment of a vowel
   3. after an aspirated stop
   4. in the environment of a fricative
   5. near the glide ɻ

II. Flapping and flap-deletion.

I. There is a process or group of processes which, speaking very broadly, causes a schwa to become lost, usually when there is another element in the environment which might be perceived as syllabic, either through being one of the elements commonly thought of as potentially syllabic, such as [l] or [n], or through being a rather intense sound such as aspiration or [s]. Since 'syllabic' is not a well-defined term, I am allowing myself the liberty of speaking of a purely perceptual phenomenon, although I hope to investigate in future studies the properties of perceptual syllabicity using synthetic speech so as to control the various parameters which could be involved.

I conjecture that the elements I perceive to be syllabic are attended by at least three characteristics: in the word 'elaborate' (as spoken by DJ) I perceive a syllabic [l] as constituting the first syllable, (i.e. the [l] in elaborate [læbərɨt] sounds longer than the average initial [l]. As mentioned in Chapter I, since my material is not controlled for tempo, it seems futile to measure and compare durations from these corpora. A controlled experiment would be much less cumbersome and more conclusive).

Incidentally, if this conjecture is true, then English could be said to have word-initial length oppositions for pairs such as 'light' [laɪt] and 'alight' [l̩:aɪt] at least phonetically.

In words like 'police' [pʰl̥'lis] the period of l-colored voiceless frication after the release of the [p] seems syllabic; perhaps the fully voiced [l] after the aspiration-like period adds to this impression, since English resonants are normally at least partially devoiced after initial voiceless stops in English (cf. Lehiste 1964: 77). Also, the period after the release of the [p] until the onset of voicing may well be longer than for a normal aspirated stop: again, this calls for experimental validation. Similarly, the [z] in the word 'places' [pʰl̥eisz̥] seems syllabic, perhaps because of the unusual word-final cluster, perhaps because of unusual length of the fricative cluster, perhaps only because I know it is a disyllabic word in its carefully-articulated form.

The schwa-submerging processes which I assume to belong together are the following:

1. schwa plus resonant becomes syllabic resonant (Kenyon 1935:321, Zwicky 1972:282ff., Stampe 1972:55ff, Bailey PRO:B-15, B-20, B-21, Selkirk 1972:81, Thomas 1947:80). (These references hold for all of the processes discussed in section 1). Examples:

a. l > l̩

BN-R	(19)	finally	'faɪnl̩i
		bicycles	'baɪstkl̩z
		gravel	'ɡɹæ̆vl̩
BN-C	(22)	people	'pipl̩
		Alaska	l'æskə
		the lake	ðə̆l̩'ɛɪk
DJ-R	(10)	believe	bl̩'iv
		repayable	ɹɪ̆'pɛɪəbl̩
		people	pipl̩
DJ-C	(9)	usually	'iuʒ̆li
		a little	l̩'ɪl
		elaborate	'læbɝ̆it
RC-R	(7)	little	'lɪdl̩
		special	'spɛʃ̆l̩
		articles	'ɔɹɹɪkl̩z
RC-C	(4)	handle	'hænl̩
		particularly	pʰtɪkl̩i

b. ən > n̩[12]

BN-R	(23)	wouldn't	'u·ɹdn̩
		thousand	'θaʊ̆zn̩
		right in	ɹaɪʔn̩
BN-C	(22)	and	n̩
		gotten	'gaʔn̩
		itself in	ɪt'sɛlfn̩
DJ-R	(16)	even	'ivn̩
		capsules	'kæpsl̩z
		certain	'sɝ̆ʔn̩
DJ-C	(41)	taken	'tɛɪxn̩
		place on	'pʰl̩ɛɪsn̩
		papa not	'papnɑ̆t
RC-R	(48)	detection	ɹi'tɛkʃn̩
		Henderson	'hɪnɹɝ̆sn̩
		in	n̩
RC-C	(68)	Preston	'pʰɹɛstn̩
		a new	n̩'u
		wouldn't	'u·ɹn̩

c. əm > m̩, əŋ > ŋ̩ (rare)

BN-R	completely	km̩'plitli
BN-C	can	kŋ̩
DJ-R	the Mexican	m̩'ɛkskm̩[13]
DJ-C	amount	m̩̊o
RC-R	and Marlena	m̩ɹalinə
RC-C	comparison	km̩'pɛɹɨsn̩
	talking	tɔkŋ̩

d. ər > r

There is little evidence for the existence of a sequence [ə + ɹ] within word boundaries in English even in formal speech (Lehiste 1964). But since [ɚ] can be the reduced form of a sequence such as [ɔɹ], e.g. 'yer' [jɚ] for 'your', it might not be out of the question to assume (if I may be permitted a theoretical assumption despite my initial claims) that it passes through a stage like reduced vowel + r which is unpronounceable in practice except for when there is an intervening word boundary, such as in 'Linda Ruth', which can be pronounced ['lIndə'ɹuθ], even though it is much more frequently ['lIndɚ'uθ]). Examples from the texts:

BN-R	(8)	for	fɚ
		already	ɚ'ɛɾi (l → ∅)
		your	jɚ
BN-C	(2)	you're	jɚ
		there	ðɚ
DJ-R	(7)	very	'vɚi
		their	ɚ
		to rebel	tɚɨ'bɛl
DJ-C	(10)	or	ɚ
		the road	ɚ'od
		for	fɚ
RC-R	(9)	or (x 9)	ɚ
RC-C	(7)	they're	ɚ
		for	fɚ
		of remote	ɚi'moʊ? (v → ∅)

For most [ə] +consonant > syllabic consonant combinations, there is a corresponding consonant +ə > syllabic consonant processes which occurs less frequently:

a'. l + ə > syllabic l

DJ-R	intelligent	In'tɛl̩ʒə̃
RC-C	development	dt'vɛl̩pmɛ̃t

b'. n + ə > n̩

BN-C	in the	In̩
DJ-C	planet	pʰlæn̩t

d'. ɹ + ə > [14] (This is an especially common process. It has been discussed by Zwicky (1972:287) under the name Ruh-reduction.)

BN-R	(1)	priorities	pʰɹaɪ'oɹ̩ɹis
DJ-R	(7)	congress	'kaŋgɹ̩s
		prolonging	pɹ̩'laŋɪŋ
		irritating	'ɪɹtɛɪ̯ɹɪŋ
DJ-C	(6)	several	'sɛvɹ̩l
		different	'dɪfɹ̩n
RC-R	(11)	microphone	'maɪkɹ̩fon
		where if	'hɯɛɹf
		over at	'ovɹ̩?
RC-C	(9)	here at	'hɪɹ̩?
		for a	fɹ̩
		Professor Egea[15]	pʰfɛsɹ̩'heɪə

2. Vowel plus schwa[16] becomes monophthongized. This process can occur when two vowels come together in any manner: across a word boundary, when an intervening element has been deleted, etc. It does not preserve disyllabicity, although the resulting vowel can be long. Examples:

BN-R	(3)	being	biŋ
		kind-of	kæ̃ (aI > æ, nd > r̃, r̃ >ø).[17]
		area if	'ɛɹiəf
BN-C	(15)	I agree	aɪ'gɹi
		the academy	ði:'kɯmi (ɾ > ø)
		beautiful	bi'wfəl
DJ-R	(10)	definitely	dɛfə̃li (ɾ > ø, t > ø)
		little	lIl (ɾ > ø)
		got a	gɑ (ɾ > ø)

DJ-C	(25)	scientists	saĨɛz (nt > ɾ̃ > ∅)
		gonna ('going to')	gə̃ (n > ɾ̃ > ∅)
		that'd (that would)	əd (ð > ə ɾ > ∅)
		be an	bin
RC-C	(12)	it'd	Id (ɾ > ∅)
		you a	iə
		on a	ɔ̃ (n > ɾ̃ > ∅)

Note that this process is used by all three speakers noticeably more in conversational style than when reading.

3. Aspiration plus schwa becomes aspiration plus voiceless vowel. This process occurs only after voiceless aspirated consonants. Examples:

BN-R	(3)	to go	tʰo̥go
		to Fairbanks	tʰ̥ 'fɛɹbæŋks
BN-C	(9)	to me	tʰ̥ mi
		after the	æftʰ̥ɾə (> ə/-#; ə > d > ɾ)[18]
DJ-R	(4)	could	kʰ̥d
		police	pʰl̥'lis
DJ-C	(5)	degree	tʰ̥gɹi
		ticket	'tIkʰ̥t
RC-R	(5)	between	pʰ̥tʰ̥ɥin
		particularly	pʰ̥'tIkəli
RC-C	(7)	to several	tʰ̥ 'sɛvə̥l
		before	pʰ̥ 'fɔɹ

The statement made in section 3 above about the complete devoicing of schwa after a voiceless aspirated consonant may in fact be too categorical. In working with spectrograms, one is led to believe that the vowel has become completely devoiced, as in the following display:

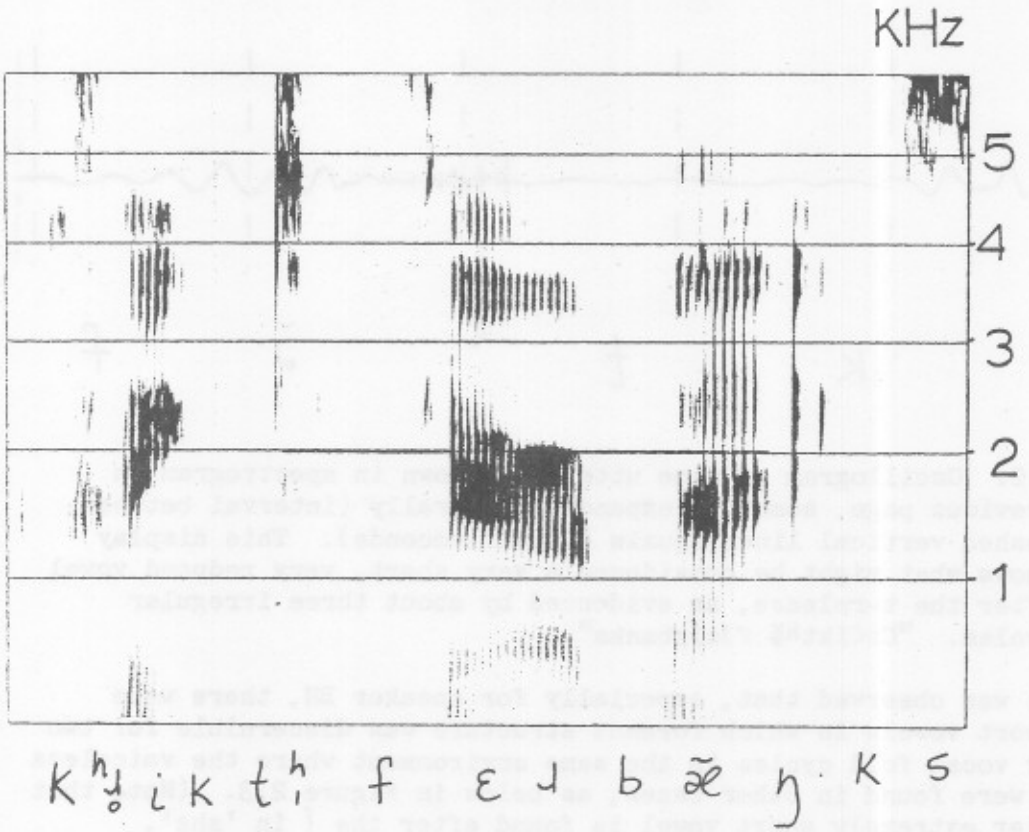


Fig. 2.1. Speaker BN-R, showing apparent loss of vowel after t-release in the word 'to'. Utterance: (Dawson) 'creek to Fairbanks'.

However, Professor R. Reddy (personal communication) has pointed out to me that in such cases there may actually be a few vocal-fold flaps in the position where one would expect to find a reduced vowel. This very weak source does not have the duration or energy to excite the oral resonators, therefore no formant structure can be seen on a spectrogram. However, on an oscillogram such as produced from digitized speech at Carnegie-Mellon University (Working Papers in Speech Recognition No. 3, to appear) one can see that a small amount of low-frequency periodicity does exist in some cases, as in the following:

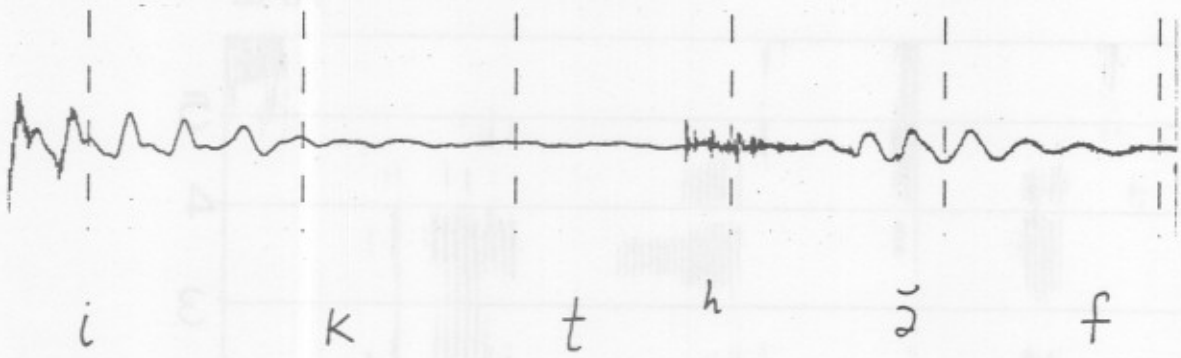


Fig. 2.2. Oscillogram of same utterance shown in spectrogram on previous page, somewhat expanded temporally (interval between dashed vertical lines equals 40 milliseconds). This display shows what might be considered a very short, very reduced vowel after the t-release, as evidenced by about three irregular cycles. "Cr[ikthə̆ f]airbanks".

It was observed that, especially for speaker BN, there were many short vowels in which formant structure was discernible for two to four vocal fold cycles in the same environment where the voiceless vowels were found in other cases, as below in Figure 2.3. (Note that a similar extremely short vowel is found after the ʃ in 'she', another potential vowel-loss environment):

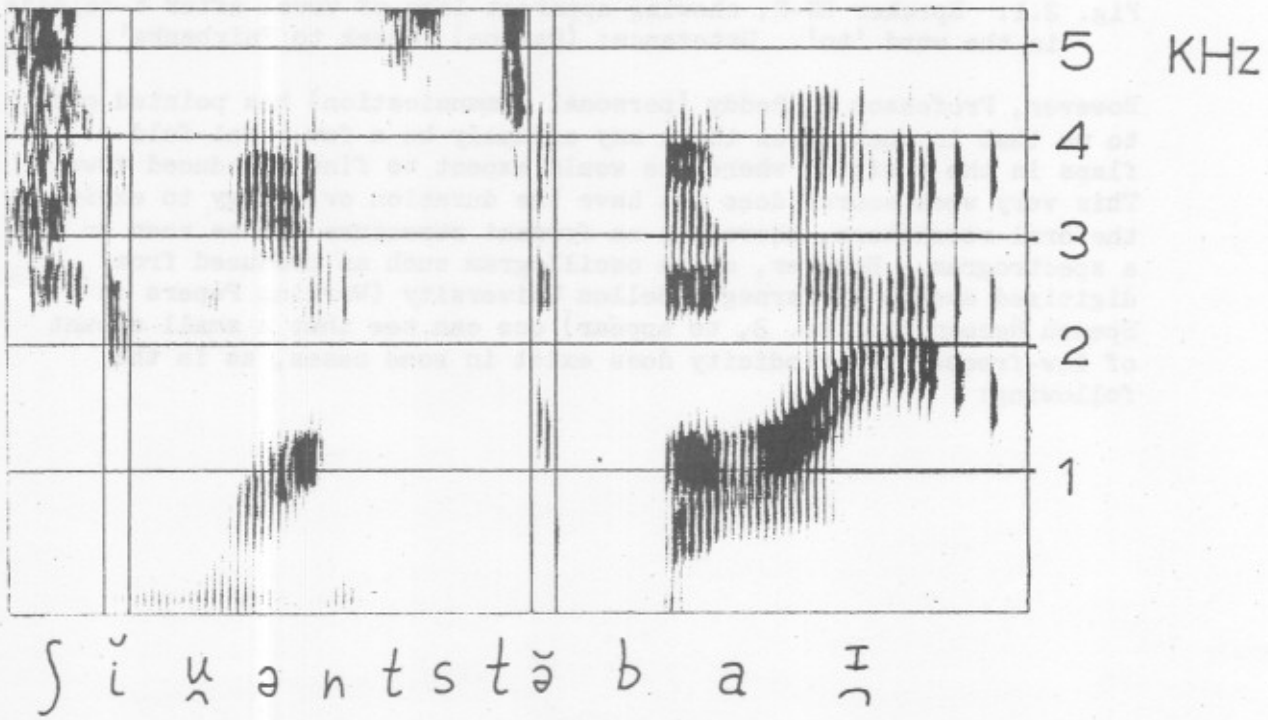


Fig. 2.3. Speaker BN. 'She wants to buy', showing unusually short vowels. (See text).

Thus it seems that naturally very short reduced vowels are susceptible to even further reduction. Kozhevnikov and Chistovich (1965:89) suggest that vowel loss at faster rates of speech is due to articulator inertia; i.e. given, as they postulate, that consonants take up relatively constant amount of time regardless of rate, and that syllables take up a consistent percentage of an utterance regardless of rate, then at fast rates of speech, there is not enough time in some syllables for the articulators to execute both the consonants and vowels, and the vowels are not achieved. Perhaps the same can be said for unstressed vowels in casual speech in English.

4. Fricative + schwa become syllabic fricative. This process applies to fricatives created by palatalization (see below, 'External sandhi processes') as well as others.

BN-R	(9)	difficult	'dIfkəlt
		university	junɨv ɝ sri
		it's a	Its
BN-C	(17)	its about	'Its bæ t
		that you	ðæt
		campus is	'kæmpəs (z → s / __)
DJ-R	(2)	officer	'afs ɝ
		hit you	'hIt
DJ-C	(1)	accident	'æksdɛ̃
RC-R	(10)	that you	'æt
		maximum	'mæksməm
		so	s
RC-C	(8)	impedance, you	Im'pipt
		much equipment	mət 'kʰuI?mə̃n
		just	dʒs

One occasionally finds the reverse situation, schwa plus fricative becoming syllabic fricative, as in:

DJ-R	its got	skat
	(presumably t in it's > ' ø)	
DJ-C	if you	fiu

The following sequence of segments seems to have a decided syllabic fricative, but its phonological analysis is not clear to me:

DJ-C	people that's	pipots

The perceptual syllabicity of these so-called syllabic fricatives is not always completely clear: for example, DJ-R 'it's got' (above)

sounds very much like the name 'Scott'. (It is certainly quite clear that the reduced vowel in 'it's' is no longer there.) But loss of syllabicity is also a feature of the other schwa-plus-consonant combinations discussed here as well, as in the following:

DJ-C	planet	'pʰl̥ænt
RC-R	and then	nIn
BN-C	memories	'mɛmɹiz
DJ-C	operation	apˈɹɛI̯ʃn̩
DJ-C	irritating	'IɹtɛI̯ɾiŋ
DJ-R	Police	'pʰl̥is

Examples of this type are infrequent, so I cannot deduce any conditioning factor for this loss of syllabicity.

5. [u] plus [ə] becomes [ə̯ʷ]. This normally occurs in monosyllabic words, so syllabicity need not be considered. Examples include the words 'was' [wə̯z] 'what' [wə̯t] and 'would' [wə̯d]. Frequency of occurrence: BN-R 2, BN-C 10, DJ-R 1, DJ-C 1, RC-R 1, RC-C 3.

These five processes, which could conceivably be different aspects of one process of perhaps a 'conspiracy' of several processes producing similar effects (cf. Kisseberth 1969) all tend to eliminate unstressed vowels. On the whole, these apply more frequently in conversational speech than in reading aloud. In total, there are 101 more instances of schwa-submerging processes in conversations (all three speakers combined) than in reading; actual figures are reading applications 223, conversational applications, 324.

2. The other very frequent non-word-boundary-sensitive process to be discussed here is flapping. (Stampe 1972:55, Bailey PRO:B-57, Selkirk 1972:197, Kenyon 1935 §163). Flapping differs from the other processes discussed in this exposition in being very nearly obligatory in American English. It is discussed here as a preface to the remarks to follow on unexpected flap-like segments and flap deletion. This process changes t to d to [ɾ], the element commonly termed 'flap' in English; and n, nt, and nd[19] to the nasal flap [ɾ̃]. ([ɾ] with the velum lowered), in relatively unstressed positions and especially in the posttonic position.

Examples from the texts: Flap from t:

word-internal

BN-R	(25)	water	'wɔɾɚ
BN-C	(19)	city	'sIɾi
DJ-R	(13)	setting	'sɛɾiŋ

DJ-C (13) fruity 'fɹuɾi

RC-R (18) better 'bɛɾɻ

RC-C (11) data 'dɛIɾə

word-initial

BN-R (Ø)

BN-C (Ø)

DJ-R (3) door to 'dɔɹɾə

DJ-C (1) four to 'fɔɹɾə

RC-R (5) go to 'goɾə

RC-C (3) over to 'oʊvɻɾə

word-final

BN-R (37) forgot exactly fɻ'gaɾIgzæktli

BN-C (25) it a 'Iɾə

DJ-R (31) but its bɨɾIts

DJ-C (20) get even gIɾivn̩

RC-R (32) built a 'bIɯ̟ɾə

RC-C (15) about a ə'bæɾə

There are consistently more flaps in the above category in the read version than in conversation for all speakers. I suggest two reasons for that: (1) I am only counting flaps which actually appear in the phonetic transcription, and many flaps are deleted in the conversational version (see below), and (2) Flapping at a word boundary implies planning ahead, i.e. one cannot flap a word-final t unless one knows the next word is going to start with a proper element. This is much easier in reading since no creativity is involved and one knows exactly what one will say.

Flaps from d:

word-internal

BN-R (10) adamant 'æɾəmɨnt

BN-C (5) yesterday 'i̟ɛstəɾɛI̟

DJ-R (2) body 'baɾi

DJ-C (3) already ɔ'ɹɛɾi

RC-R (6) bladder 'blæɾɣ

RC-C (7) radio 'ɹɛI̯ɾio

word-initial

BN-R (6) I don't ŏI̯ɾõʔ

BN-C (8) three days θɹ̥iɾɛs

DJ-R (9) to do tə'ɾu

DJ-C (4) they don't ŏɛɾõn

RC-R (1) the detection ŏəɾitɛkʃn̥

RC-C (3) I did əI̯ɾId

word-final

BN-R (11) would if 'uˇɾIf

BN-C (12) side of 'saIɾə

DJ-R (7) read about 'ɹɛɾəbæˇɾ

DJ-C (7) could ever kˇɾ'ɛv

RC-R (21) good equipment gˇɾiIkʰu̯Iʔmɚn

RC-C (10) old, established ou̯ɾis'tæb̥lIʃ

Flaps from nt:

word-internal

BN-R (1) wanted 'uəɾ̃Id

BN-C (Ø)

DJ-R (2) twenty 'tʰuə̯ɾ̃i

DJ-C (1) interesting 'Iɾ̃ɣɛstIŋ

RC-R (2) center 'sɛɾ̃ɣ

RC-C (1) interesting 'Iɾ̃ɣɛstiŋ

word-final

BN-R, BN-C (Ø)

DJ-R (5) percent of p ɝ 'sɛɾ̃əv

DJ-C (2) want it 'u̟əɾ̃i̟

RC-R (4) spent about 'spɛɾ̃əbɑ<t

RC-C (2) print out 'phɹ̥Iɾ̃æo̟t

Flaps from nd:[20]

word-internal

BN-R, BN-C (Ø)

DJ-R (1) hundred 'həɾ̃ ɝ t (ɹə> ɝ)

DJ-C (Ø)

RC-R (1) sounding 'saɾ̃I

RC-C (Ø)

word-final[21]

BN-R (10) turned out t ɝ ɾ̃æo

BN-C (7) kind of 'kæ >ɾ̃əv

DJ-R (8) mind and 'maIɾ̃ən

DJ-C (3) and a æɾ̃ə

RC-R (2) kind of 'kəIɾ̃əv

RC-C (1) and then ɛ̆ ɾ̃ɛn (ð > Ø /# __)

Flaps from n:

word-initial[22]

BN-R (20) car needs 'kɔɹɾ̃ids

BN-C (14) I don't know 'æɾ̃əɾ̃o

DJ-R (2) or no ɝ 'ɾ̃o

DJ-C (1) you know i̟əɾ̃o

RC-R (Ø)

RC-C (1) you know i̟əɾ̃o

word-internal

BN-R	(15)	anyway	'Iɾ̆iu̯ɛI̯
BN-C	(9)	refineries	ɹI'faI̯ɾ̆ɹ̩iz
DJ-R	(19)	money	'məɾ̆i
DJ-C	(8)	many	'mɛɾ̆i
RC-R	(6)	inner	'Iɾ̆ɹ̩
RC-C	(4)	electronics	lɛk'thɹ̥̆ɾ̆Iks

word-final

BN-R	(14)	on arguing	aɾ̆'ɔɹgi̯uIŋ
BN-C	(7)	on a	aɾ̆ə
DJ-R	(6)	on his	aɾ̆Iz
DJ-C	(1)	down on	dɛoɾ̆ɔn
RC-R	(10)	run it	ɹəɾ̆Id
RC-C	(4)	microphone and	maI̯kɹ̩foɾ̆ən

It is commonly assumed that the flapping gesture can be made only between vowels. Malecot and Lloyd (1968:264) state:

> A flap is by definition a momentary, passing apico-alveolar single trill necessarily preceded and followed immediately by vowels.

Stampe (1972:55) includes 'r, nonapical l, nasalized vowels, etc.' in the possible preflapping environments, and there are several cases of such in my data:

four to	'fɔɹɾə
party	'paɹɾi
start adding	'stɔɹɾ'ærIŋ
door to door	'doɹɾədɔɹ
piled all	'paIɬɾɔl
built a	'bIɬɾə
old, old	'oɬɾoɬd

Of course; the two sounds in question--r and l--are quite vowel-like. Cases are also found of flapping before [h], supporting the notion that English [h] is essentially a voiceless vowel (Heffner 1964:151). Examples:

at home	ɨɾ'hɔ̃m
carpet here	'kaˌpɨɾhIˌ
but he's	bɨɾhIz

There are also cases of other extremely short alveolar stops which I have sometimes characterized with the flap symbol in my transcriptions, although I am aware that the physical mechanism for producing them is no doubt somewhat different. They occur: (1) after n and (2) after continuants (other than vowels, l and r) which do not involve the tongue tip. In the case of n, the tongue tip is actually at the point of articulation for a flap-like sound and only a well-defined oral release is necessary to approximate a flap; this course be thought of as an n with an abrupt release. For example, on the spectrogram of the phrase 'I kind of' by BN, reading style (Figure 2.4) I have marked off the duration of the stop following the n in 'kind', which is approximately 27 milliseconds:

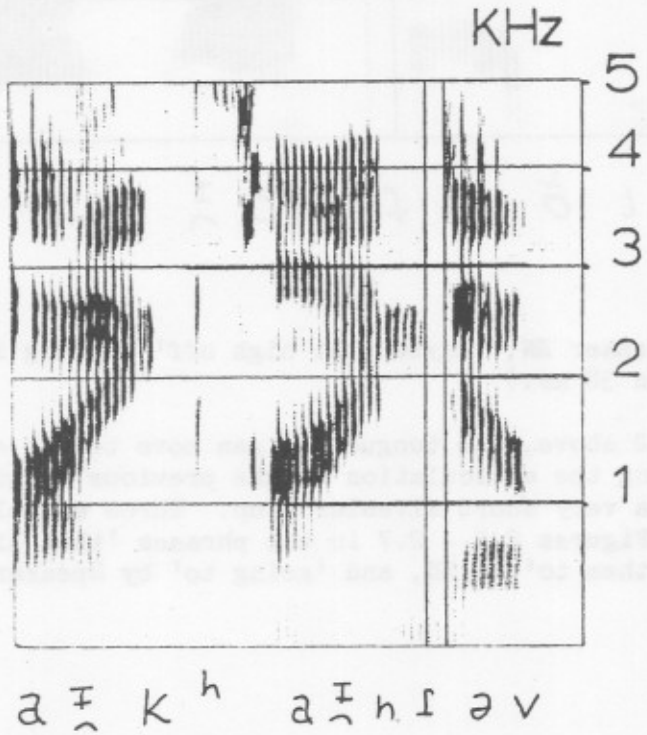


Fig. 2.4. Speaker BN 'I kind of' showing short alveolar stop after n (duration 27 ms.)

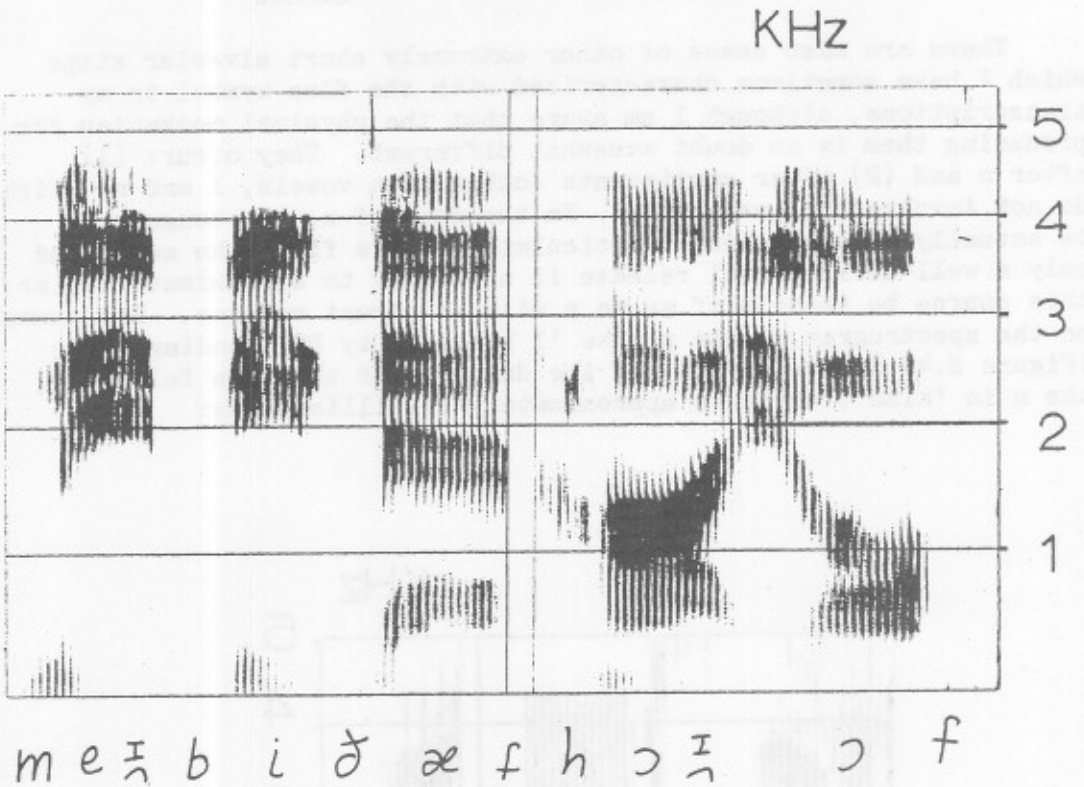


Fig. 2.5. Speaker BN, 'Maybe that high off' showing flap before [h]. (duration 38 ms.)

In case 2 above, the tongue tip can move to the alveolar position during the articulation of the previous sound, thus facilitating a very short alveolar stop. Three examples are displayed in Figures 2.5 - 2.7 in the phrases 'that high' by Speaker BN, 'them to' by BN, and 'going to' by Speaker RC.

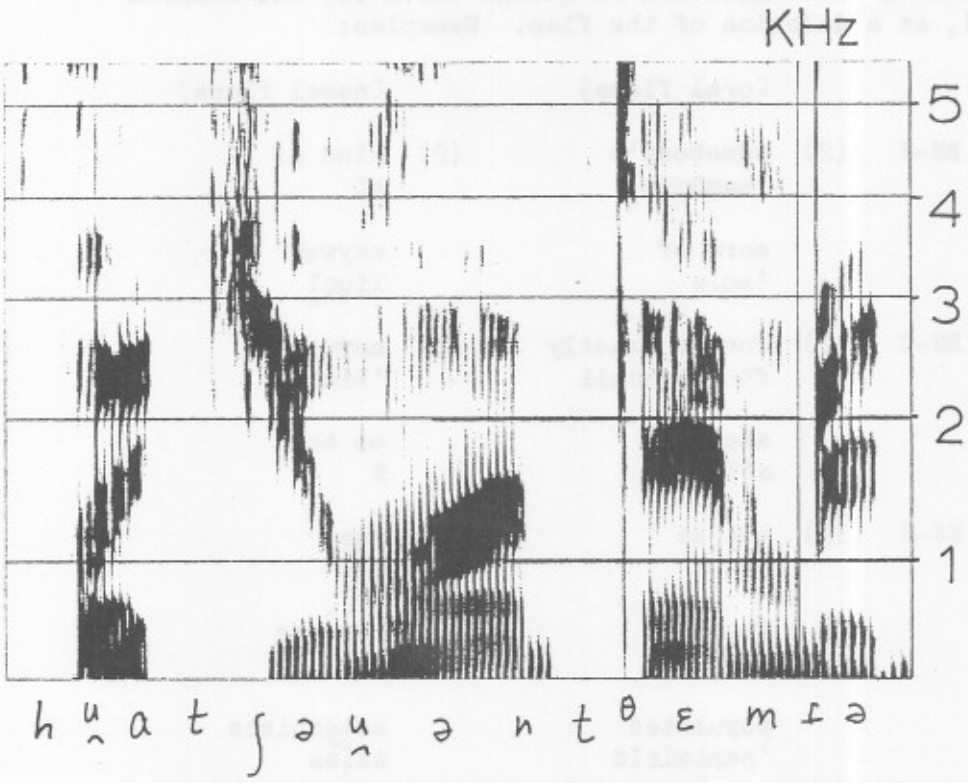


Fig. 2.6. Speaker BN, 'What you wnat them to do,' showing very short stop after m (duration 15.2 ms.)

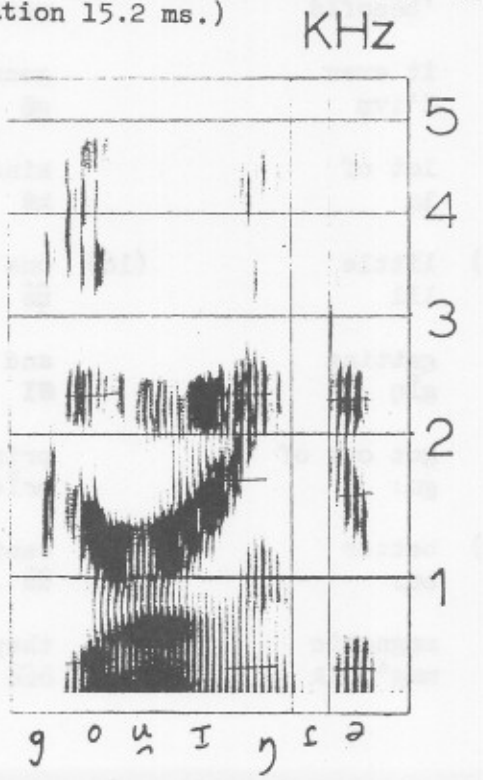


Fig. 2.7. Speaker RC, 'going to,' showing very short alveolar stop after [ŋ] (duration 34 ms.)

2'. Flap deletion. In many environments where a flap would be expected, no closure at all is achieved. This is interpreted here, following the suggestion of Stampe (1972:56) and Selkirk (1972:200), as a deletion of the flap. Examples:

	[oral flaps]		[nasal flaps]
BN-R	(2) somebody's 'səmbɑiz	(2)	kind of kə̃
	sort of 'sɑɹə		anyway Iiɥɛ̰I
BN-C	(12) forgot exactly fɝ gaIgzæ̰kli	(3)	anyway 'IiuɛI
	about it ə'bæIt		on the ɔ̃
DJ-R	(39) but as bəz	(24)	many mĩi
	it even I'vm̩		planets pʰlæ̃əts
	populated 'papiəlɛId		scientists saĩəs
DJ-C	(48) benefitted 'bɛnəfId	(16)	money mə̃i
	it even I'ivm̩		gonna gə̃
	lot of lɑ		kind of kæ̃
RC-R	(20) little lIl	(16)	one of ũə̃
	getting gĩŋ		and it æ̃I
	got out of gɑ:		print d pɾĩd
RC-C	(28) better bɛɹ	(9)	want to ûə̂
	magnetic mæg'nɛIk		they're not ðɛ̂a

about eight	went out
əba'eI?	uɛ̃'a>t

Flap deletion seems to be consistently more frequent in conversational speech than in reading, except that DJ deletes nasal flaps more often in the reading condition.

2.6.C. External Sandhi Processes. Defined as processes which apply only at word boundaries, external sandhi processes are rare in my recordings of connected speech. I will describe below two which occur, one infrequently and one very frequently; palatalization and ð-assimilation respectively.

I. Palatalization. This process is discussed in studies of abstract phonology (e.g. Chomsky and Halle 1968:230, Bailey PRO B-11), where it is used to account for pronunciations such as [əbu̯eIʒən] for abrade + ion and [ɹu̯eIʃɚ] for erase + ure. On a more superficial level it applies when a word-final t, d, s, or z is followed by the glide j, to yield [tʃ, dʒ, ʃ] or [ʒ] respectively (Zwicky 1972:280). Examples from my texts are the following:

1. d # i. (total of 5 cases for all speakers)

BN-R	would you[23]	'wʊ ʒu
DJ-R	world, you	'wɚldʒu
DJ-C	married you	'mɛɹidʒə

2. t # i. (total of 16 for all speakers)

BN-R	that you	'ðætʃu
BN-C	put your	'pʊtʃə
DJ-R	hit you	'hItʃ
DJ-C	out you	'æʊtʃə
RC-R	what you	'hwətʃə
RC-C	that you	'ðætʃ

3. s # i. (total of 10 for all speakers)[24]

DJ-R	voice your	'voIʃɚ
DJ-C	keeps you	'kipʃə
RC-R	impedence you	Im'pidn̩tʃu
RC-R	course you	'kɔɹʃiu

4. z # i. (total of 7 for all speakers)

DJ-R	degrees, you	dɪ'gɹiʒu
DJ-C	things you	'θɪŋzʒɪə
RC, C and R	use your	'iuʒɚ

II. ð-assimilation (Hubbell 1950:37). This process is quite frequent in connected speech. It causes a word-initial [ð] to assimilate to a preceding alveolar consonant or to [v].

I believe this process is different from simple word-initial ð-dropping (Zwicky 1972), of which there are several cases in my texts, usually occurring after silence or velars. Since the words for which this process occurs are a closed class (the, they, them, these, those, that, this, there, then), I will not list specific instances of it for each speaker, but only the number of times it occurs:

BN-R	ø
BN-C	2
DJ-R	2
DJ-C	18
RC-R	3
RC-C	6

In all cases, initial ð is deleted more in conversation than reading, although it happens more than just a few times even in conversation only for DJ.

However, ð-assimilation is quite common for all three speakers. I think the process instantiated below is an assimilation rather than a simple loss for the following reasons:

(1) As a hypothetical example, in a phrase such as, 'Run the quarter mile', which would be pronounced ['ɹən·ə'kʰu̯ɹtɚ'maɪl] after ð-assimilation; the remaining consonant from the original consonant # ð cluster frequently gives the impression of extra length,[25] as in the example. This lengthening suggests a geminate consonant consisting of the original pre-ð consonant plus another copy of itself which replaces the ð.

(2) Further, there are cases where ð seems to have only partially assimilated to the previous consonant, for example:

BN-R	from the	fɹəmnə
RC-C, DJ-R	from this	fɹəmnɪs

in which there is partial assimilation of point of articulation and total assimilation of manner;

RC-C	at the	ætdə

in which there is assimilation of place and manner and only voicing remains unassimilated;

RC-C		magazines that	mægə'zin^{t}szæ

in which there is again place assimilation without complete voicing assimilation.

Examples of complete ð-assimilation from the texts follow:

t # ð[26]

BN-R	(6)	out that	æo̞t·ət
		but the	bət·ə
		aren't the	ɔɹəntə
BN-C	(3)	that the	ðætə
		at the	æt·ə
DJ-R	(13)	that they	æt·eɪ̯
		get these	gɪtʰiz
		what the	uə̯tʰə
DJ-C	(12)	got this	gatɪs
		respect the	ɹɪs'pɛktᶿə
		out there	atᶿɪ>ɹ
RC-R	(Ø)		
RC-C	(1)	out there	æo̞tɛɹ

d # ð[27]

BN-R	(2)	head that	'hɛd·æt
		argued the	'aɹgɪ̯ədə
BN-C	(2)	rearranged the	ɹi˞'ɛ̃ɪ̯ndʒdə
RC-C	(1)	word that	u̯˞dət

s # ð

BN-R	(Ø)		
BN-C	(1)	course they	kɔɹs·e
DJ-R	(6)	Congress that	'kaŋg˞s·æt
		once they	uə̃seɪ̯
		that's the	ðæs·ə
DJ-C	(1)	course the	kɔɹs·ə
RC-R	(2)	impedence that	Im'pi̥nsæt
RC-C	(3)	effects the	ɛ'fɛks·ə

z # ð

BN-R	(2)	suppose they're	sə'pozɛɹ
BN-C	(5)	blows the	bloz·ə
		there's the	ðɛz·i
		cause the	kʰəz·ə
DJ-R	(9)	dudes that	dudzæ
		bills that	bɪlzæ
		does their	dəz·ɛɹ
DJ-C	(9)	broads that	bɹadzət
		size (of) the	saɪzi
		was that	uəzæt
RC-R	(3)	was there	uəzɛɹ
		years there	jɪɹz·ɛɹ
		magazines that	ˈmægəzɪnz·əd
RC-C	(6)	shields the	ˈʃiəudzə
		cause they	kəzei

n # ð

BN-R	(27)	in the	Inə
		in there	Inɛɹ
		on the	ɔn·ə
BN-C	(26)	seen the	sin·ə
		gone the	gani
		isn't that	ˈIznæt
DJ-R	(15)	on they	an·ɛɪ
		on this	ɒɪs
		on their	ənɛɹ
DJ-C	(17)	one (of) these	uəniz
		and these	əniz (d → ∅)
RC-R	(8)	upon the	əpan·i
		between the	pʰˈtʰui·ni
		and then	nɪn (d > ∅)
RC-C	(6)	in the	Inə
		and then	nɛn
		line that	laɪn·ət

There are also a few examples of l # ð > l and v # ð > v, but only a very few; the examples above should serve to illustrate the process under consideration adequately. In some of the alveolar consonants derived from clusters listed above, there is no indication

of extra length (e.g. BN-R 'in the' [Inə]), because the perceived length of the elements in question did not warrant it. This suggests a degemination process, which has been postulated for English by both Bailey (PRO:B-37) and Stampe (1972:56) for reasons independent of those stated here.

The example of 'in the' cited above points out that in some cases where ð-assimilation and degemination have applied, there is no apparent distinction between the definite and indefinite article, i.e. 'in the' is pronounced similarly to 'in a'. For elements which flap (see previous section) the distinction between definite and indefinite may be preserved in some cases since it is much less likely that intervocalic alveolars derived from original alveolar-plus-ð clusters will flap than original intervocalic alveolars.

2.7. The processes outlined above constitute only the most frequent ones represented in my texts. Each speaker shows individual phonological characteristics, but a description of these has been excluded since my aim in this study was to determine some of the more general characteristics of connected speech. One obvious omission from this treatise is the subject of vowel reduction as a function of stress, position in an utterance, and style in connected speech. This subject certainly deserves careful attention and hopefully will be covered in a separate paper.

Other questions still to be investigated are 'Given that the processes discussed here generate more than one possible pronunciation for a sequence of sounds, is it possible to predict when one is likely to find a given one of them?' Situations which arise in the texts make one doubt that this is possible.

For example, BN in the conversational text says, 'We would sit in the...in the highest balcony' [ɥiɥ˞d' sItIni...ndə'hɔIɨstʰ'bælkɨni], where the first occurrence of the words 'in the' is realized as [Ini] the second as [ndə]. The two lexically identical phrases have quite dissimilar phonetic shapes; in one word-initial ð has assimilated to the preceding nasal, in the other it has become [d]; in one word 'in' has a vowel in it, in the other it is represented by a syllabic nasal; in one, the vowel of 'the' is [i], in the other it is [ə]. If one were asked to choose which of the realizations were more likely to come after a fully articulated t (as in 'sat' above), one would almost surely choose [n̥də], since articulation of the sequence [tn̥d] involves little more than lowering and then raising the velum. But in fact, one finds that the [n̥də] version occurs after a short pause.

DJ's conversational phrase, 'People not working are getting money' is realized as ['pʰipona'u˞kn˞'gɪ˞Iŋ'məni]. Notice that the first final -ing is realized as [n], while the second is [ŋ]. These words both occur in the same sentence in the same style and represent the same grammatical type, yet they are realized differently.

Secondly, given a particular phrase, can one expect it to reflect a homogeneous style? This seems unlikely just from the phrase by DJ 'I haven't had', which is realized in reading style as [aIævn̥æd], but in conversation as [əhævn̥æd]. In the first, the word 'I' is realized as [aI], and both possible word-initial h's are deleted. In conversation, 'I', is pronounced [ə], but one of the word-initial h's is fully articulated. One would like to be able to associate style of speech with degree of reduction; but even though the same

phrase in two different styles is realized differently, it is difficult to say which version is more formal or less reduced.

In short, there are many intriguing phonological inquiries still to be made about the properties of connected speech even from this rather limited corpus taken from a small number of speakers.

2.8. Phonological differences between styles.

It is generally believed (see e.g. Kenyon 1935:16 and Joos 1962: Chapter 4) that reading aloud is conducive to using a more careful style of speech than speaking conversationally. This study suggests that except for one phonological process which we are made aware of in elementary school: ŋ > n / __# (dropping the g), and which, perhaps because of this educational experience, two of my subjects are able to suppress at will when reading, the phonological differences between reading and conversational speech are more quantitative than qualitative. A given rule may apply more or less frequently in a given style than in another, but a different set of speech patterns is not brought into use. (Perhaps if the subjects were induced to speak unnaturally in some respect, new phonological patterns would appear. The subjects in this study had no restrictions on their speech in either condition except that they were asked to speak intelligibly when reading. See Chapter I). The processes outlined above which show noticeable differences in frequency of application in the same direction for all three speakers are monophthongization of vowel plus schwa and flap deletion. In both of these cases, the process was more widespread in conversational style. (It was pointed out earlier that deletion of unstressed vowels is, for all speakers combined, more general in conversational style).

Considered individually, speakers do display differences between styles as related to frequency of rule application. The following chart indicates differences between styles for individual speakers:

Speaker	Process	Style in which predominant	difference
BN	C > -voi / #__	conversational	12
BN	$\tilde{V}$NC > $\tilde{V}$C	conversational	7
BN	+fric. > syllabic fric.	conversational	8
BN	u + ə > $^{ə}_{ʊ}$	conversational	8
BN	t > ɾ / __ #	reading	12
BN	d > ɾ / __ #	reading	11
BN	n > $\tilde{ɾ}$ / __ #	reading	7
DJ	v > Ø / __ #	conversational	7
DJ	aU > a	conversational	19
DJ	ən > n	conversational	25
DJ	v > Ø / __ #	conversational	14
DJ	t > ɾ / __ #	reading	11
DJ	n > $\tilde{ɾ}$ / V__V	reading	11
RC	t > ʔ / __ #	conversational	11
RC	aU > a	conversational	12
RC	ən > n	conversational	20
RC	VNC > VC	reading	9
RC	t > ɾ / V__V	reading	7
RC	t > ɾ / __ #	reading	17

I have commented above on the unusual frequency of flaps in reading style. For most other processes, there is greater frequency of application in conversational style, as might be expected.

There are doubtless other differences between reading and conversational speech, such as in phrasing (see Chapter III) and intonation as well as number of hesitation noises ('uh') and filler material ('you know') that give the listener cues as to whether a speaker is reading. Style is, of course, also associated with features on different levels of linguistic analysis such as choice of lexical item or grammatical construction (see for example Joos 1962, Crystal 1969). These elements may in themselves convey the level of linguistic formality which the speaker intends to utilize with little help from phonological mechanisms.

Footnotes to Chapter II

1. No claims are being made about innateness or about the actual existence of an ideal pronunciation from which all realizations derive their being.

2. See Kenyon American Pronunciation, p. 198 for a rationale for this point of view. "It is a very small proportion of words to which the full vowel sound of the unaccented syllables can be restored without making the pronunciation wholly unnatural and even unintelligible."

3. Kenyon used "r" for the American r, usually represented as [ɹ] in IPA notation.

4. In this paper, I use [ə] for both stressed and unstressed schwa and [ʌ] for both stressed and unstressed retroflex schwa, thus having one symbol each for major vowel categories. Perceptible reductions are indicated by diacritics.

5. Key: The first two letters are the initials of the speaker, the letter after the hyphen indicates the speaking style, C for conversational; R for reading. The number in parentheses indicates the number of times the process was found to occur for the speaker and style given.

6. However, BN consistently pronounced the phrase 'going to' as [gəɾ̃ə], which, frequently spelled 'gonna' in written colloquial dialogue, is probably lexicalized as a unit in the speech of most Americans.

7. As a speaker of the same dialect as the two Columbus informants, I feel that is perfectly natural to say ['lɑtsə 'æplz] for 'lots of apples', even without a glottal stop before the [æ]. However, no cases of əV# → əɸ / __ Vowel occurred in the texts.

8. ɯ is the symbol used in this treatise for a very constricted high back vowel-like sound substituted for [l] by the Columbus speakers in some cases.

9. Although some natives of Pittsburgh, Pennsylvania use this process quite generally, as far as I can determine from informal field work, e.g. 'house' [ha>s], 'cloud' [kʰa>d].

10. While transcribing, I have variously written the resulting monophthong as a fronted back vowel or a backed front vowel.

11. If the initial sounds in words like when, why, where are considered a sequence of [hu], we could say that DJ and BN consistently apply h → ∅ / __ u; whereas RC does not apply it at all.

12. The striking frequency of this process is a result of its being a possible reduction of the word and (ænd > ənd > ən > n̩), which all of the speakers use often and which speaker RC uses after practically every span of connected speech, as a filler word.

13. Followed by a labial.

14. I am assuming that [ɹ] and [ɝ] function identically in this process.

15. Name of Latin-American origin: pronounced locally [əheɪə]

16. In this case, as perhaps in most, 'schwa' is a cover term for unstressed, reduced vowels. It is doubtful that the second vowel in 'being' ever gets as low as a true schwa.

17. See below for flapping and flap deletion.

18. The fact that flapping (see below) can occur between the period of voicelessness and the following vowel tends to support the idea that the first vowel becomes simply devoiced rather than deleted.

19. One might alternatively claim that t and d drop in nt and nd clusters, then the n flaps. One certainly can find cases of intervocalic n where an nt or nd is expected, suggesting that a stop-dropping rule in this environment is necessary at any rate. (Zwicky (1972) quotes S. Jay Keyser as suggesting the opposite phenomenon--n drops and the remaining t flaps).

20. It appears to be far more common for the cluster nd to become [n] than go to a nasal flap, which might be described as an extra short [n] (see footnote 19).

21. mostly from and and kind of.

22. mostly from you know.

23. BN frequently changes affricates to simple fricatives.

24. BN does not contribute any examples to 3 and 4.

25. See Chapter I for an explanation of why actual measurements were not done. Hubbell (1950) apparently agrees that extra length is involved: "In negligent pronunciation, the initial fricative is sometimes assimilated to certain preceding consonants. In phrases like all the men...., who's there...., ll, nn, zz, sz (ss) may replace /l/, /n/, /z/, /s/, respectively. The double consonants that result are sometimes simplified."

26. The resulting t frequently has a very dentalized release, suggesting that the tongue has moved forward during the closure. This could be tested by examination of transitions in an experiment where phonetic environment could be controlled.

27. Since BN changes [ð] to [d] word-initially at apparently random times in other environments, it is difficult to interpret these data.

CHAPTER III

3.1. As mentioned in Chapter I, there is currently much discussion among phonologists as to the nature of fast or casual speech. Although there is interest in the phonological properties of non-maximally-differentiated speech, there is considerable vacillation of opinion as to whether speed or style or a combination of these serve as a trigger for the reductions that one encounters in natural connected speech for the various degrees of reduction that the same phonological sequences can undergo. Zwicky (1971) discusses possible reasons for alternative pronunciations in "On Casual Speech" and a rather impressive example of variant pronunciations of the same phrase is offered by Stampe (1972:56).

Several scholars have used the term 'fast speech' to refer to relatively reduced sequences (Harris 1969, Zwicky 1972, Stampe 1971: Chapter 1.) It is intuitively satisfying as well as in accord with experimental data (Lindblom 1963, Kozhevnikov and Chistovich 1965: Chapter 3) that as a speaker increases his rate of speech, he has less time to achieve targets, therefore segments may be non-maximally articulated or deleted entirely. Therefore, the term 'fast speech' may be a proper one for speech manifesting many imprecisely articulated forms. But Stampe (1972:1) has made a convincing case for the position that phonological processes are basically mental, although their possible forms are strongly determined by the nature of the human nervous system and vocal tract. If so, utterances showing relatively greater amounts of phonological reduction may reflect an attitude on the part of their producer as to the formality of the speaking environment, and therefore the terms casual or relaxed speech may be more appropriate to describe reduced utterances. However, data from the previous chapter suggested that when texts taken in their entirety are examined, there are practically no differences between naturally spoken texts in two different styles as to types of phonological processes manifested and only small differences between them as to number of times the process applies. The technique makes the assumption that consistent style is used by a given speaker in a given recording situation, though as pointed out in Chapter 2 the term 'consistent style' may be somewhat difficult to define, considering the apparently random variations in phonetic realizations of the 'same' sequences one encounters between styles and within the same style.

In this chapter, an investigation is made of the rate-of-speech characteristics of each of the two styles of speech under discussion. Then a more specific study is made of individual rate and style relationships for each speaker: pairs of utterances containing very similar lexical material and spoken at similar and different rates of speech are examined to determine: (1) whether greater reduction

is characteristic of utterances spoken at relatively greater speeds, and (2) whether utterances spoken at nearly the same rate exhibit differences in amount of phonological reduction, which might be attributed to style.

3.2. The term 'degree of reduction' is rather hard to quantize. Simply counting the number of low-level phonological processes found in two different utterances and assigning a 'degree of reduction' score to each depending on the absolute number of processes seems unsatisfactory since a process which deletes an element completely seems to cause a greater amount of reduction than one which simply changes a feature of an element. Ideally, a reduction scale should be devised, where a value is assigned to each process depending on the number of features it changes, with complete deletion being assigned the highest value and the total amount of reduction of any given utterance scored on the basis of this weighted scale. In practice, however, the designing of such a scale seems to involve many arbitrary decisions. So in this study the admittedly unfelicitous technique of counting the number of processes manifested will be used to determine amount of reduction of a given span of speech. The number of processes evidenced in a given span is to some degree a subjective decision, depending on the theory in which the researcher is working and the possibility of determining unambiguously which processes are in effect in any particular case. For example, it was found that in connected speech there is a process which changes schwa plus nasal to syllabic nasal in relatively unstressed positions. But there is also evidence of a process which devoices schwa after an initial aspirated voiceless stop (see Chapter II for examples). Supposing then, that the words 'to me' were pronounced [t^hmi·]. It is perfectly clear that they remain a two-syllable sequence, but not at all clear which element is assuming syllabic nature in the first syllable. Granted that this reduction can probably be considered one process, it is difficult to decide which it is. Considering the subjective nature of the decision, the reader may not always agree with the tally of number of phonological processes evidenced in a given span of speech as outlined below. It is hoped that in most cases the decisions will seem obvious and non-ambiguous.

3.3. Before looking into the question of whether reading and conversational styles are characterized by different rates of speech, I will discuss briefly the concept of speech rate.

Kelley and Steer (1949) state:

> Rate of speaking is traditionally described as the number of words spoken per minute during a complete speech performance. In calculating overall rate of speech, the estimate includes intentional pauses and unintentional pauses as well as meaningful words spoken in the elapsed time. In extemporare speech the amount of nonspeech time may be considerable. Under such conditions, it is possible for the speaker to have a slow overall rate, yet word utterance within the sentences might be rapid for the most part.

They point out that a similar position had been taken by Jack C. Cotton (1936) who wrote:

> Speech rate determinations which are made by timing a speech and calculating the average number of words spoken per minute, although useful for some purposes, are practically worthless in any scientific speech study.

Cotton proposes that a rate in syllables per second be calculated for each syllable in the utterance under investigation, thereby eliminating the deleterious effects of averaging. (He points out that averages can always be extracted from data in the form he advocates). Kelley and Steer claim that using words-per-minute or syllables-per-minute give highly similar rate estimates since the correlation between the two expressions of rate is about .84, They decide on words-per-minute as a measure in the article cited. with the innovation of omitting pause time in one form of rate determination, sentence rate. They report that their measure of sentence rate corresponds well with subjective estimate of rate of speech.

Another technique for determining rate was used by Osser and Peng (1964): Phonemes -((sic)=speech sounds) per-minute, in comparing Japanese and English average speech rates. Goldman-Eisler (1956) rejects the concept of speech-per-unit time as a determiner of rate. She states:

> A continuous flow of speech rarely broken by periods of silence is felt to be fast speech, and speech the flow of which is halted by frequent pauses of hesitation is experienced as slow speech. The speed of the actual articulation movements producing speech sounds occupies a very small range of variation, 4.4-5.9 syllables per second.

The present study adopts the Kelley and Steer suggestion that only speech be included in determining overall rate of speech. Cotton's distrust of averaging is not shared by this writer, since it seems to me that for example the shortness of an unstressed syllable is predictable from English stress rules and is not to be considered a sign of change in rate, either from a production or perception standpoint. Rate, in my opinion, is a property of a span of speech and therefore averaging has been done on my data. Goldman-Eisler's suggestion was not investigated here, since the 'pauses' in my recordings were very often filled with comments from the experimenter (during the conversation) or were due to interruptions caused by turning pages (while the subjects were reading).

Speech rates are given in words per second, a measure which I found easier to conceptualize than words per minute. The former is obviously easy to convert to the latter by multiplying by 60. Rate was averaged over every phrase as determined by the speaker, i.e. over every span of continuous speech between pauses. Agnello (1965)

calls such a span a 'speech unit', but notes that the term 'talkspurt' is of common usage in communication research. This seems a particularly appropriate term in that it implies nothing about the internal structure of the span of speech, which in this study was often not equivalent to any recognized grammatical unit.

3.4. In the following table are displayed the results of the investigation of speech rate for the three subjects used in this study, including total speech time, total words, number of talkspurts, average talkspurt duration, average words per talkspurt and average words per second, averaged over the entire corpus for each speaker in each condition. Included are the results of a T-test testing similarity of distribution of words-per-talkspurt and words-per-minute values between the reading and conversational conditions for each speaker.

TABLE 3.1
Speech Rate Results

	Speaker DJ		Speaker RC		Speaker BN	
	Conversation	Reading	Conversation	Reading	Conversation	Reading
Total Speech Time (sec.)	344.33	371.92	362.35	347.50	333.21	336.56
Total Words	1674	1562*	1275	1236*	1498	1453*
Number of Talkspurts	153	225	128	146	173	99
Average talkspurt Duration (sec.)	2.25	1.653	2.831	2.380	1.926	3.400
Average Words per Talkspurt	10.94	6.90	9.96	8.47	8.60	14.78
Variance	38.70	14.51	61.66	25.36	46.02	94.00
T-Measure	7.81		1.89		6.03	
Average Words per Second	5.40	4.25	3.52	3.56	4.50	4.32
Variance	13.11	.85	2.32	.86	1.75	1.34
T-Measure	4.54		-.271		-.566	

*Smaller number of words in reading version is due to deletion of repetitions, hesitation noises, and filler phrases, especially 'you know'.

Levels of Significance for T-Measure (∞ df)

.10 = 1.645 .05 = 1.960 .02 = 2.326 .01 = 2.576 .001 = 3.291

Discussion.

Several tendencies are apparent in the first two speakers that we do not find for the third: speakers DJ and RC have, on the average, more words per phrase and both fewer and longer-duration talkspurts during conversational speech than when reading. Also, the range of speed found in conversation is more spread than for reading (reflected in variance of average words per second). All of these tendencies are reversed for speaker BN. BN is the speaker of the New York dialect, but this fact is probably not to be considered significant.

There is little difference in average rate of speech measured in words per second between the two tasks for speakers RC and BN while a very significant difference in mean rates exists for DJ.

DJ and RC have a significantly greater amount of variation in size of talkspurt, in terms of number of words, in the conversational mode. BN has an equally significantly greater variation in words per talkspurt in the reading mode.

It seems, then, that this attempt to elicit two different styles has not succeeded in eliciting anything which is generally characterizable as two different speeds for all speakers. DJ shows the only case of conversational speech being on the average noticeable faster than reading.

One assumption that could be made is that the fastest and slowest utterances for each speaker in each condition might show strikingly different amounts of reduction. When the corpora at hand were investigated for this tendency, it was found that instead of a difference in degree of reduction, the 10 fastest and 10 slowest talkspurts for each corpus showed a marked difference in number of words per talkspurt. For each speaker, the very slow talkspurts consisted of only a few words and the very fast ones consisted of a great many. The following table summarizes the findings:

TABLE 3.2.
Fastest vs. Slowest Utterances

	Conversational Style			Reading Style		
	Average Words per Talkspurt	Average Words per Second	Average Duration of Talk-spurt	Average Words per Talkspurt	Average Words per Second	Average Duration per Talk-spurt
Speaker DJ						
10 fastest	11.6	8.28	.77 sec	7.2	6.31	.88 sec
10 slowest	6.0	2.82	.47 sec	2.3	2.40	1.04 sec
Speaker RC						
10 fastest	12.1	5.36	.44 sec	10.7	6.0	.56 sec
10 slowest	3.5	1.93	.55 sec	2.0	2.38	1.19 sec
Speaker BN						
10 fastest	7.9	7.43	.94 sec	24.2	9.0	.37 sec
10 slowest	1.8	1.73	.96 sec	9.3	3.0	.32 sec

Despite the intrinsic interest of the above material, it does not advance the cause of examining the relationship between speech rate and amount of reduction, since it would clearly make no sense to compare the amount of reduction present in a group of phrases with a few words to the amount of reduction present in a group of phrases with many words.

3.5. In order to examine the frequency of low-level phonological processes in these texts, the following procedure was then followed:

1. Cases were found where the speaker talked at the same rate of speech when producing the lexically identical or nearly identical phrase in both styles. The utterances chosen were spoken at rates of speech not differing more than .5 words per second for any given pair. The experimenter compared the written and conversational versions of 13 sets of utterances for speaker BN, 12 sets of utterances for speaker RC, and 8 sets of utterances for speaker DJ, and a tabulation was made of the number of phonological processes found to apply in each case of the pair.

2. Cases were found where speakers used the same of nearly the same lexical material in two talkspurts, one each in each of the styles under discussion, when the rates of speech were different, i.e. there existed a greater than .6 word per second difference. (This decision is arbitrary, but there is no standard technique to determine the boundaries of speech rates, i.e. where 'slow' yields to 'medium' and 'fast'.)

Results.

The examination of the equal-speed phrases showed that there was a small but consistent tendency for conversational phrases to be more reduced than read phrases, given the same content and rate of speech.

For BN, 11 out of 13 cases showed more reduction in conversational style; for DJ 6 out of 8; and for RC 9 out of 12.

On the following pages, I give phonetic transcriptions of lexically similar phrases spoken at different rates as taken from my texts. Following these transcriptions is my analysis of what processes have operated to shape each output and a tally of the number of processes I think have applied for each utterance.

Speaker BN

"I forgot exactly how much it costs"

Conversation: ʔaɪ̯ fɚ gɑ Igzækli hæo̯ mətʃ Iʔ kʰɑsts

Reading: aɪ̯ fɚgaɾ Igzækli hæo̯ mətʃ ɪ̆t kʰɑsts

Processes in conversation: "forgot": oɹ > ɚ ; t > ɾ > ∅; "exactly": t > ∅/k__l; "it" t > ʔ/__#. Total: 5 (t > ɾ > ∅ counts as 2).

Processes in reading: "forgot": oɹ > ɚ ; t > ɾ/__#; "exactly": t > ∅/k__l. Total: 3.

"And the island is really small; you could probably walk around it in an hour."

Conversation: ni æɛ̯l əndIz ɹIli smɔ ɨwd pɹɑli ʊ̯ɔk æo̯ndIt n̥ æʊ̯ɚ

Reading: ænɨ aɪ̯ləndz̥ ɹili smɔ ɨmkn̥ pʰɹ̥abəbli ʊ̯ɔk ɚ aɪ̯ɾndId In ən æʊ̯ɚ

"And the island is really small; you could probably walk around it in an hour."

Conversation: ni æɛl əndIz ɹIli smɔ ɨwd pɹɑli ʊɔk æondIt n̥ æu

Reading: ænɨ aɪləndz̥ ɹili smɔ ɨmkn̥ pʰɹ̥abəbli ʊɔk a ndId In ən æu

Processes in conversation: "and": ænd > æn > ən > n; "the": n # ð > n; "small": l > ∅/__#; "could": k > ∅; U > ∅; "probably" [bəb] > ∅ (this process or collection of same is rather difficult to classify. It may simply represent an alternative pronunciation of the word probably which has become stylized and therefore not reflect a generalizable process). "in an" > ənən > n. Total: 9 ("would" is not included since it does not occur in both styles).

Processes in reading: "and" d > ∅/__#; "the": n # ð > n̥; "island is": əz > z̥; "small": l > ∅/__##; "can": æn > ən > n̥; "it": t > d/__#. Total: 5 ("can" is not included, since it does not occur in both styles).

Speaker DJ

"very elaborate seating"

Conversation: vɛɹi læbɝ sirɪŋ

Reading: fɛɹi ɪlæbɝ sirɪŋ

Processes in conversation: "very": v > -voi; "elaborate": əl > l̩, + ə > t > ∅/__#; "seating": t > ɾ. Total: 5.

Processes in reading: "very": v > [-voi]; "elaborate": t > ∅/__#, + ə > ; "seating": t > ɾ. Total: 4.

"And I'm not like many scientists, I very strongly believe that there is definitely life on other planets."

Conversation: æ̃ ə æma laɪk mɛɾ̃i səɪɛ̃z aɪ vɛɹi stɹɑngi blɪvəth
Is ədɛfə̃ɪ laɪf ɔn əðɝ plæɾ̃ɛts

Reading: æ̃ ɾ̃ æ̃ɛ̃na ləɪ mɪi saɪəɾ̃ɪsts aɪ vɛɹi stɹangli blɪvðɛthɛɹ
Iz difɝ ʔdɛfə̃li laɪf ən əðɝ phlæ̃ɪts

Processes in conversation: "and": d > ∅/__#; "I'm": aɪ > æ; "not": m # n > m; "many": n > ɾ̃; "scientists": nt > ɾ̃ > ∅; ɛ + ə > ɛ; sts > ss > z; "strongly": l > ∅/__i; "believe": əl > l̩; "that": v #ð > v; "there": ð > θ /#__; "definitely": n > ɾ̃ > ∅; ə + ə > ə; "planets": n > ɾ̃ > ∅; l > ∅. Total: 18.

Processes in reading: "and": nd > ɾ̃; "I'm": m > ∅__#; "not": t > laryngealization /__#; "many": n > ɾ̃; "scientists": nt > ɾ̃; "believe": blɪv; "there": t # ð > thʰ; "definitely": n > ɾ̃ > ∅; "on": an > ən; "planets": n > ɾ̃ > ∅. Total: 11.

Speaker RC

"And also by using a low impedance you can use two conductors shielded".

Conversation: ɨn ɑusoə baɪ uzɨnə loʊ Impɪn̩tsʃ kŋ̩ iuz thuhk ɨndəktɝ
ʃiɯɾtd

Reading: ɛ̃n also baɪ uzI eI loʊ Impintʃiu kɨn iuzthu khəndəktɝ
ʃiɯɾtd

Processes in conversation: "and": ænd > æn > ɨn; "also": l > u; "using": > n; "impedance": ən > n̩, s + i > ʃ; "you": u > ə > ∅; "can": kæn > kɨn > kn̩ > kŋ̩; "shielded": l > ʉ, z + ʃ > ʃ . Total: 13.

Processes in reading: "and"; d > ∅/__#; "a"; > [eI] (hypercorrection, not a genuine low-level process); "can": > kɨn; "conductors": z + ʃ > ʃ; "shielded": l > u. Total: 7.

"It goes down through your body and if you have any."

Conversation: ɨ gɛoz dæun tθuiɚ bain̩ If iə hævɛ̃i

Reading: ɛ̃I goz dæun θɹui bain̩ If iə hævɛ̃i

Processes in conversation: "it": t > ∅/__#; "down through": nθ > ntθ; θɹ > θ; "your": i > ĩ > i; "body": d > ɾ > ∅; "and": ænd > æn > ən > n̩; "you": u > ə; "any": n > ĩ > ∅. Total: 11.

Processes in reading: "it": t > ∅/__#; "your": oɹ > ɚ; "body": d > ɾ > ∅; "and": ænd > æn > ən > n̩; "you": u > ə; "any": n > ĩ > ∅. Total: 7.

Examination of the different-speed phrases indicated that the same tendency holds for conversational speech to be more reduced; but the conversational speech was always the faster of the two being compared. For BN, 7 out of 10 pairs show more tendency of the faster member, i.e., the conversational utterance, to reduce: for DJ this is true for 8 out of 9, and for RC 4 out of 6. Examples:

Speaker BN

"Yes, the wind blows the wrong way, you can smell it."

Conversation: iɛs də uIn bloz ə ɹɑŋ ueI kn̩ smɛlIt

Reading: iɛs θə uInd blɔz θə ɹɑŋ ueI iu kæn smɛlIt

Processes in conversation: "the": ð > d; "wind": d > ∅/__#; "the": z # ð > z; "way, you": I + ə > I, u > ə; "can": æn > ən > n̩. Total: 7.

Processes in reading: "the": ð > θ /s__ (twice). Total: 2.

"Yugoslavia I saw through a jaundiced eye, as they say."

Conversation: iuɡ̊əslɑviə aI sɔ θuə dzun-ə dzɔ̃dist ãI ɛsðɛI sɛI

Reading: iugəslaviə aI sɔ θɹu ə dʒɔndɨst aI æz ðeI seI

Processes in conversation: "Yugoslavia": o > ə; "through": θɹ > θ; "jaundiced": ṼNC > ṼC; "as": æz > ɛz. Total: 4.

Processes in reading: "Yugoslavia": o > ə. Total: 1.

Speaker DJ

"I think if J.F.K. was alive we wouldn't have Vietnam."

Conversation: ɑ θĨk If ədʒeI ɛf keI uəz əlaIui u◡dn̩ hæviI?nam

Reading: aI θĨk If dʒeI ɛf kʰeI uəz əlaIv ui u◡dn̩ hæv iə?nam

Processes in conversation: "I": aI > a; "think": VNC > ṼC;
"alive": V > ϕ/__#; "wouldn't": t > ϕ/__# Total: 4.

Processes in reading: "think": ṼNC > ṼC; "wouldn't": t > ϕ/__#.
Total: 2.

"And it's non-repayable; you don't have to pay it back or anything."

Conversation: ɛ̃n Is nə̃ɹIpeI̯bl̩ i̯õ hætʰ pei̯ I bæk ɚ ɛ̃IhIŋ

Reading: ɛ̃Is nən Ipʰei̯bl̩ i̯ɯ dõt hæftə pei̯ bæk oɹIĩθIŋ

Processes in conversation: "and": æ̃nd > æ̃n > ɛ̃n > ɛ̃; "it's": t > ϕ; "non-repayable": a > ə; eI > ə > eI; əl > l; "you": ɔ > i; "don't": d > ɾ > ϕ; "to": V > -voi / tʰ; "or": o > ɹɚ; "anything": n > ɾ > ϕ, nt > ɾ > ϕ, θ > h. Total: 9.

Processes in reading: "and": æ̃nd > æ̃n > ɛ̃n > ɛ̃; "it's": t > ϕ; "non-repayable": a > ə; eI > ə > eI; əl > l̩; "don't": VNC > VC; "it": t > ϕ/__#; "anything": n > ɾ̃ > ϕ. Total: 11.

Speaker RC

"Because all the time you were on transmitter duty you couldn't relax; I never could."

Conversation: kəz əɔtaI̯m i̯əzon tɹæn^t smIɾɚ duɾi i̯ə kʰʊ̃nt ɹIləks aI̯ nɛvɚ kʊəd

Reading: bɪ̆kʰɔz aIθətʰaI̯m iu uɚ ɔn tʰætsmIɾɚ duɾi i̯ɯ kʰ dn̩ ɹilæks ʔaI̯ nɛv kʰʊd

Processes in conversation: "(be)cause": a > ə; "all": l > ϕ; "you": u > ɵ; "transmitter": ns > nts; "duty": t > ɾ; "you": u > ə; "couldn't": d > ϕ/__n. Total: 6.

Processes in reading: "the": ð > θ/#__; "transmitter": ns > nts; VNC > ṼC; "couldn't": t > ϕ/__#. Total: 4.

"Oh, you usually get better frequency response for one thing, and they're built a little bit more rugged."

Conversation: ou̯ i̯ə i̯uʒəu̯i gIʔ bɛɚ fɹikʰu̯əntsi ɹispɔnts fɚ u̯əntθə̃Iŋ n̩ ðᵒɛɹ bIlɾə lIl bIʔ moɹ gɨd

Reading: ou̯ i̯u i̯u uu̯i gIʔ bɛɾɚ fɹikʰu̯intsI ɹispan^ts fɚ u̯ənt^θIŋ æn ðɛɹ bIu̯ɾəlIl bIʔ moɹ əgɨd

Processes in conversation: "you": u > ə; "usually": l > ʉ; l̩ > ʉ; "get": ɛ > I; "better": t > ɾ > ϕ; "frequency": ns > nts; "response": ns > nts; "for": oɹ > ɚ; "one thing": nθ > nt; "and": ænd > æn > ɛn > n; "they're": n̩ð > ndð; "built": t > ɾ; "little": t > ɾ > ϕ; "bit": t > ʔ/__#. Total: 17.

Processes in reading: "usually": l > l̩ > ʉ; "get": t > ʔ/__#;
"better": t > ɾ; "frequency": ns > nts; "response": ns > nts;
"for": ɔɹ > ɚ; "one thing": nθ > ntθ; "and": ænd > æn > ən > n̩;
"built": l > ʉ; l > ɾ; "little": t > ɾ > ø; "bit": t > ʔ/__#.
Total: 12.

3.6. These data suggest that rate determines degree of reduction in that given two similar utterances, one spoken at a rate relatively faster than the other, the faster one will be the more reduced. But style plays a significant role also in that given two utterances spoken at the same rate, the degree of reduction is not always identical, the more relaxed the style usually showing more reduction. Therefore one must conclude that both rate of speech and style of speech contribute substantially to degree of low-level phonological reduction.

CHAPTER IV

4.1. It is suggested by Lindblom (1963) that the production of a given vowel involves an invariant signal or set of signals sent to the articulators whenever the speech producer tries to produce a token of this vowel. The fact that we see variation in the actual acoustic output is, according to Lindblom, due largely to inertia of the articulators, which are affected by the nature of the other sounds preceding and following the one being examined and by the rate of speech which the speaker is using. The following study was designed to investigate the question: "Given a relatively fixed set of environmental influences and a relatively invariant rate of speech, can one detect influences of style of speaking on vowel formants?".

4.2. As mentioned in the three previous chapters, each of the three subjects for this investigation was induced to produce nearly the same lexical sequences in two different styles, once in conversation with the experimenter and once as read from a typed script. A determination was made of rate of speech of each connected sequence of verbal material in each style, the unit of measure being words per second. (See above for a discussion of speech rate. This technique may be criticized in that it does not allow for variation in rate within a given speech spurt.) For this study, the pairs of talkspurts described in Chapter III which contained nearly the same sequences of words and which were spoken at a rate of speech not differing by more than .5 words per second were again examined. (Since these utterances were of quite different lengths, the actual number of them used is not significant here. The total number of vowels measured is recorded in Tables 4.1-4. It was hoped that by choosing utterances spoken at so nearly the same speed the speech rate variable would be eliminated, insofar as it can be in natural speech.

As stated in Chapter I, spectrograms were made of all texts for all speakers; those corresponding to the equal-rate pairs of phrases were isolated for this study, and measurements were made of vowel formants 1, 2, and 3. These measurements were made only in cases where the identical contextual influences were, hypothetically, in operation in both cases; i.e. if vowel V appeared between elements X and Y in one style, it appeared between the same elements (in the same word, etc.) in the other style. It was presumed that with environmental influences being nearly the same for each style, any systematic differences in formant measurements could reasonably be attributed to style.

The measurements of the three lowest formants were made at a point determined to be the point of maximal achievement of the vowel

target in question. If the vowel attained a steady state, the measurement was made from the middle of the steady state; if not, the measurement was made at the point where the onglide ceased and the offglide began.

Two unavoidable problems with this particular type of investigation are that: (1) it is impossible to control for how many tokens of each vowel are measured. Given the constraints that the utterances must be the same length and speed, and that any given vowel must be measureable in both styles in a specific environment (if it is to be used at all), it does not seem practical to further demand that an equal number of tokens of each vowel type must be used, especially since vowels vary a great deal in the frequency with which they occur and the texts are relatively short. (2) Since the above is true and since, further, a little-represented vowel may occur, say, five times before an [l] and not at all otherwise, the vowel charts made from these measurements are not to be expected to be identical to traditional vowel charts made from recordings of identical numbers of vowels spoken in identical environments. The basic question is whether the vowel formant charts derived from vowels spoken in two different styles differ from each other, not whether they differ from standard vowel formant charts.

4.3. Results. Tables of average formant 1, 2, and 3 frequencies for each speaker in each condition and values averaged over all speakers in each condition appear below. Following them are acoustical vowel diagrams reflecting average values of F1 and F2 for each speaker, with both styles being represented on the same diagram. The fourth chart shows the average for all three speakers.

TABLE 4.1
Average Vowel Formant Frequencies for Speaker DJ
(Vowels in Random Environments)

Vowel	Reading				Conversation			
	F1	F2	F3	(n)	F1	F2	F3	(n)
i	308	1868	2492	6	313	1858	2481	6
I	463	1505	2277	11	439	1477	2348	11
ɛ	532	1468	2225	7	521	1375	2289	7
æ	600	1514	2206	9	636	1444	2392	9
a	606	1081	1950	4	594	1113	2069	4
ɔ	516	900	1933	3	533	1083	2066	3
o	554	1143	2186	7	536	1161	2289	7
u	260	1550	2150	1	300	1480	2400	1
ə	525	1278	2125	9	481	1272	2317	9
	422	1167	1825	3	450	1175	1933	3

TABLE 4.2
Average Vowel Formant Frequencies for Speaker RC
(Vowels in Random Environments)

Vowel	Reading				Conversation			
	F1	F2	F3	(n)	F1	F2	F3	(n)
i	373	1982	2499	19	393	1921	2513	19
I	449	1620	2316	21	473	1618	2487	21
ɨ	425	1688	2425	2	375	1775	2638	2
ɛ	579	1550	2413	6	520	1567	2382	6
æ	615	1644	2435	13	542	1644	2490	13
a	634	1194	2209	8	588	1159	2363	8
ɔ	638	1100	2275	2	538	1175	2438	2
o	575	1194	2256	9	519	1239	2406	9
u	370	1554	2300	6	383	1708	2363	6
	525	1600	2250	1	350	1700	2400	1
ə	524	1462	2411	19	509	1406	2403	19
	459	1364	1877	14	476	1368	1804	14

TABLE 4.3
Average Vowel Formant Frequencies for Speaker BN
(Vowels in Random Environments)

Vowel	Reading				Conversation			
	F1	F2	F3	(n)	F1	F2	F3	(n)
i	324	1919	2410	24	351	1836	2501	24
I	387	1671	2468	19	404	1675	2408	19
ɛ	512	1456	2419	12	477	1366	2498	12
æ	650	1602	2394	9	561	1661	2336	9
a	692	1138	2492	6	608	1133	2414	6
ɔ	613	1033	2675	6	466	1029	2763	6
o	554	1125	2329	6	542	1121	2333	6
	388	1275	2375	2	475	1238	2288	2
u	404	1483	2516	6	404	1371	2283	6
ə	444	1447	2434	17	430	1375	2415	17
	425	1396	1857	7	475	1439	1977	7

TABLE 4.4.
Average Vowel Formant Frequencies for All Speakers
(Vowels in Random Environments)

Vowel	Reading				Conversation		
	F1	F2	F3	(n)	F1	F2	F3
i	340.82	1936.94	2454.59	49	362.76	1871.94	2503.27
I	428.92	1614.22	2364.22	51	439.78	1609.02	2427.65
ɛ	534.00	1482.00	2363.00	25	500.00	1417.00	2412.00
æ	620.97	1594.35	2356.45	31	575.00	1591.13	2416.94
a	647.22	1150.00	2245.83	18	595.83	1140.28	2314.44
ɔ	590.91	1009.09	2400.00	11	522.27	1050.00	1513.64
o	562.73	1159.09	2253.41	22	530.91	1181.82	2348.86
u	377.69	1521.15	2388.46	13	586.53	1535.00	2328.85
	433.33	1383.33	2333.33	3	433.33	1391.66	2325.00
ə	493.85	1419.44	2362.22	45	473.89	1367.44	2390.56
	446.87	1348.96	1864.58	24	472.92	1364.58	1870.42

Figure 4.1: Speaker DJ.

For this speaker [i] shows nearly identical formant structure in both styles, as does [ɔ^]. [æ] is both lowered and backed in the conversational style, relative to reading style.

In all other cases, the vowels taken from the conversational corpus show a greater amount of centralization, vowel for vowel, than those taken from the reading corpus. (Centralization is defined here as position relatively closer to an imaginary center of the cluster of symbols representing vowel formant positions on these charts, not movement towards schwa, especially since schwa itself does not reflect a stable target). I will comment later on the unusual placement of [u] on this diagram in respect to standard formant diagrams.

Figure 4.2: Speaker RC.

This speaker also shows a centralized effect for conversational vowels with reference to vowels from the reading style. Except for [i, ɨ, u] and [ɔ] the differences between the two sets of vowels seem to lie largely in F1: the values lie in approximately the same line along the absissa, but differ as to their value on the ordinate. Again, the 'displacement' of [u] is in evidence.

Figure 4.3: Speaker BN.

Speaker BN shows nearly the same formant values in both styles for the vowels [I] and [o]. Other vowels show centralization for conversational style relative to reading. The above comments about [u] apply here as well.

Figure 4.4: All speakers combined.

When formant values for all three speakers are averaged, it appears that [I, u] and [ʊ] have approximately the same formant

structure in both styles. Averaging causes reading [ə] and conversational [ɛ] to seem to have nearly the same formant structure, although this is not true for any single individual. Except for the vowel [ɛ], the average difference in the two groups of vowels rests primarily in F1, as was noted for RC above.

4.4. Discussion. These data suggest that, when other factors are eliminated as much as possible, vowels tend to be more centralized when a person speaks in a relaxed conversational style than when he is reading aloud. Lindblom's theory assumes that given an individual speaker's vocal tract characteristics, the targets for which he is aiming, and the rate at which he is talking, the degree of reduction of the vowels he will produce can be rather precisely predicted. The results of the present investigation suggest that perhaps, given a rate, there is a range of degrees to which a vowel target may be achieved on the average; and that the more 'peripheral' values may be related to a relatively more formal style of speaking, the more 'centralized' ones to a relatively more relaxed style. Lindblom's calculations are aimed at discovering only the upper bounds of degree of target achievement given a speech rate; i.e. they would supply an answer for a question such as "When speaking at such a rate and under this particular set of other conditions, what is the most peripheral possible achieved value for a given vowel?" One can, of course, achieve less than the most extreme values, and the results described above imply that whether one does is, at least in part, governed by the style in which one is speaking.

For all speakers, differences between vowels in reading and conversational styles are not large, suggesting that these are second-order effects and not to be considered at all equivalent to the very large differences between vowels spoken in isolation and vowels in general as they appear in connected speech. Fig. 4.4 shows F1-F2 values for vowels averaged over several male speakers, as taken from Peterson and Barney (1961) (indicated by x's). These represent carefully articulated vowels. Even taking into consideration the bias introduced into the data from uncontrolled phonetic environment and variable number of tokens, it seems that the vowels taken from running speech are strikingly centralized relative to this particular set of carefully articulated vowels. This observation has been made by other researchers in the past, e.g. Joos (1948) and Stevens (1963).

While centralization is found for all speakers in conversational style relative to reading style, it seems that identical types of centralization are not used by all three. Let us assume that the following four characteristics describe a set of centralized vowels, relative to some other arbitrary more maximally realized set:

1. F1 has a smaller value for the mid and low vowel (causing 'upward' movement on the vowel diagram).
2. F1 has a larger value for the high vowels (causing 'downward' movement on vowel diagram).
3. F2 has a smaller value for the front vowels (causing 'right' movement on vowel diagram).
4. F2 has a larger value for the back vowels (causing 'left' movement on vowel diagram).

Speaker DJ shows, on the average, characteristics 3 and 4; RC shows characteristics 1 and 4; and BN shows characteristics 1 and 3 for conversational vowels relative to vowels found in reading. Thus it is not possible at this time to arrive at a rigorous definition of centralization which might be expected to apply to all subjects in relaxed speech as compared to a slightly more formal style.

The question of the fronted [u], as was noticed in all three of my subjects, is no doubt of less general interest, but may have some practical implications, e.g. for automatic speech recognition. [u] is a relatively infrequent sound, occurring a total for all three speakers of only 26 times (13 in each style). But it occurs in a variety of environments, not only those which would tend to cause a high F2. It was mentioned by House and Stevens (1963) that the vowel [u] has 'appreciable deviation in F2 above the target value' in the environment of non-rounded consonants. They suggest that this is the result of the lips being relatively slow to move compared to the tongue. Examination of acoustical vowel diagrams published by Labov, Yaeger and Steiner (1972) shows a great deal of fronting of [u] regardless of speaking style used by their subjects, although this tendency is not universal: it is common for speakers from Texas, Georgia, and North Carolina, uncommon for speakers from the North-eastern United States. These scattered observations suggest that the tendency to use a fronted or unrounded [u] might be rather common in connected speech. This possibility should, of course, be investigated further, especially as regards whether it represents a conditioned alternation or a context-free substitution for back [u].

I Speaker DJ

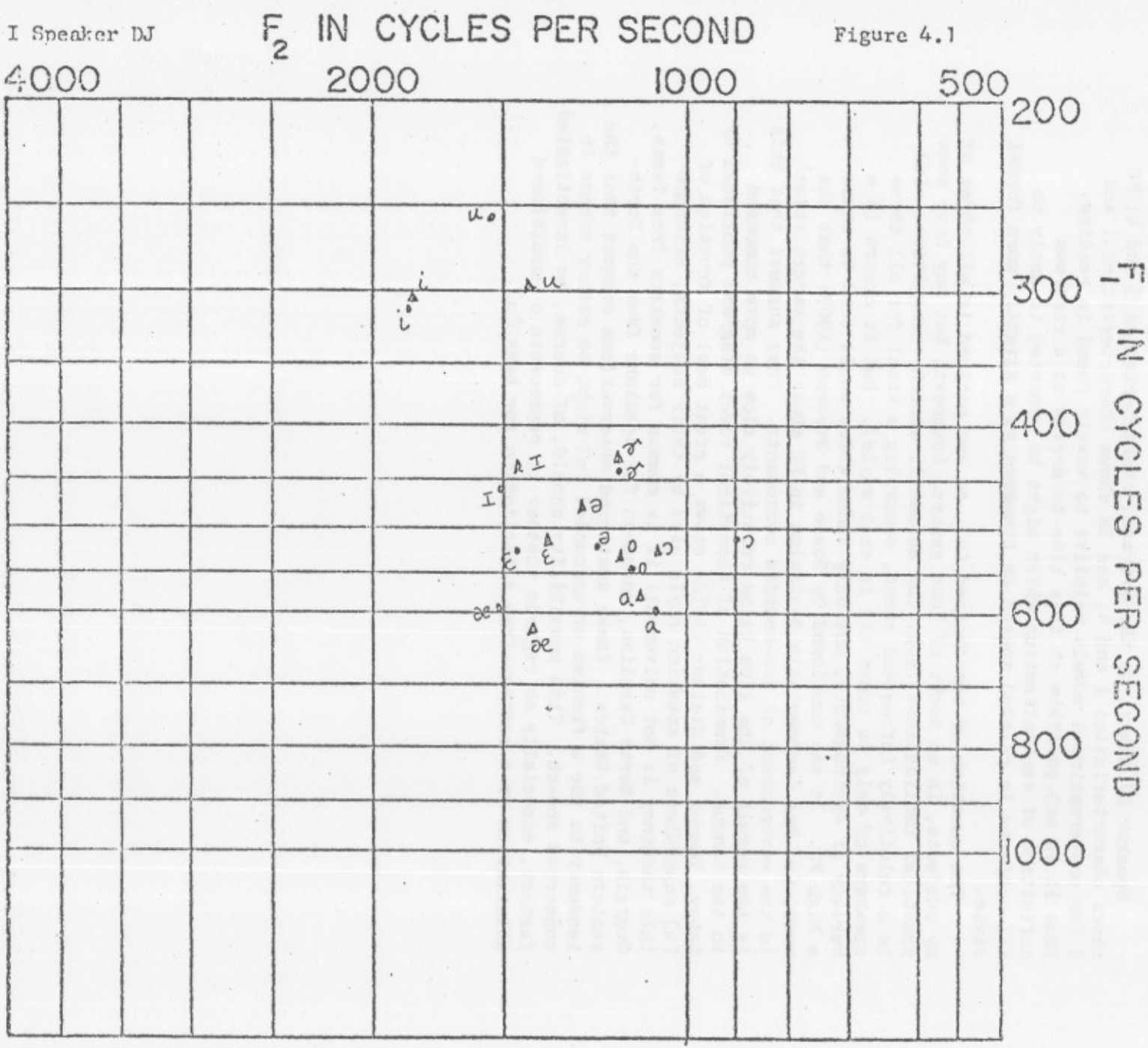


Figure 4.1

II Speaker RC

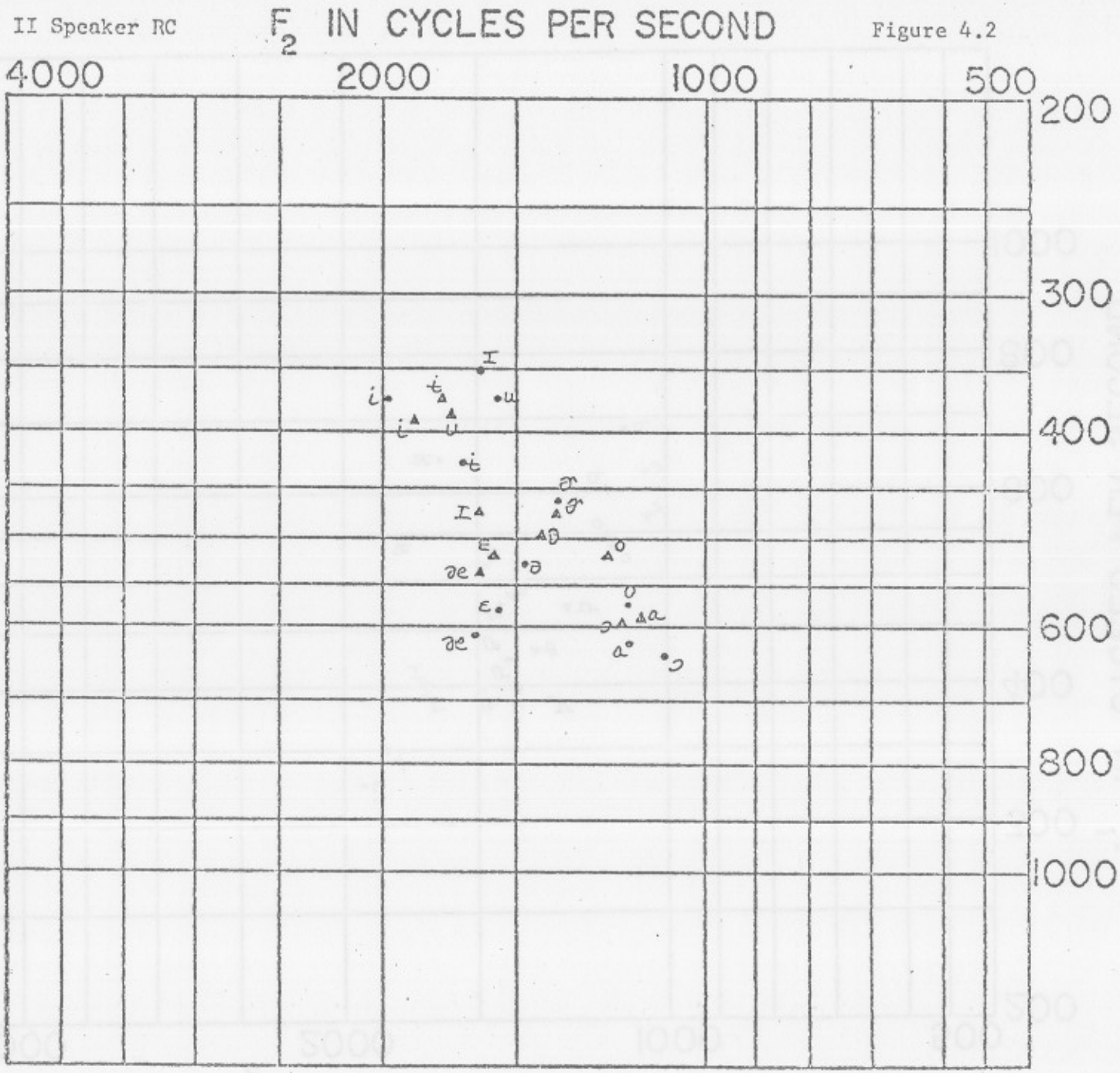


Figure 4.2

III Speaker BN

Figure 4.3

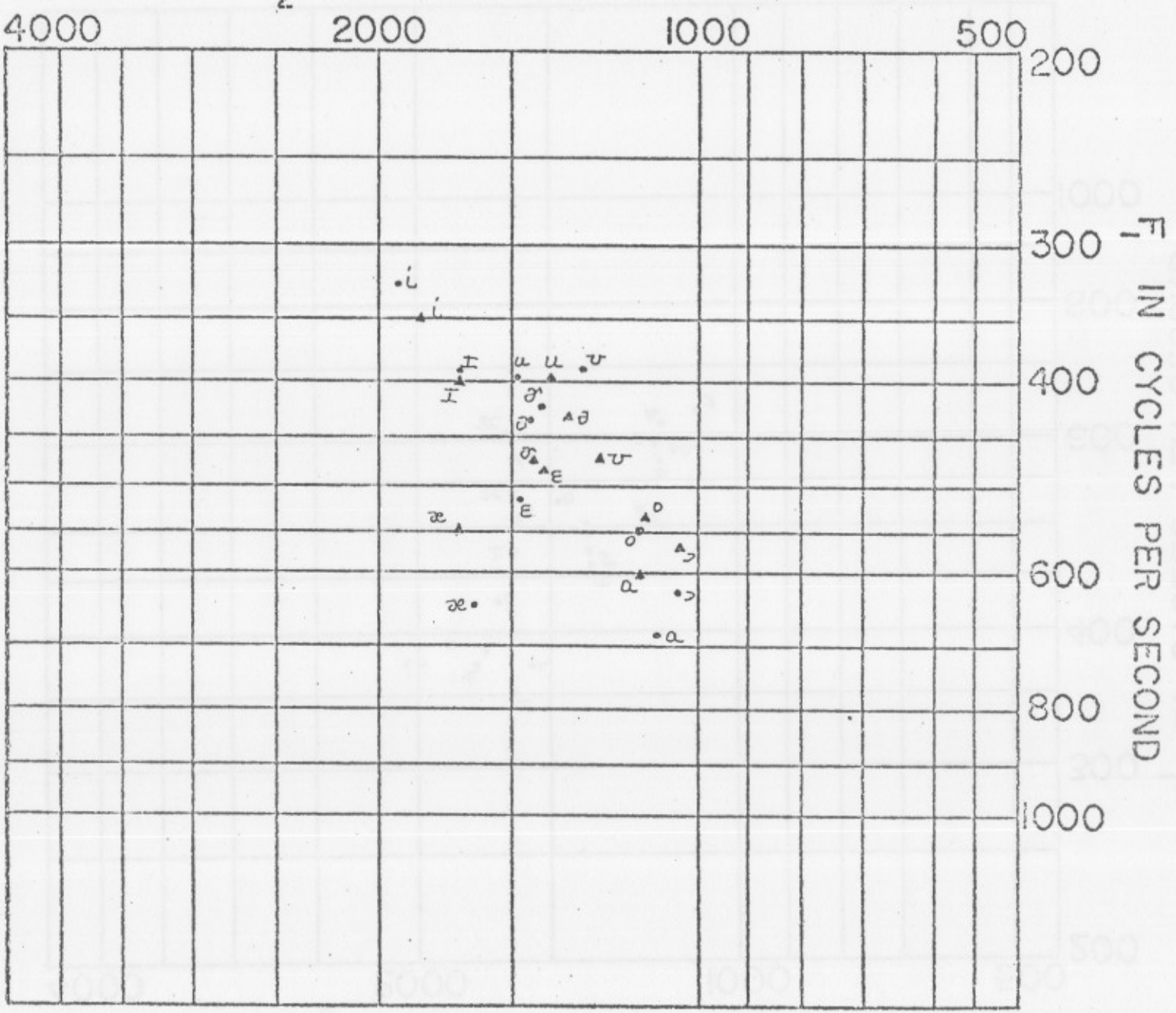
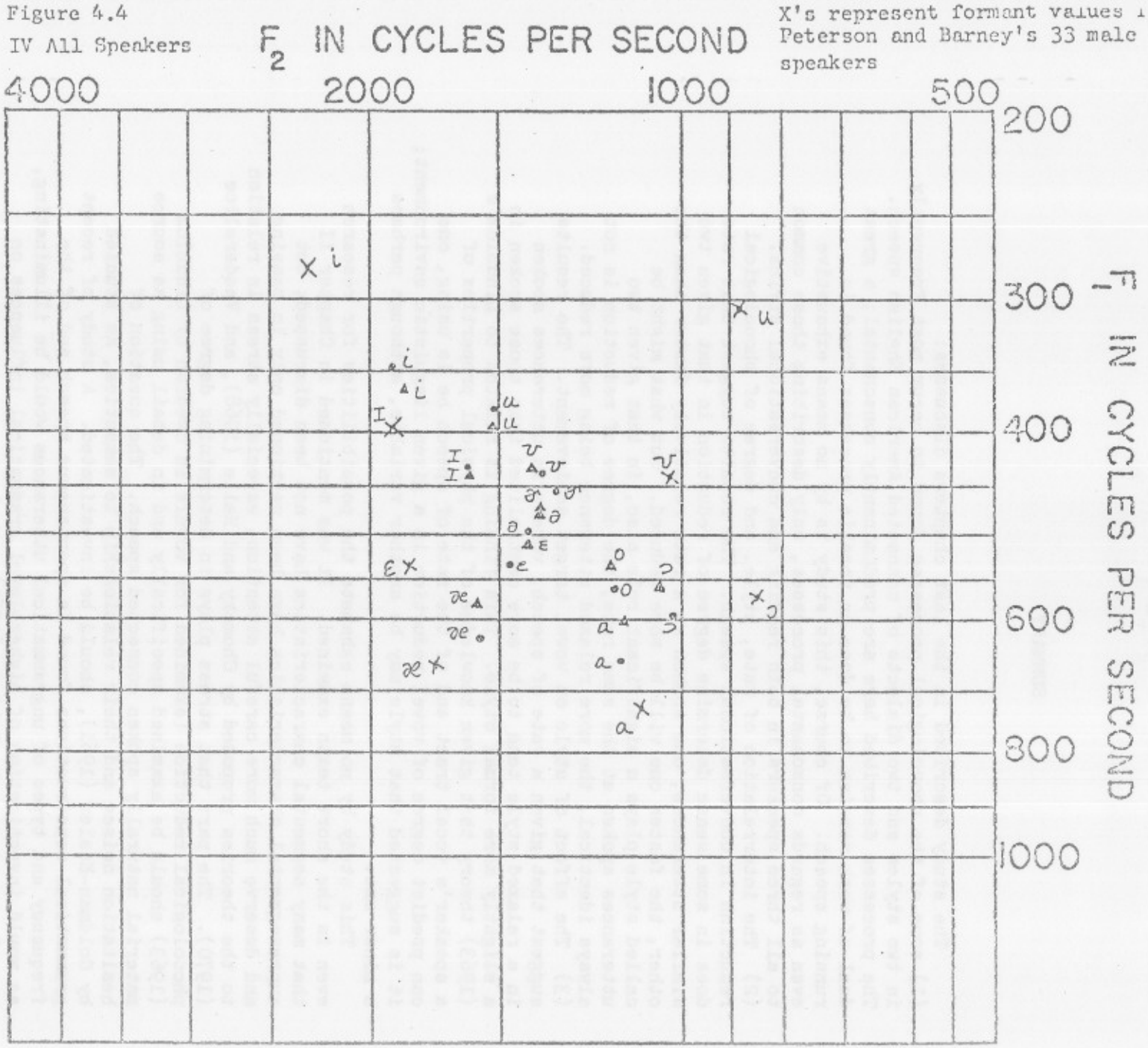


Figure 4.4
IV All Speakers



X's represent formant values for Peterson and Barney's 33 male speakers

SUMMARY

The study described in the last chapters discusses: (1) some of the phonological processes found to occur most frequently in two styles and two dialects of connected American English speech. The processes described here are predominantly consonantal; a great deal of work remains to be done on vocalic processes found in running speech. Of course, this study is by no means exhaustive even as regards consonantal processes, only describing those common to all three speakers in both reading and conversational styles. (2) The interrelation of rate, style, and degree of phonological reduction in conversational speech. The results suggest that rate does in some sense determine degree of reduction in that given two similar utterances, one spoken at a rate relatively faster than the other, the faster one will be more reduced. But what might be called style plays a significant role also, in that given two utterances spoken at the same rate, the degree of reduction is not always identical, the more relaxed utterance being more reduced. (3) The effect of style on vowel target achievement. The results suggest that given a rate of speech, vowels in utterances spoken in a relaxed style tend to be more centralized than those spoken in a slightly more formal style. This finding is related to Lindblom's (1963) theory that given knowledge of the physical properties of a speaker's vocal tract and of the rate of speech he is using, one can predict degree of vowel reduction in a given linguistic environment; it is suggested that style may be another variable, although perhaps a minor one.

This study by no means exhausts the possibilities for research even in the short texts examined. It was mentioned in Chapter II that many segmental characteristics have not been discussed; but suprasegmental characteristics have been mentioned only in passing and deserve much more careful attention, especially stress in relation to the theories proposed by Chomsky and Halle (1968), and Vanderslice (1970). The part that stress plays in determining degree of phonological reduction (examined for vowels in Swedish by Lindblom (1963) should be examined specifically and in detail using as source material naturally spoken connected speech. The question of hesitation noises and their relationship to semantics, as studied by Goldman-Eisler (1961), should be investigated. A study of recent grammatical constructions found in spontaneous speech and of the frequency and types of ungrammatical utterances would be illuminating, as would investigation of higher-level grammatical influences on phonology, as done by Lehiste (1960).

The research described in the preceding pages has certain apparent shortcomings: (1) it considers data from only three subjects; therefore it is impossible to determine how widespread the processes

and stylistic characteristics described are in the American-English-speaking community as a whole (although examination of dialect studies can give partial answers to this question), (2) with investigation of several topics, it has not been feasible to examine any one in as much detail as would have been possible, and (3) since all the data was analyzed by hand (after some rather elementary instrumental analysis) there is a relatively small body of results, and that undoubtedly contains inconsistencies considering the inherent properties of the humam mind (susceptibility to fatigue, small changes in perceptual set from day to day, limited short-term memory, etc.). The first two problems can be remedied by future studies, which this investigation will surely motivate in the case of the present author and possibly others; the third, and to some extent the first two, can be remedied by computer data analysis since, depending of course on the computer, practically unlimited amounts of data can be subjected to an invariant set of analyses. The quantity and kind of results then available are limited primarily by the experimenter's ability to implement analysis algorithms.

APPENDIX A

The following pages contain phonetic transcriptions of the six texts described in Chapter I. The transcription uses standard IPA symbols plus the following symbols which may be unfamiliar to some readers:

Symbol	Meaning	Example
x̥	becomes voiceless	z̥
x̰	laryngealized	o̰
x̠	incomplete closure	g̠, d̠
x̚	simultaneous glottal closure	t̚
x→	released (as opposed to aspirated)	t→
x̂	glide	û, î
x̬	voiceless	d̬
x̆	very short	ə̆
ʗ	palatal click	

Parentheses indicate untranscribable sections. Spaces indicate a pause.

Speaker BN, Conversation

1. ui̯hævəlɪstəvpʰɹa̠ɪo̠ɹtɪzɹaɪ̂t→
2. ʔəvʔəvθɪŋstu
3. baɪ̂ʰɪnənɪɹfi̯ut∫ʗ
4. səməðɛmaɪ̂gɹi̯uɪ̂ðnsəməðɛmaɪ̂
5. aɪ̂dõtʃ̩ɯmɛmᵇəóəsaɪ̂zəvaɹpʰe̠ɪ̂
6. pʰe̠ɪ̂sʃɪ̆u̯ə̆tstə̆baɪ̂u̯ətʃ
7. ʃɪ̆kɔlzə̆mə̆stʗtʃɛɹfʗ bæi̯ɯ̃o

8. hɑˆmətʃʔaɪʔaɪfɤgɑɪgzæklihæɵmətʃ

9. ʃɪ̌ʔkastsɛtsɪtovɤətʃɑ

10. ʃɑʔnstinzsᵊsɛʃɪ̌kɔlzəʷɾəmɑ̃stɤ

11. ɑ̃stɤtʃɛɹɪts·bæʊtsoiɾ̃ɾ̃ətʰwiɑɹds

12. jɑɹdsʊɔɪə̃

13. θɹiiaɹtsiɛtətupiplknfIɾɑ̃ɾ̃It

14. ɛ̃tsbæɵmebiɔ̃æɾhaˆɪafθð̃floɹəhɛzɪ̌s

15. hɛzɪ̌sbIgskʊɛɹθIŋiw̃ɔ̃ætʃkmpətʃə

16. ʃəfɪ̃ə̃mItskəvɤʊIᵗθfɤɹaIʔ

17. kəvɤʊItθfɤɹaIʔ

18. əIsɛksivɛɹisɛksi

19. əɪ̃iʊeIʃifɛlɪ̃>nləvʊItɵθIŋ

20. ɛ̃ndəʃIuə̃tstə̃bɔ̃I·ʷtɛ̃aIkɛptɑ̃n

21. ɑ̃nɑɹgiuIŋuð̃ɤ·bæ·əʷtʃiʊ̃ɔ̃tɬdə

22. aIaɛɑɹgiwdɬpleIsɵztusmaluItʃ

23. ʊItʃəzIvkɔɹsɬdIzə

24. Iɾ̃iʊeIʃɬʊəzkəkʰʊeIɾæɾəmə̃t

25. əmə̃tə̃bæʷɾItɛ̃nfaInliʊən

26. ʊənʊIkɛnᵗʃikmpliɬlɪɹi

27. ɹiɤeɪ̃ndʒdəhæʊzə̃muvdɛvɹiθIŋɬaɪ̃kɔ

28. ɔləbᵛksɤ>Inbɛdᶻɹumnæɵə̃vɔpʰleI

29. pʰleIɔɬzɹaɪ̃tɛ̃ndə

30. laIkuivʃɛlzpʰəɛldɔləueIhɛʷf

31. ɛfəptəðəsilIŋzɑ̃mosɾəðəʊɔzɣksɛ

32. sɛpθɪ̌suənɛ̃

33. ɛ̃ndəʊɛlʃikɬnvɪ̃stmiðɛzᵊnəfɹʊ̃m

34. ʊmɪ̆nɛɹfɣ̃mɑ̃stɣ̃tʃɛɹ

35. ʔɛ̃ʔɪ̃ɾiu̯eɪ̯əvkɔɹsnæʊɛɹu̯--dn̩bɪInɪɹumfɣ̃>

36. fɣ̃> baɪ̯sɪ̆kl̩z

37. u̯ɛɪ̆aɪ̯u̯--ɾɨfu̯igaʔ̤nubaɪ̯s˘kl̩z

38. ɹaɪ̯tfəʊətʰaɪ̯mbiŋu̯Ifkaɾoəd

39. ɔldɹəsti

40. i̯uztʰ

41. slodɪ̆f·kəltupɛdəl

42. i̯ɛsəmənstiləbl̩

43. u̯ɛtʰm̩iʊəmɑ̃stɣ̃tʃɛɹIzn̩tʰəiIzn

44. Izn̩tivn̩anəlɪst

45. b̤əi̯ɛ̃i̯ʃIzgɑʔn̩Itsəsoməɪ̃ʃIntuəhɛdæt

46. dæ^ʔ̤i̯ɛstə̆ɾeɪ̯ʃIu̯Isfəlisɛdbɛɹiu̯--dʒɯ

47. ʒɯlaɪ̯ktʰə̆gosiʊəmə̆st*tʃɛɹʃ·u̯ə̆səkol--

48. l--kæɾItʃizəɹɛdis

49. sinəθIŋtʰaɪ̯snæ̆ʃ·u̯ə̃tstəgol--kəɾɪɾ

50. əɾIɾəgInɛ̃ɾiu̯ɛɪ̯

51. u̯idʒɨsdʒəsfɑ̃<ndæo̯dɛtdɛtdɛt

52. ʊætəkˣɔɹnidseɪ̯ɨɾIkspɛ̃nsIvɹəpɛɹ

53. eəvtə̆pʋlʊ̆iɪ̃nʒənæo̯tɛ̆n

54. ɛ̃nfIkθiədəŋæskIts-ɣ̃səmθIŋ

55. ItsfIftisIksɑɾIt→

56. fIftisIksθæ̃o̯θæu̯zmaɪ̯lz

57. Isgɑniəlæskəhaɪ̯u̯eɪ̯·ɯno

58. i̯ɯɾIdn̩oʊæt

59. i̯ɛdædæʔ̤u̯əzdiədəfɣ̃s

60. fɣ̃stsəmɣ̃ʊæʔ̤u̯iu̯ɣ̃ækʃl̩imɛɹid

61. di̩læskəhəɪ̯u̯eɪ̯ou̯ɛlɪ

62. u̯ɛlɪʈsfaɪ̯nɪksɛpθɛʈʰə

63. t˩̥əkskəmɪŋiəð́əu̯eɪ̯ʈʰɪnᵈəgoɹil̩f

64. ɹil̩fæsʈn̩kʰɪ̥kəpgɹævl̩ɛ̃n

65. ɛ̃ɾ̌əgɹævl̩ʈɛnsʈui̯ɯnoladʒ

66. ladʒɪ̆ʈsɛˡfn̩i̯ɣ̞u̯ɪnʃil̩d

67. ɔɹɪni̯ɣ̞hɛɾlaɪ̯ʈs

68. ɪɾ̌i̤ɪɾ̌iu̯eɪ̯·i̯ənoi̯ɣ̞kɔɹkŋgɪʈpɹɪɾi

69. pɹɪɾibiɾəpf˩̥əmɔlᶿgɹævəlbeɪ̯

70. bəɪsɪ̆kliɛɾ̌əvkɔɹsu̯iu̯ɛ̃tᶿuəsɛɾətaɪ̯ɣ̞s

71. ɑ̃mnɑʃɣ̞ɪg æ̃klibəʈi̯ə̃i̯ɯ

72. fɪgi̯ɣ̞ə·ɪʈsfɔɹdeɪ̯zitʃueɪ

73. eɪ̯f˩̥əmdɔsn̩kʰɹ̥ikʈʰfɛɹbaŋks

74. u̯ɛlnənoð́ɛnaʔ

75. pʰeɪ̯fʈð́ɛɹ̤ənɛ̃ð́ɛɹ

76. ð́ɛɹgɹævl̩ɹotsi̯ɨɾ̌ogɹeɪ̯ɾɨdð́ɛɹ

77. i̯uɾ̌ogɹeɪ̯ɾɨdð́ɛɹð́ɛɹu̯ɛlmeɪ̯̃ʈʰeɪ̯nd

78. laɪ̯kəð́ɛð́ɛdᵒeɑu̯ɪzh̬ævdᵒizmeɪ̯̃ʔɨnᵗs

79. ð́izmeɪ̯ʔnɨnʈsɛð́eɪ̯ɛvmeɪ̯ʔn̩ʈsʃɛʈsi̯uno

80. ɛvɹifɪfʈimaɪ̯l̩zɣ̞səmpθɪŋi̯ɪi̯ɪɾ̌oð́ɛɹɔ̯uizɑ˂ʈð́ɛɹ

81. zɑ˂ʈð́ɛɹi̯ɣ̞ɔu̯izpʰæsɪŋgɹeᴵ̯ɾɣ̞zn̩

82. n̩ĩ̯ŋ̈pipl̩u̯ɣ̞xɪ̃ɔnəɹo·d

83. ə̃sfæ̃nʈæsʈɪ́kɛ̤˘ɛdmɛ̃nʈʰə̃zᵊɹɪ~li bi̯ɯɨfl̩sɪɾi

84. ɛ̃nəi̯ɯɾ̌ɪvɣ̞sɪ̆ɾizɹɪliɹɪlinaɪ̯ᵗs

85. i̯ɯnoəkæmpəs·ɹɪliɹɪbi̯ɯfəl

86. kˣlinóInŋIɹöIsploIsĬzĬŋkʰɻɛɾIblikʰlin

87. ʔaIkˣɐmfˈmfIlədɛlfiə

88. fIɾɛlfiəzvɛɹidˠɾi

89. jɛsdəuInbloz·əɹaŋueI·knsmɛĬIt→

90. ooˠla?laɾəvəmkʰIˇm↑kIsn

91. noIlɹIfəIɾˠizniɛ

92. jɛpʰɛtʰɻokʰɛ̃ˆm↑kʰlstu·pʰlæ

93. pʰlætsuIt∫ɔɹ

94. ɔɹiɯɾ̃oiIiIkʰnsiöəmækʃəlifmnə

95. fmnəiuɾ̃Ivˠs·ɾiɛɹiə·fəuInblouszəɹaŋueI

96. ueiˈ·ənoət→ɑ

97. ɑmĨItItsənaIskʰæpəsiũɾ↑vˠs·ɾipɛnsl

98. slveniəIˇts·bIgsIɾiItfilzlaIgə

99. əbIgsIɾitsdˠɾizhɛlkʰpɛɹ

100. kʰpɛ̆ɹuəθhiɹɹaI?

101. o∫ˠuɛlóɛðɛz·ikʰæəmiəbmiuzĬkuIt∫

102. uĬt∫zfæntʰæs·klaIkő̆ɛznoplesɑnˠθlaIóik

103. ikʰæmimiuz↑knfIlədɛlfiə

104. lakuiuəumuəuiuɾɾdsItIni

105. ndəhɔI↑stʰbælk↑ni

106. öəlæstɹobækɹaItnəmIɾl

107. Izdəbɛsitnəhæˇɾs

108. uəlaIuɛ̃t·slipə?naInθˠɾiiɯnos

109. səuIˇɲIgoɾəslipᵗθæɾˠliiɯIkspɛktɔmost

110. hæfĬskpɛktă̆tsəmbaizgəŋkɔiu

111. Ĭznætso

112. moaIdᶻIdntʰɻIpovədəwikɛn

113. kɛlizaɪ̯lənjɛuiu̯əθɛɹə̯.

114. ə̯dᵘəu̯ikɛ⌢nbɪʌfɔɹθæt⌢ʔ

115. ə·iˇŋ̊okɹasɑɾəfɛɹi

116. m̆tsəlɪɾlfɛɹiθɛtkɛɹisjwɾə̯

117. mɛɪ̯bitʰənikɔɹs

118. fjuu̯ɣn·ætmɛɪ̯bifɪ̆ftinkɑɹz

119. ænpæsnd͡ʒə·snænbaɪ̯sɪkl̩s

120. əniniæɡləndɪsɹɪ̆lismɔjwd

121. pɹɑliu̯ɔkɣaŋ̊ndɪtn̩·æu̯ɣ

122. ɪkn̩su̯ɪmŋ̍kæmpθɛθɛz·stetpɑɹk

123. ɪkˆæ̃pɹaɪ̯ɹəɹaɪ̯ʔbaɪ̯θəbitʃ

124. tsfɛɹinaɪ̯sfɣθæʔʔɛ̃nəu̯ɔɾ⌢ɣskʰlɪɹ

125. fən·liɪnəfaɪ̯mɪ̆slɛ̣ɪkɪɹi

126. ɹiɹaɪ̯ʔbətbətθ̃əu̯ɔɾɣskʰlɪ̆ɹ

127. ə·ə̃ʔætskʰəz·əbitʃɪzanə

128. əkʰn̩eɾiəntsɹaɪ̯ʔ

129. (   )

130. jɛ⌢ɾθɛɹɡ⌢ɾdpɑɹsərəleɪ̯kn̩bædpɑɹtsjã̰ə̃kɛliz

131. ãɪəɪskyaɪ̯ədɪfənsu̯ɪ̆dəsæθ̯θsaɪɾəθə

132. ãɪlənənoɹθsaɪɾəθlaɪ̯̃ɪθəfɛɹiɣ aɪ̯zənəs

133. sæɣθsaɪ̯tɛ̃nəuɔɾɣ lɾks

134. ɔfəlæəxʃuɪ·dʔɪɪtlɾkslaɪ̯kəm

135. ɑɾə̃ɔ̃ɾɪskʰæɣʔəvɡɹinkʰɹæp

136. iɪʔθ

137. aɪ̯ɪtsɹɪlidɪ̆skəstɪŋɛɪ

138. ɪɪtlɾksləɪ̯ksiu̯idsupɣ

139. æɾəɾo· ɛɾi

140. ɛɾiuɐIóənɔɹθsæ>ɾəóiaɛ·ləndIsɾə

141. kʰaIdIfɣnItsvɛɹistɹɛ̃Indʃ

142. bətiɯ̃ɾolaIkóɛɹ·pɔɹtsədəleIkóəɾɣnaIs

143. ɲpɔɹts·dleIkóɛɾɑɹəntdəɐɛI·t

144. stæ̃tsnæoəvkɔɹs·esɛIóɛtəholɛIkIz

145. dɛdkʰuotʰdɛdʰ

146. ə·ɑɾəɾoətæʔminzbəʔiInoŏɛðɛɹɔɹ

147. stIlfIʃɑ<mɾiəpʰipəlfIʃənɐI

148. eIkætʃfIʃθɛɹ əbə

149. aIspozsɛɹsmɔlɣôɲŏəfIʃustəbi

150. bətθəuɔɾɣskʰlIɹənənɔɹsəIdlaIk

151. ɾ̃nopiəopniɣaIznᵈəuɔɾɣnsiiəhænd

152. ʔɨtsʰɑɹtumæʒə̃nfəɾohaIoənɹaIʔ

153. laIknouɛʃnohaIokʰnifaIn·ækaIɾ̃əuɔɾɣ

154. iɛuɛʏuəiəuɤ-nopniɣaIzInIuɛI

155. kʰzəvkˣloɹinu-ɾdkIɘiə

156. əuə̃ᵐtsbʰɻokmaInɛk ɔmost

157. aIθɔɾaIdId

158. sodIɾᵈðədʒImtʰĭtʃɣ

159. laIxiphæɾIktnsɔɹɾəf

160. iIɾðɹənfədənɣsɹənfŏə

161. dɑktɣ

162. hiɐzɹilinɣvəs

163. æ>lænᵈIɾɔ̃maIhɛd

164. ɔnətʃɻæmplinəlɛ̃nthɾɑ̃maI

165. hɛdɛ̃ŋdʰəaIkæ̃ɾəf

166. laImmaIhɛɾuɛ̃tʰɹɹaŋuɛIIn

167. sIɾəvgoIŋIʂuɛII˅uɛ̃~ʔθæʔuɛI

168. ə̃gɛsIəzlaIkuIplæʃ

169. ɑ˂s·pozĨ˅iuɛIædIdnʔniɾ

170. InіθIŋfɹəmɾæ˃gstʃɨstɑ˂əsoɹɾəv

171. sɛmipʰɛɹlaIzf˞ʃumIɾəts

172. læĝĩəfɹəg˞ɾʃumIɾətsaIk˞dnmufiIɾo

173. dætdætsuaIóidʒImtitʃ˞əsopæni˅k

174. əæIfɛlʔɹIlihoɹɨbəlbəʔiIɾouəuɛhãId

175. ɹilaIsəɑIuəzokʰeI

176. uɛluəɾiəseI

177. bæ˃tθɹiɾɛsuIuĨtʰuə

178. ɦoməsɛkʃulpoɹɾiuɛɹóɛ̃ʃuɾIŋhɛɹoIn

179. æ̃slusIɹiəsɛ̃Iəz

180. (   )

181. ə·uɛuiuInuIsgaIhuə̃m

182. tʰ˞ kʰ˞ stʰə̃óIsiIɾoöIs

183. poɹɾiɛɾɪtʰ˞da˞tʰə̃bilaIθæʔiIɾõ hh

184. uihəŋ˞æ˞nɛɹI˅spiplɔspɛIst

185. æ˞ʔla˞nʒIŋ˞æ˞dItĨzɹIli

186. kæ̃nəv   stɟẽIdʒ

187. səisɔðəmə̃uĨŋIʔnə̃bækɹumiI

188. ɾoɛ̃ðɛIdɛIɛɾəpʰɑʔbõɛ̃ɑ̃əkItʃɨnstov

189. IzɹiIpɹIɾipɹIlidĬskəsIŋ

190. (   )

191. ɪ̃ɾiu̯ɛɪ̯ʔɛʔaɪ̯ʔaɪ̯vʰæpi̯ɤ̂ mɤ̯mɹizəvləndən

192. tu·laɪ̯klaɪ̯kɪ̆ɾbiɪŋvɛɹikʰul

193. ɪnəsəmətaɪ̯mbəɾɪ̯uəzlaɪ̯kməbisɪksti

194. ɔɪkstiʈʰuɾəgɹizfɛɹiɦ̯ umǝd

195. kæ̃ɾ̃əvmɪstiɛ̃nu̯ɛ̃nlaɪ̯ks·bʌbn̩

196. (   )

197. i̯ugǝslaviəaɪ̯sɔθuədʒunədʒɔ̃dɨst

198. ɑ̃ɪ̯ɛzõɛɪ̯sɛɪ̯

199. bɪkʰəzaɪ̯hæ˷dəhɛpəʈʰaɪ̯ʈɨshu̯ɛɾ̃aɪ̯

200. əʷzõɛɹ

201. æsɑɾɨg̈ɪɾɪŋsɪkɑ̃ɾæɔnəʈʰʃɹeɪ̯n

202. fɹ̥əmʈʰʃɹiɛsʈʰʈʰulɚblɑnə

203. aɪ̯dɪdn̩oaɪ̯ɛ˅dʒɔ̃dɨsn̩ʈʰɪlaɪ̯əʷzɔ

204. mostθɹ̥uu̯ɪ̯õɪ̤ʔ ləlaɪ̯k

205. aɪ̯ɾə̤:fɛɹlimaɪ̯lkesɛòɛɪ̯õɛɪ̯õɪɪ̃

206. fæ̃õnɾæ·ɣ̯ɾɪnɛu̯ɛɾ̃aɪ̯gɑʈʰɪzɹil̩

207. i̯ɪɾ̃omeɪ̯biθ̥ʴiu̯iksæfʈʰɾə

208. hɔθɪŋstɔɾɨddɛɪ̯ə

209. oi̯ɛʔɛʔ̤uəzəmək

210. əkʰʈ̌bɚtsdɑkʈəəaɪ̯əd·

211. sinəʈʰu

212. ʈʰui̯ugəslavdaktɤ̂ zn̩ə̆̃mɛɹɪkɪ̃ndɑkʈɤ̂

213. (   )slaviəɛ̃ɾ̃əgɹikdɑkʈɤ̂ ɛ̃n

214. æθɪnzɛ̃ɾ̃ɪʈʰɚ kʰəm

215. õɪsəhɪkʰdakʈɤ̂ɪn

216. ɪskʰɪ̌bɚtsn̩ɪzɹiəlʈʰə

217. fəI̯nlidaI̯gnosɛ̃nIdIɾIpbaI̯l‐ɾkIət̪ə

218. u̯aI̯t̪s·maI̯aI̯sisɔi̯ɛloInəu̯aI̯t̪sə

219. diaI̯sɛ·IməsbImaI̯lkɛI̯s

220. kʰəzɛɹu̯əzn̩ədɛI̯dɛɾaI̯dIdn̩t̪əgIɾəp

221. n̩u̯ɔkɣæu̯ni̯ɨr̃oə̫ɾə̃mĩ

Speaker BN, Reading

1. u̯ihævəlIstəvpɹaI̯ɔɹ·ɾisɹaI̯t→
2. ʔəvθIŋstubaI̯·nanIɚʃ̬utʃɚ
3. səməvðɛmaIəgɹiuIθæ̃⌢nsəməvðɛmaIdõt→
4. i̯uɹimɛmbɚðəsaI̯zəvæuɚpʰleIs
5. ʃiu̯ə̃tsəbaI̯u̯ətʃikɔzəmɑ̃ñstɚtʃɚ
6. fɚ>əbæ>ti̯unohæo̯mətʃaI̯fɚgɑɾIgzæk
7. Igzæklihæo̯mətʃĬtkʰɑstsẽnItsovɚ
8. vɚɛtʃɔtn̩stinzItsʃikɔz
9. kɔzIɾeI̯mɑ̃ñstɚtʃɛɹItsəbæo̯tsoi̯əno
10. tʰui̯ɔɹdsu̯ɔI̯tθɹi·ɔɹtsi̯ɛə
11. twpipəlkɛvnfIɾɑnI̯t→Itsəbæo̯ʔme
12. meI̯biðæɾhɔI̯ɔfóəflɔɹɛnɾhæzóIsbIg
13. sku̯ɛɹθIŋi̯udæt̮ʒukʰænpʰʋti̯ɚ
14. i̯ɚfiɾɑnIskʰəvɚɾu̯Iθfɚɹai̯t→
15. Itssɛksivɛɹisɛksi
16. ɛ̃ɾ̃Iɾ̃iu̯eI̯ʃifɛlInləvu̯Iðəθɪŋŋ̍
17. ʃɨu̯ə̃ntstə̆baI̯tɛɾ̃aI̯kʰipãn
18. ɑ̃naI̯aI̯kʰɛptɑɾ̃ɔɹgi̯uIŋu̯əθɚəbæ>ɾIt
19. ʃiu̯əɾ̃IdaI̯ɑɹgi̯ədəpʰleIsuəztusmɔl
20. u̯ItʃəvkɔɹsĬɾIzĬɾ̃iu̯eI̯ʃi
21. ʃiu̯əskuaI̯ɾæɾəmIntəbæo̯ɾIɾənfaI̯nli
22. liu̯ənu̯ikIndʃikʰm̩plitliɹiɚẽI̯nʒ
23. ɹeI̯nʒðəhæo̯sənmuvdevɹiθIŋlaI̯kɔləvðə
24. bʋksɑɹInəbɛdᶻɹʋmnæo̯əvɔlpleI̯sɨz
25. ɹaI̯t→ɛ̃ndə·laI̯ku̯ihævʃ

26. ʃɛlvzpaɪɹɔlðəuɛɪəpthæʔə

27. əɔlðəuɛlhæfəpthəðəsilI

28. ilIŋsɑmostəðəuɑzɪksɛpòɪsuən

29. uɛlʃikɨnvIntmiðɛɹzɣnəfɹuʷmIn

30. InɛɹfʷəmɑñstʷtʃɛɹIɾiuɛˑɪəvkɔɹsnæ

31. næòɛɹuʷdnbiIɾiɹũfʷbaɪsɨkls

32. uɛlaɪuʷɾIfuiɑatnubaɪsɣklzˀ

33. fəðəthaɪ̃mbiŋuIɑatolɾoldɹəsti

34. iuslodIfˑkəltəpɛɾlənsti

35. tiləbəluɛlthɨm

36. miðãmɜ̃ñstʷtʃɛɹIzntʰivəɾɑnəlIst

37. bətʃuɾoʃizkatɳItsomətʃIntʰəhʷhɛ

38. hɛdˑætiɛstʷɾeIʃiɻIstfəlisɛd

39. bæʷɹiuʷɾʒulaIkthgoənsiðəmɔnstʷtʃ

40. tʃɛɹʃɣuðtstʰəgolʷkærIɾinoʃizʷ

41. ɹɛɾisinəθIŋthuaIsnæˀʃiuð̃

42. uðntstəɾəgolʷkærIɾəgIn

43. uidʒIsfæundæɔtθətθəkɔɹɾidsənIkspɛˑ

44. pɛʷnsĨvɹIphɛɹðeɛvtə̆pʷlöiInʒənæoɾən

45. fIksθəgæskItsoɹsəmθIŋItsfIft

46. IfɾisIksɔɾ̃ItfIftisIksθauznmaIls

47. maIlsɪ̆tskɔniəlæskəhaIu

48. uæIˑunodInt∫unoðɛv?

49. iɛə?uəzθəfʷsəmʒʷóæ?uiɹʷækʃlimɛ

50. mɛɹidɪ̆zIɾhɔɹthðɹaIvθilæ

51. æskəhaIueIuɛlItsfaIɾ̃Iksɛpθɛ

52. θɛtʰɹ̥əkskˣəmɪŋðɪəðɚ u̯eɪ̯tʰɪntʰə̆goɹɪəl

53. ɪəlfæstənkʰɪkəpgɹævl̩

54. ænəgɹævl̩tʰɛ‿nstəlɔ̃tʃɪ̆tsɛlfɪni̯ɚ

55. u̯ɪnʃɪəldoɹɪni̯ɚhɛdlaɪ̯t

56. aɪ̯tsɛɾ̃iu̯eɪ̯·uɾ̃oi̯ɔɹkɔɹ

57. kɔɹkʰɨngɪtpʰɹɪɾibiɾəpf˩ ɚ moðəgɹævl̩be

58. beɪ̯sɪ̆kliɛ̃nəfkɔɹsu̯iu̯ɛ‿ntᶿuəsɛɾəvtʰaɪ̯ˆs

59. aɪ̯ ɚ sæmnɑtʃɚɪ

60. ɚɪgzæklibətʃufɪgi̯ɚ ɪtsfɔɚ deɪ̯

61. ɪzitʃu̯eɪ̯f˩m̩dɔsn̩kʰɹ̥iktʰfɛɹbæŋks

62. u̯ɛlnoðɛɹnɑp·eɪ̯vt→ðɛɹ

63. ðɛɹgɹævɪlɹodsi̯ɪ̃ɾogɹeɪ̯ɾɨdðɛɹ

64. ðɛɹu̯ɛomẽɪ̯ñtʰeɪ̯ndlaɪ̯kðɛɪ̯ɔu̯izhævðizmẽɪ̯?

65. meɪ̯?nəntsðɛɪ̯hævmẽɪ̯?nəntsʃɛdsi̯ɪ̃ɾoɛvɹi

66. fɪftimaɪ̯lzɚ səmpθɪŋi̯ɪ̃ɾoðɛɹɔ

67. ɚ ɔu̯ɪzæo̯tᶿɛɹi̯ɚ ɔɪtspæsɪŋ

68. ɪŋgɹeɪ̯ɾɚ ziɾ̃opipl̩u̯ɚ kɪŋɔnəɹo·d

69. oɪtsfæntʰæstɪkɛdmə̃ntˢn̩zəɹi˜li

70. bi̯ɯɾɪfəlsɪɾiɛ̃nəi̯uɾ̃əv ɚ sɾ̃ɾis

71. izɹiliɹilinaɪ̯sn̩i̯ənoðəkʰæ̃pəsɪz

72. ðəkæ̃pəsɪzɹiliɹilibiɯɾɪfl̩

73. kʰl̥iɾ̃ ɚ ðɪnhɪɚ ðɪspʰl̥eɪ̯sᵊzn̩kɹɛɾɪbi

74. kʰl̥inaɪ̯kʰemfəmfɪləɾɛlfiəfɪlədɛlfiəz

75. iəzvɛɹidᶻɚ ɾii̯ɛsθəu̯ɪndbloz

76. u̯ɪndblozθəɹaŋu̯eɪ̯iukænsmɛlɪ?

77. ðɛɹɑɹ·lɑɾəvkʰɪmɨkəlzænd·oɪ̯lɹɪ‿

78. o̯Il̩ɹI^fa̯Iɾ̃ ɣ izɛ̃niwnopɛtʰɹ̥okʰɛ~mɨkl̩

79. kl̩pʰl̥æntsu̯It∫ɑ̯ɹiuno̯iukʰnsiõæ̃m

80. əmækʃl̩ifmnəi̯unɨv ɣ s·ɾiɛɹiəfθəu̯In

81. bloz°əɹɑ̯ŋu̯eIəno

82. a̯Imiɾ̃Its·na̯Iskʰæ̃pə̯siɾ̃Iv ɣ sĬɾiəv

83. əv̥pɛnsIlvɛI̯ɾɣ əItsəbIgsIɾItfi

84. filzɑ̯IkəbIgsIɾiItsd·ɣɾiɛshɛl

85. hɛlkʰm̩pɛɹdu̯Iθh I ɹaItʰ

86. o∫ɣu̯l̩õɛɹzöiəkʰærəmiəvmi̯uzIk

87. u̯It∫əsfæntæstIkõɛɹznopʰl̥eIsɑnɣθ

88. a̯Ikθiəkʰæɾəmiəvmi̯uzIkInfIlədɛlfiə

89. ɑ̯Iku̯iu̯~tsIɾInəha̯Itspbæl kniõəlæst

90. ɹobækɹa̯I?n̩æ̃mIɾələ̃zöəbɛsitnəhaɣs

91. u̯ɛla̯Iu̯ɛ̃tə̃slipə̃tna̯Inθɣɾisəu̯ɛni̯ə

92. i̯əgoɾəslipõæɾɣliiu̯Ikspɛktɔmosthæf

93. æfIkspɛkõætsəmbəɾizgəɾ̃əkʰɔ̯i̯əIznt

94. Izn̩tθætsokɛlizɑ̃̃I̯ləndi̯ɛu̯i

95. i̯ɛu̯iu̯ɣ õɛɹõəu̯ikɛ~nbifoɹõæt

96. i̯Igoəkʰɹ̥ɑsɔməfɛɹ̃IIsəlIɾl̩fɛɹidɛt

97. kʰɛɹizi̯uɾ̃oməbitʰu̯əntʰikɔɹzɣiu̯ɣõɛ~n

98. õɛ~nõæ?meIbifIftinkɑɹsn̩pæsn̩ʒ

99. pæsn̩ʒɣzn̩baIsĬkl̩sæ̃niaIlə̃ndz

100. ə̃ndz·ɹilismɔ̯iwkn̩pɹɑbəbli̯u̯ɔkɣaɣndId

101. ɹaɣndIdInənæu̯ɣi̯Ikʰ InsuIm ɨn

102. kˣæ̃pθɛɹõɛɹszsteI̯tpɔɹki̯Ikʰæ̃pɹaItbaI

103. baI̯öəbit∫Itsfɛɹina̯Isfəõætɛ̃nəu̯ɔɾɣskʰl̩

104. kʰḷɪɹfənḷiənəfaɪ̯miɾ̃ɪtsleɪ̯kʰɪɹi

105. ɹaɪ̯t→bətᶿəu̯ɑɾ↗skʰḷɪ↗

106. əhə·ðætskʰəzðəbitʃɪ̯zɑnə

107. əkʰəneɪ̯ɾiənsaɪ̯dðɛɹ·g ʋdpɹtsəðəleɪkən

108. nbædpɔɹtsi̯ɪɾ̃ou̯ənkʰɛlizaɛ̯lənᶠɪtskʊ̯aɪɾə

109. ədɪfɹɪntsbətu̯inəsaʋθsaɪ̯ɾəðiæɛ̯ləndənənɔɹ

110. nɔɹθsaɪ̯ɾəðiæɛ̯lənðəfɛɹi↗aɪ̯znə

111. sæʋθsaɪ̯ɾænəu̯ɔɾ↗l⁻ʋksɔfḷ

112. ækʃḷiɪʔlʋkslaɪ̯kaɪ̯ɾðʔnodʒəslaɪ̯kə

113. əkæ̃vgɹinkʰɹæpi̯ɪɾo⁀ɪsɹɪlitˢkəs

114. stɪŋɪʋkslaɪ̯ksiu̯idsubɪɾ̃iu̯eɪ̯ðənɔɹθsaɪ̯ɾ

115. saɪ̯ɾəðiaɛ̯lənd ɪzi̯ɪɾokʊ̯aɪ̯t·ɪfɹɪ̃ʔɪts

116. tsfɛɹistɹeɪ̯nʒbətʃɪɾolaɪ̯kðɛɹɑɹpɔɹts

117. pɔɹtsəðəleɪ̯kðæɾɔɹnaɪ̯sɛ̃⁀npɑɹtsðɾəleɪ̯kðæɾɔ

118. ðæɾɔɹəntᶿəu̯eɪ̯ɪ˅tstænsnæɡəvkɔɹs

119. ( )

120. ku̯oʔdɛdæɾõnou̯ədætmins

121. si̯ɾ̃oðɛɹɔɹstɪlfɪʃ

122. ʃɑ<ɛ̯mini̯ɯɾopipḷfɪʃneɪ̯kætʃfɪʃθɛɹ

123. aɪ̯sɛ̆pozɛɹsmɔl↗ðɪ̃ðəfɪ

124. fɪʃi̯ustəbibətᶿəu̯ɔɾ↗skʰḷɪɹɔnənɔɹθ

125. ɔɹθsaɪ̯dlaɪ̯ki̯unoi̯ukænopɪni̯↗aɪ̯zənd↗

126. u̯ɔɾ↗ɪnsi·ɔɹhæntðæts

127. sʰɔɹdtʰuɪmæʒɪnf↗ənohaɪ̯oənɹaɪ̯t→

128. æaɪ̯knou̯ɛɹɪnohaɪ̯okɪni̯ufaɪ̯nætkaɪ̯

129. kaɪ̯ndəvuɔɾ↗ɪ˅ksɛptɪnəpulɪɛuɛɪə

130. uɛɪəu ʋdn̩topɪni↗aɪzɪɾ̃iueɪ̯bikəzəkʰḷoɹ

131. kʰl̥ɔirə̃kʰIlj̬ə

132. aI̯u̯əntsbɹ̥okmaI̯nɛkɔmostaI̯

133. θɔɾaI̯dIdsodIdʊədʒImtitʃɤ̃laI̯khipæ

134. pæ̃ɾ̃Ikənsɛdj̬əɾ̃oɹənfəɾənɤ̃sɹənfəɾə

135. dɑktəhiu̯əzɹilinɤ̃vɨs

136. aI̯lændIdɑnmaI̯hɛɾɑnəthɹ̥æmpəlinaI̯læ̃ndIdɑm

137. ɑmaI̯hɛdænə·aI̯kʰaI̯nᵈəvə·laI̯kmaI̯

138. maI̯hɛdu̯ɛ̃ntəɹaŋu̯eI̯Instɛɾəvgoɪŋ

139. oIŋðIsu̯ɛI̯aI̯u̯ɛntθæʔu̯eI̯Iʔu̯Int

140. u̯Intθæʔu̯eiaI̯gɛsI̯ʔu̯əzlaI̯kuIplæʃ

141. æʃᵊI̯sə̆posIɾ̃iueIaI̯dIdn̩·i

142. niɾĨniθIŋfɹəmIɾæu̯əsdʒəsesoɹəvs

143. sɛmaI̯pɛɹəlaI̯sɾfɤ̃əfj̬umIɾ̃ətslaI̯kiuɾ̃o

144. ɾ̃ofoɹeI̯gɝdfj̬umIɾ̃ItsaI̯kɝdn̩muvætsʰuaI̯

145. u̯aI̯ðədʒImtiʃə̥u̯əsopæɾ̃IktaI̯

146. aI̯fɛltɹIlihɔɹᵗblɛnj̬Iɾ̃ou̯ɛɾ̃aI̯kʰemæɾəvIɾ

147. IɾaI̯kʰemæɾəvItj̬Iɾ̃ouaI̯ɹIlaI̯zaɛu̯əzokʰe

148. u̯əzokʰeI̯əbæoθɹideI̯suiuĨ

149. Ĩtuəhomosɛkʃuᵊlpɔɹɾiu̯ɛɹðɛu̯ɤ̃ʃuɾIŋhɛɹo

150. hɛɹoIɾ̃ə˃ mæpsl̩uʔlisI̯ɹiəsɛ̃ɾ̃Iu̯əzn

151. snətsaI̯nuðIskaI̯hutɹ̥ɾkəs

152. əsIsj̬Iɾ̃oðIspɔɹɾiɛ̃ɾ̃Itᵊtʰɤ̃ɾ̃æo̯tʰəbi

153. biðæʔiəɾ̃ou̯ihəŋɤ̃æon̩ᵈənɛɹu̯ɤ̃ðiz

154. pʰipl̩ɔspeI̯stæu̯ʔlæu̯ndʃI⌢nɤ̃æu̯n

155. əgzɹilikæ˃ɾ̃əvstɹeI̯ndʃsəu̯isɔðɛ⌢m

156. ðɛ⌢mduIŋIʔn̩əbækɹumj̬Iɾ̃on̩eI̯hæɾəpɑʔ

157. boI̯lIŋɑnəkItʃn̩stovIgzɹilipɹIɾj̊

158. pɹIɾidIskəsʃIŋækæɾ̃əfɛlvɛɹibærəbæˀɾIɾ̃

159. Ĩiueɪaɪhævəhæpivɣʌaɪhævhæpivɣʌ

160. mɛmɹizəvlə̃də̃ntuæɪkbiŋvɛɹikʰuˌ

161. InəsəmətʰaɪmbəɾI

162. bəɾIuəzlaɪkbeɪbisIksʃisIkstituɾiŋɹizfɛ

163. fɛɹihɣɯmIdlæɾ̃əmIstiIkæuɔkIŋəlɔŋ

164. ŋəʌns·bɣʌbnlə̃ndənsɔɹɾəiugəsˌɑ

165. ɑviəaɪsɔθˌuədʒɔndɨstaɪæzóeIˌ

166. seɪbikəzaIɛdhɛpətaɪɾIsuɛɾ̃əIuəzőɛɹ

167. óɛɹaɪstɑɹɾIgIɾIŋsIkɑnətʃenfˌəmtʰɹiiɛste

168. etˌʌubiɑɾ̃əaɪdᶻIdnoaI

169. aɪhædʃɑ̃ndɨsntɨlæuəzɔmosʃθˌuuIðI?

170. aɪəd·fɛɹlimaɪəltIkeIsiaɪõĩfæˀɾ̃æu?uɛ̃

171. ɛ̃ʌɾ̃aɪgɑtə̃?Izɹiəliɯɾ̃omeIbiθɹiuiks

172. æftɣʌóəholθIŋstɑɹɾdeIoiɛəIuəzə̆

173. zə̆kʰIbˀtsdɑktɣʌaɪɛdsintʰuiugəslɔvda

174. ɑkəsəmɛɹɨktndɑtIniugəslɑ

175. ɑviɛɾ̃əgɹikdɑktɣʌIɾ̃æθIns

176. ɛ̃ɾ̃ItˀkθIsʰIkdɑktɣʌInIskIbˀtsIɾ̃Iiz̃ɹiəl

Speaker DJ, Conversation

1. óInəkɔɹsəːts·nɑ
2. õ͂ihɛmbətəːətsə
3. kɑŋɡɹIsɨtəːɑʉ̯soðət
4. ətsə̆pɚlɑŋĩ͂ðəθɛŋ
5. θɛŋzu̯iʃʊb·ĩi̯ou̯ɣ kIŋan ( ) sei̯
6. ðəhɛʉ̯Iθ   ɑθIkeʃədʑeI̯k
7. ðə   pəmɔɹmə̃inə̆speIspʰɹ̥oɡ̃ɹæm
8. pʰɹ̥ɡ̃ɹæmɨ̆n
9. i̯ə̃ɡoɡotʰoɹdspeI̯sInə
10. ĩɔnInəu̯ɔɹbIznɨs
11. bətʰɛu̯laŋə̆zu̯Iɹoɚ ɛɹɛskItʰθ
12. θɛŋoɚu̯Iθ
13. ɔːtsbInIfImæŋkænɔɹɛɾi
14. ɔː
15. ⊂ ɛbikʰɑ~nəni·tna~aI̯Istə
16. θĨkðə
17. ðəi̯ɔĬtsIɾ̆ ɚɛstIŋ   tʰvIzItə
18. i̯ɨnoənəð ɚ sːəːu̯ɚɚ di̯wnɑ̆
19. ænəæ˜mɑlaI̯kmɛɾ̆isaI̯ɛ̆zəI̯
20. vɛɹistʰɬaŋibl̩ivətʰəɹɑθɛɹIs
21. əːdɛfə̃ilaI̯fɔnəðɚ pʰl̥æɾ̆ɨts
22. ɛ̃nəfæktəðIfi̯uɹ (   )t
23. pep ɚlæstʰy̥ykətəsaI̯nəsəv
24. kmpʰl̩l̥il̆itexn̩ənəð ɚlʊkʰtmɑɹzevtʃẽI̯ʒIɹ
25. hou̯æo̯tl̂ʊkə·θɛŋi̯ɯ͂ɔ

26. ɑθĨkʊ̃ə̃tseu̯ətsei̯ɡIvl̩ɡIɾivn̩

27. kʰl̥osɚ·ɡə̃tʃə̃dʒɨtvm̩ɔɹ

28. xz̩aI̯vɛɹistɹɑŋiblivəte:

29. mɑɹztʰəzhævɨntʰɛu̯dʒĩlaI̯fɔɾ̃Itæn

30. ænIzn̩hæbɨəd

31. onoaI̯d̃IstɹɑŋliblivəaI̯IstkɑnƏ

32. i̯ɔ̃ɔlavəi̯ə̃vɹæɾəbɑɾItn̥

33. i̯ɔi̯ɔIbiɹIifɑɹæu̯t̃

34. ɛɾ̃aI̯θĨkəteðɛɹnɑtʰɛu̯Iŋəsɑlðə̃tðɛ

35. nobatθəmu·ni̯æ̃tsəθIŋIθɑɹ

36. ɡɚəmn̩texipsi̯iɾ̃osə̃mĨiθIŋz̩ə

37. i̯wɾ̃oheʃheʃɨte:iə̃

38. Itsou̯IdIkˣi̯əs

39. i̯ɛ (   ) i̯ɛlaI̯klaI̯kʰevpɹuvɨni̯ɨ

40. kˣIɾæu̯teóIspʰl̥ænthIɹə-ʋ̯tsomɛ̃i

41. ɔ̃θæʋ̯zə̃mɑ<ʉzn̩i̯əlʋ kʰætʰn̩

42. hɛi̯ukə̃tɛlIsploI̯szpɑpʰi̯əl̆eI̯ɨd

43. (   )

44. i̯ɨlʋ kðɛʔiɔ̃n̩soðɛsɛ̃n

45. u̯ənizkʰæpsz̩laI̯ktəviə̃seseI̯ɔ

46. hɛlItse:I̯tsfaIvhə̃ɹtʰɡɹiz

47. ɔ̃ɒnobnəθIŋkʰɾɛɚlIvɛɹ

48. u̯ɑtʰəhɛoi̯əlɛndʔəi̯ɔi̯əlændə

49. sɛɹʔn̩pʰl̥eI̯sn̩Isplænthl̩ɹi̯əɣ ɑt·ə·k

50. stʰɹimkʰodɚkstʰɹimhiʔ

51. i̯ukəseI̯u̯əhɛo̯ðɛɹznəθIŋɛɹkəz

52. i̯ð̃ɨfɡɑtsændɚi̯əɡɑt·ə·aI̯sbɚɡz

53. nahu̯ətʰəhɛɐ̯kɤɹIvɛɹ

54. æts·ənɛɹəmaI̯ndɨdʱ

55. i̯ɛəhispʰɹ̥ɑmIsn̩əlɑɾəlɑɾə

56. fonibl̩oniòətʃIzi̯ɔ̃dʒIsnou̯eI̯

57. uəti̯ɔ̃lɑI̯kòeu̯ə̃tstʰəIŋkʰɹ̥isə

58. òiə·m nakgɚdu̯I̯o̯

59. ə·i̯kˣɑətʰiənɨmpʰl̥oImə̃tʰəmɑtʰəmploI̯m̥bətə

60. nonɑsosɨki̯ɚiòə

61. u̯ɛofɛɹtʰaIpəθIŋi̯ɨno

62. pʰipõɑu̯ɚkn̩ɚgIɾIŋməni

63. ɛnhɛe̯ʔi̯ɔ̃pɹIswn·æɡ̯aI̯zgəmoI̯kn̩

64. sɛvn̩eI̯θaɤžɖɑɹʒi̯Iɹfɹ̥sɛʔn̩homənɛɹkˣæn

65. noɹIu̯iɑmĨstʰɑɹdunsəmlaI̯kIsn̩hɛlõə

66. òiə·ʴɛsθiəmɛɹỸxImpipʉɚdIsgənə

67. ɹɨbɛln̩seI̯òəhɛou̯Iθətn̩ɛsalsIthom

68. ( )

69. u̯ɛhɛõɛɹzla·pipotsdoIŋItnæu̯õ

70. i̯ɑi̯ustʰuəlɑ·doɹdoɹsɛlIŋənIsə̃pʰɹaI̯zIŋi̯wno

71. θ̩tθIŋzʒi̯əsi

72. (ɨgIiz) bIghɛlθidudzətᶿɛɹIstʰudæm

73. leI̯zitəu̯ɚkn̩dIsti̯ɔ̃

74. ( )

75. (ɛnizəi̯ɔ̃lIlbɹɑdzətʰ

76. ə:hævɑl eIɾɚ

77. ɚnaI̯ŋkʰIdzn̩pɑpn̩ɑɾeu̯naʔmɛɹidʒəɾ̃ð

78. ʔou̯ɛhɛli̯ɛaI̯u̯ɛntᶞIsu̯ənəʃpɤɾɑɾɑ

79. ʊ̯ɑɾəblɪ̯ɐzədtʃokəhɔɹs

80. ʊ̯oɛɪ̯gɑtIs·Iŋnæɐ̯təIf

81. i̯ɚ ɪ̯͡oloʊ̯Inkʰəmɨmeɪ̯fɔɹɾə

82. sIks·æɤ̯zndɑɚzi̯ ɹsəmpnIsneɪ̯tʃɚ

83. ʊ̯ɛhɛðekŋi̯ɔ̃baɪ̯dʒs·naɪ̯s·pleɪ̯sɑhɛdlIvIn

84. ɛnəi̯ɔ̃egəmənpeɪ̯zfɚ sIkstipɚsɛɾ̃əvItʰ

85. ɛnIsnɑ̃ɹIpeɪ̯blɪ̯ɔ̃hæftʰpeɪ̯Ibækɚɛ̃͡I·ŋ

86. soʊ̯ɪ̯͡ɔæs æftʰɚʊ̯ɑɔ̯

87. i̯ɔ̃i̯kʰɑ̃əstʰɑɹædnəptʰuəntʰungIdn̩

88. fɔɹɨnseɪ̯ʊ̯ətʰəhɛo̯uaɪ̯ʃᶿɑɪ̯gʊ̃ɔ̃guæ̃ɪ̯ɹn

89. əbəsmaɪ̯hɛdʊ̯ɚkɨnənizəɚ

90. gaɪ̯zɚIsI?n̩bɛkn̩

91. ɨnomɛksIɛtsəʊ̯ɑ̃θIŋaɪ̯ɹIʊ̯ɹIspɛktᶿəmɛks

92. pipl̩fɔɹ ðɛɾɔ̃nhævIniʊ̯ɛɐ̯fɛɹ

93. ɛ̃͡ɔɪ̃θIŋə̆ðIsneɪ̯tʃɚɛbɑIgIts

94. æʊ̯ndəzɛɹfɛɹʃɛɹivŋgɹæ̃m

95. m̩æ?ætsɔgo~uənɹiznʊ̯aɪ̯ðɛɪ̯hɛˇsɛʃlɑɹdʒ

96. fæmliz

97. kʰəzə̆i̯ə̆tɛɪ̯kʰɛɹə̆iold

98. na·a~kˣɛ̃tʰɹIʊ̯iseɪ̯ðɛ~soməṭʃbə?

99. ɔn·æɹIʒzeɪ̯·uʒlihævfIftĪnsIkstiŋkʰIdzə

100. ( )

101. ( )

102. ʊ̯iʊ̯ɛnəɹɛstɔ̃ɨnoɔ̃ɾəkʰækəmzæɐ̯tʃəno

103. n̩ hiz

104. uno m̩̊s ʊ̯ɚzɹɛstʰəmætn̩

105. æ>sɛz ( )

106. ( )

107. ɥeɪstɑɹdpʰɹ̥ ɚ^i ɚ^lov ɚ ðɛɹ

108. hʔgɪ̆ʃo·ɣɑn ɚɹo·d

109. otʰɥɛlflɛvn̩tɥɛlvnɛoɹɪi

110. hɛðɛɾõmɛs ɚ æɥn

111. jɛtsɛhɔpleɪsɨzɪ̃kɹɛɾɨbl̩

112. aɪθɪ̃kɹɑb ɚ^ʔkɛ̃iʃᶿbipɹɛstm̩bəizɑɹɛidɛd̥

113. ɑtᶿɪ̃kʰhiezɑtᶿɪ̃khiɥ·ɾəgɑtᶿ̩ʃoɥɑn ɚ·od

114. ɑθɪ̃kɪfədʒeɪɛfkɛɪɥəzəlaɪɥiɥ·ɾdn̩

115. hæviɪʔnam

116. ɥɛojɛs ɚ^ɪzbɨɾhɪzɪ̆nəhɑspɪoɹaɪʔnɛo

117. hizl̩ɪlbɨ̆dɛoɾ̆ɔnəʔɔnəiɔniqɹopʰpipʰl̩

118. ɣɪtʃə·kɔɹsʔɛɹzg·ɾdn̩

119. bædn̩ɔɹɛɪszɑmɑʔjwɔdaɥn·ɪɾibəi

120. bətʰəɨ͡ɔθɪŋɑlækˣbæoɾhɪmə·hi

121. dəzm̩biɾ ɚ^ɑnəbuʃ·nohɨ̆kə̆mzɹaɪən̩

122. sɛzɥəɾizɥətsɑ̃izmaɪn

123. n̩əsəuidonævnæo

124. ætsvɛɹitʈuætsdslaɪkʊ́ɪsi͡ɔ

125. tʰaɣ nhɪɹaɪɾõlaɪkɔ̆eʔmətʃbɨkəz

126. ə̆tsgɑ·lɑ·i͡ɔdɪspʰɛiθɪŋz

127. zʔzi͡ɔəmekʰɑmeɪxiənhæpilaɪkɔ̆oz

128. gɪ̆stɑpopʰlisfɔɹsɥihæv

129. laɪkiu͡ɔfiuhɛiɔfi ɚ^ə̃tʰɹæfɪxæks̩

130. dɛ͡·ɾ ɚ^fiəɪfiəgɪ̆ətʰɪkʰt ɚ^ɪ̃θɪŋ

131. oɹɔ̂iɑf ɚ^sgɪiətɪkɨtiukʰæ̃tʰiɔ̃sei͡ɔ

132. kæ̃?voI̯ʃɚpIŋəɚIθĨɚj̯ɔ̃   hItʃ

133. Inəhɛdu̯Isə̃?m̩   j̯ɛʃ̯ugoə

134. kˣɔɹj̯umaI̯zu̯ɛɾIs·teIhɔ<mf̩gIəbæ

135. I?kəzi̯ɨfaʋ̯ŋgIlɾiɹIgɑɹdlɨsə̃·lɛʃu

136. ə̃vɛs·əmfə̃ntæstĬkm̩õmə̃lənəkˣɹʋkɨdloI̯ɚ

137. bəə̃niəöɚhɛnə·ɛ̃õoaI̯ɾɔ̃laxɨakˣæ̃tθĨkəv

138. Ĩipʰl̥eI̯sɛosəəI̯laI̯ktʰl̩IvĨmɔɹso

139. ɑgsohɑt·ə·ɔŋ (   )

140. sɛ̆tboI̯ætiɔ̃ɹIlifaI̯mpleI̯sɑtdᶻI>ɹ

141. (vm) u̯ɑ·ɹɛəbaʋ̯ɾI?hɛɹɾəbəʋ̯tnkˣʋ̃ɾu̯eItʰgIɾ

142. ɑtθI>ɹə   æftɚagɑʋ̯tðɚəkʰæ̃ʋɾnu̯eItʰkIthom

143. nohɛləsmam̩baɚmiəɾal

144. ItʃIstʰə·fæspeI̯səlaI̯fi̯ɛ̃o

145. nobəinozIɾ̃iθIŋi̯ɔ̃u̯ətskoə̃anɑtʰI>ɹ

146. kəz   ænə·ItˢIstə

147. hɛleI̯vɛɹɛ̆oðɛɹɾIstgoəntʰu̯ɛ̃ifɔɹɑɹzeI̯

148. sə?m̩laI̯knIi̯ɔɹkbə·tsmɔɹspæstIkɑtʰɛɹ

149. snaI̯speI̯stʰəvIzɨtʰəu̯ənu̯ə̃IIvɛɹo

150. saI̯tsi̯əsgɑ·lɑ·Iɹteɾ Ĩ θIŋz

151. Iŋzbə̆tʰIs·Iibətʰ

152. ə·ɹIidonoɛ̃IpʰleI̯səlaI̯kˣIɾ̃ibɛɾɚso

153. ã̃Ii̯kæ̃thævɛɹiθIŋu̯ɛI̯əu̯əɾ̃ɨɑlətʰaI̯mso

154. ?ətsnaI̯sɪ̆tsə·ʃ̯ɑɾə̆lɑənuIku̯Imᵊ

155. tsku̯aI̯ətʃaʋ̯nʒə·   ðə

156. θiɚbIzn̩səzu̯ɛntʰə   Its

157. u̯ɛ̆tʰkʰmp̩lu̯ɾɚIskmp̩lu̯ɚaIzɹaI̯?nɑɔ

158. iɛtsorəmeɨd   ɨɛ

159. ɛnvkɔɹs·əhɔθIɹiəvɑpɹəIʃɛ̃Izkɑ̃plI

160. tʃeIntʃuiævədIfɛɹnlaIɾIŋ

161. soɹsnɑouidɔ̃hævkʰɑɹbnaɹksIɾimɔ

162. uiɛvəəlaIɾIŋ-ʊtskaldIŋziɑn

163. ksiɑnlaIɾIŋ

164. (ɛ)θɹIdIfndɹumznsIksə·

165. tʰumə̆ʃIŋzpɝ·um

166. kɑɾəkʰɑ̃kʰipʃə̃ɹən·

167. sɑ̃tɑ<mzuihæmstɑɹtɔtseImtʰaIm

168. iwgabIkʰuIkʰ

169. nɑʔɹIlInouɨfgɑt·ə

170. əkʰĩtʰɹobɑksuʊɹuixə̃stɑɹtʰuɔ̈iɑtoɹəmzəʔuən

171. tʰaIm ĨuhætʰɹəniŋgItʰiɔ̃

172. gItʰiɔ̃gItʰθɝuən

173. (   )

174. kipʃəmuvnĨiueI·əlʊkʰæt

175. uɛlIuəsmɔbɨtə·pʰʌpoɹʃntʰɔə

176. saIzɨɑətʰoɹmɑɔ̃θĨkIuəzætsmɔ

177. uɛlIuəzbIltsɛvɝliIɹzə̆gobɨtə

178. dIstopĨndəbɑtʰuməntsəgo

179. uɛliɛ·ðəgaIəhædə̆tʰiuəzlIɨbItə·m

180. (   )

181. noiʔibIotʰIsbIldIŋən

182. æzikʰlozdʰaʊnəhiuəzəiɔ̃əmɑldəmiIənɛɹ

183. bIdĨlaIkspɛm·əni

184. nəɹilliIɛənə:zə·ðɛtʰɛɹdɑ̃Izoɾɝθiɝz

185. hiteIkiɔ̃sits

186. səmnəbɛɾɚ siʈsaɣ̯öəθɪɾɚ ɨ͡nɔ

187. æmpəɾəmnɪspʰl̥eɪ̯sɛnaɪ̯kʰid

188. hævəblusiʈn̩əi̯ɛləsiʈnɨɹɛd

189. siʔɨ͡nɔɹaɪ̯ʔnɪksnɛkstiʈʃəɚ

190. ɛ̃seɪ̯mu̯ɪθə̆kʰɑɹpɪʈi̯ɛilɪlsku̯ɛɹz̩

191. kʰɑɹpʰʈhɪɹn̩ɚɨno

192. hiu̯əsɹɪ̯ɨ̯ifɹuɾi

193. nononoeɪ̯spʰɛ̃pʰɹɪnɪɹəmɪi̯ə̃n

194. dɑlɚ uɚ əvs·fɚ̤ ɪsfɚöəsiʔsiɾɪŋɪna

195. pʰleɪsi̯ɛ̃nusits

196. vɛ̣ɹilæbɚᵗsiɾɪŋ

197. kʰɔɹsə·u̯ɛnhidaɪ̯də̃·m

198. bɪg̊ɪ̃·ŋəi̯ɪɹu̯ɛlə·

199. i̯ɔ̃öɛsʔöiaʈʰɚɨ̃izʈʰə

200. ĩ̯əöə̆ʈʰɚ̃izʈʋ öəsʈeɪ̯ʔ

201. ðeɪ̯ɪsaɪ̯d·əopɨ̆ɾ̃əpθ;ɪŋi̯ə̃

Speaker DJ, Reading

1. əvkoɹs·Isnaɾolihɪmbɨɾɪts
2. kaŋɡɚs·ætɔsoðætspɚlaŋɪ̃ðəθɪŋ
3. θɪŋzu̯iʃʊb·ii̯uno
4. u̯ɚkɪŋan·eɪ̯seɪ̯ʊəhɛlu̯ɪθ
5. aɪ̯θɪ̃kθɛɪ̯ʃʊdtʰeɪ̯kθə·   pə?
6. moɹmaɾ̃iɪnspeɪ̯spʰɹoɡɹæmi̯ɯno
7. gotʰu̯aɹdspeɪ̯sɛ̃nəɹæðɚðɪn
8. ðɪn·əu̯ɔɹbɪznɨsbə·zlaŋ
9. æzu̯ɪ̯ɹovɚdɛɹlɛtsɡɪtʰθɪŋovɚu̯ɪθ
10. o·ɪsbɛnɨfɪdmæŋkænalɹɛɾi
11. næu̯aɪ̯dʒɪstəθɪŋki̯unoɪtsɪɾ̃ɚɛ
12. stɪŋtʰʊvɪzɪt·ˢi̯ənoənəðɚu̯ɚldʒɯno·
13. æ̃:nalәɪ̯k˃mɪ̃saɪ̯əɾ̃ɨstsaɪ̯
14. vɛɹistʰɹaŋliblivᵒɛtʰ
15. tʰɛɹɪzdɪfɚ̃?dɛfãlilaɪ̯fənəðɚpʰlæ̃ɪts
16. æ̃ənfɛktɪʧi̯ɯɹidᵒipeɪ̯pɚlæstu̯ik
17. ɛtəsaɪ̯̃əsəvxəmplɪitɛɪ̯kã·nəðɚ
18. lʊkʰtmoɹz·eɪvtʃeɪ̯̃ʒsɚhɔəʊlʊk
19. an·əθɪŋi̯ɯno
20. ?aɪ̯θɪ̃ku̯ãseɪ̯ɡɪɾovɚaɪ̯θɪkðɛ?
21. u̯əseɪ̯ɡɪɾivəŋkʰlosɚðʊɹɡoɪ̃dətʃeɪ̯̃dʒɪivn̩
22. moɹ·kəzaɪ̯vɚɪsɹãŋiblɪ
23. ðɛt?əmoɹʒdəzhævɪ̃ntɛl·ʒã
24. laɪ̯faɾ̃ɪ??æɾ̃ɪtsɪ̆nɦæbɪ·d
25. aɪ̯dɪs·ɪ̃kəvi̯uno

26. ɔlaɪvɨwnoɹɛɾəbæɹɾɪtʰ

27. naɪθĨkθæʔóIɻnɑnɑtʰɛlɪŋəs

28. æətᵍeɪnoəbɑ<tᶿə̃mũn·ɨwno

29. æs·ə̃θIŋɑɹgə̃ɤ̃mĨt

30. ðeɪkʰipsomIɾ̃iθIŋz

31. ɨwno·həʃhəʃə̃æts

32. ðæɾIsɹ̥IdIkʰɨələs

33. laɪxθɛɪpʰɹ̥uvənɨugIdæɤ̃t

34. əfˈə̃mnIsplæ̃ĨdhIɹ

35. ɑtsəmĨĩθaɤ̃znzəmaɤ̃lsənɨəlɤ̃kæɾIt

36. Ĩɨəkʰæ̃tʰɛlIspʰ̥eɪsɬzpʰɑpɨəleĨɬd

37. soðæɪsɛ̃ɻə̃ðizkʰæpslzsʧuviɾ̃əs

38. neɪseɪoIsfaɪvhəɾ̃ɤ̃ɖIgɹiʒ

39. ɨwnonəθĨŋkʰdɛvɤ̃

40. ɛvɤ̃lĨðɛɹ

41. ɥətᶿəhɛlɨɤ̃læ̃dəsɤ̃ʔnpʰ̥eIsənIspʰ̥læ̃̃It

42. hIɤ̃skɑtsʧ̃kstɹim

43. kˣoədə̃kstˈ̥imhItɨwkˣɤ̃d

44. seɪðɛɹzˀnəθIŋhIɹbʧ̃kɑʒɨwno

45. ðeɪgɑtsænɔɹɨəgɑɾaɪsbɤ̃·gz

46. nɑɥətʰəhɛɛ̃kʰəlĨvôɛɹ

47. ætsonɛɹomæ̃̃Indɬd

48. ɨɑIˇtsəpʰ̥ɹamIsĨŋ

49. ɨɛəhizəpʰ̥ɹamɬsĨŋlɑtəv

50. fonibəloɾ̃iɨwno

51. θæt·ʃIsnoɥeI

52. ɨ̯no·laɪ̯khiu̯ə̃nsthɯɪŋkhɹ̥isə̤

53. ʊəu̯ɛe̯fɛɹthaɪ̯pəvθɪŋi̯ɯno

54. phipəlǿærɑ̰̃ı̯u̯·ɚkɪŋɑɹɡ̊Ĩ·ŋməni

55. phɚɪsunóozgaɪ̯zɚgɑɾ̃əbimoɪ̯xɪŋ

56. sɛvənʕɪθaʋ̯zn̩ʕɑlɚi̯ɪɚfɚsɛɾɪŋhɔm

57. ənɛɹkhæn

58. noɹɪlɑɪ̯mt̚ni̯ustɑɹʔtoɪŋ

59. sə̃mpθɪŋlaɪ̯kθɪsɛ̃ɾəɹɛsθɪmɛɹkəm

60. pipɯɑɹd̃ɪsgoɪ̯ŋthɚɨbɛln̩seɪ̯

61. óəhɛo̯u̯ɪöɪʔʔɛlɛtsɛ⁀ɾɔɔ̤lsɛ⁀ɾɨɾ

62. hɔmənhævəbɪɡ̊phɑɹɾi

63. ǒɛɹɑɹlɑtsəpipl̩ǿætstoɪŋɪnæo

64. i̯ɛɑɪ̯·ustə̃ɾuəlɑədɔɹɾədɔɹsɛlɪŋ

65. ɛɪsəp̃hɹ̥aɪ̯zɪŋi̯ɯnoǒəθɪŋzi̯əsi

66. i̯ɯgɪthizbɪɡ̊hɛlθidu·dʒæɑɹɾɪs

67. thuɾæmleɪ̯zithəu̯ɚkængo

68. əndʒəsgoɛ̃gɪth̩ɪɹu̯ɛe̯fɛɹtʃɛks

69. ɛvɹiu̯ikˣænöizʒi̯ɯno

70. lɪɾl̩bɹɑdshæəʔhæveɪ̯ɾɚ

71. naɪ̯ŋkhɪdzæmphɑpənɑd̂hom

72. nɑ̤mɛɹidʒɯnoaɪ̯u̯ɛ̃thǒɪs

73. u̯əɪ̯nʃiphɚdæʋ̯rəu̯ɑɾəbɪlz

74. zæu̯ʋtʃokhəhɔɹsu̯ɛl

75. eɪ̯gɑthɪs·ɪŋnæu̯ǒət?ɪfi̯ɪɹ

76. i̯ɯnolou̯ɪnkhəmi̯ɯmeɪ̯k

77. foɚɾhsĬksaʋ̯zn̩dɑlɚzəi̯ɪɚ

78. oɹsəmθIŋəðIsneI̯tʃɚ u̯ɛlðeI̯kʰənbaI̯

79. dʒIstəznaI̯səpʰl̥eI̯səzaI̯hævɾəlIvIn

80. ænəi̯ɯnoðət^θəgəbmɛ̃pɛIz̯·Ik

81. sɪ̂ipɚsɛɾ̃əvIt̂ɛ̃IsnənɹIpʰeI̯əbl̩

82. i̯ɯdõtˢhæftəpeI̯

83. IbækoɹĨθIŋ   soi

84. soæftɚ i?eu̯a̯i̯ɯno

85. i̯əxɑɾ̃əfstɑɹtæɾIŋtʰuu̯ɨntʰuu̯IngI·ŋ

86. foɚ i̯əsiu̯ətʰəhɛo̯u̯aI̯

87. ʃədaI̯   ino

88. təxoɑtʰɛɹɛnɛmbəstmaI̯hɛdu̯ɚkIŋ

89. ɛnozəðɚgaIz̯ɚdʒəs·Iᵛ·ŋbækɛ̃n

90. i̯no

91. θæts

92. u̯ənᵗθIŋɑ<ɹIu̯iɹIspɛkmɛxs̩kmpipl̩foɹ

93. ðɛI̯ɾõnhævIɾ̃iu̯ɛlfɛɹoɹIno

94. oIɾ̃iθIŋəðIsneI̯tʃɚɛɹbai

95. gItsəʊ̯tn̩dəz·ɛɹfɛɹʃɛɹivɨnguæ̃mcʊ̯

96. ɛ̃nætsɔ̤soʊ̯əðəɹizneI̯hæsətʃə

97. lɑɹd̥ʃfæmlisbikəzəi̯əŋ

98. teI̯kʰɛɹðioldnɑbIkʰɑz

99. zɛɹkʰæθlIksnoaI̯ɹIlkæ̃?seI̯

100. ðæ?səmətʃbəɾɑni̯æ̤ɹI~tʃ

101. sɛI̯uʒlihæfIftt̂sIkstin

102. kʰIdzəfæmliiðɚ

103. dõhævĨtʰiviɚɾ̃obʊ kstʰɹ̥ɹiɚsəmpθIŋ

104. u̯iu̯ɛɾ̃Ĩəl Iɹɛstɚ̃ətʃuno

105. Inəkʰækəmza̰ʋ̯tn̩Inoɛn

106. isɛzunə

107. u̯ɛɹzəɹɛstəbm̩æt̪aI̯sɛz

108. ɹɛstəvu̯ətʲi̯uno

109. ðɛɹz̰iəðɚfoɹt·u̯ɛɹziəðɚfoɹt̪in

110. fIft̪inu̯ɛlcI̯stɑɹ

111. pɚiɚliovɚðɛɹɛI̯gItəʃou̯ɑnəɹo·d

112. lɛvəntʰu̥ɛovnoɹIli

113. ðeI̯dˤõmaI̯nðɛI̯omɛss̰ɹaʋ̯ n

114. aI̯θĨkɹɑbɚʔkɛ̃⁀əd̃iʃʋbipɹɛzə̃ʔ

115. bə̣hizɑɹɛidɛdaɛ̯θĨkhi

116. u̯ʋəgɑt·əʃou̯ɑnɚodaI̯θĨk

117. Ifdʒe I̯ɛfkʰɛI̯u̯əzəlaI̯vu̯iu̯ʋdn

118. hæv·iəʔnɑmu̯ɛi̯ɛ

119. li̯ɛsθɛɹIzbə̣ɾhizIn·əhɑspl̩

120. ɹaI̯ʔnæohizəlIl̩bIdæon

121. onii̯ənonig̊ɚpipl̩

122. u̯Itʃəvkʰɔɹsɛɹskʋdn̩bæɾInɔɹɛI̯sɨz

123. aI̯mnɑtʰi̯ənodæ͡o̯ɾIɾibɑɾi

124. bətə·i̯ənou̯aI̯θĨk

125. i̯unoðəθIŋaI̯laI̯kãbɑ<ɾhIm

126. hIdəsĬmbiɚæʋ̯nəbu˘ʃ·no

127. hixəmzɹaI̯ɾæʋ̯tn̩sɛzu̯ətsɔɾ̃Izmaĩ̯ɾɛn

128. ðætshu̯ətu̯iɾõhævæo

129. ætsfɛɹitʰɹ̣u

130. ə̆æt∫Isla̯Ixŏistæ⌣ʊ̯nhIɹ

131. əɾŏla̯Ikθæʔvɚ^im mət∫b̥ɨkɔzIs

132. Isgɑəlɑɾəvi̯ɯnodʒɛspɚ^i

133. θIŋzə<t∫ɛ⌢sti̯ɯnoka̯Ĩɾəv

134. me̯Iki̯uənhæpila̯Ikŏəs

135. gɨstɑpopʰḷisfoɹsu̯ihæv

136. ɑ̯Iki̯ɯnoIfi̯ɚ^Ĩə̆tʰɹ̣æfIk

137. æxs̩dɛ̃tɚ^Ifi̯ɯgIɾətʰIkItoɹĨθĨŋ

138. ŏiɑfsɚgIvʒi̯uətʰIkɨti̯ɯkæ̃ti̯əno

139. se̯Ii̯ɯnoi̯kʰæ̃tvoI̯∫ɚ·

140. pIŋi̯ɨnɚ^Ĩθɛŋoɹŏɛɹhit∫In

141. əhɛu̯Isəmpθiŋi̯ɛəIfi̯əgo

142. tʰəkɔɹti̯ɯmaæzu̯ɛostɛ̯Ihomɨn

143. fɚgIɾəbɑ<ɾItb̥ə̆kəzᵊɠi̯ɚ fɑi̯ɚ

144. fæu̯nɚgIɣ̯ɾiɹIgɑɹləsə̃lɛ∫ɯĨ

145. Ĩvɛ̃səmfəntʰæstIkəmæ⌣ʊ̯ɾ̃əməɾiIɾ̃əkˣɹ̣ʊ̯kɨd

146. loI̯ɚbəɑ̃niədɚhʔ

147. hændivɨnou̯aI̯ɾŏla̯IkˣIɬ̊

148. a̯Ikʰæ̃θĨkəvɛ̃ɾipʰḷe̯Ise̯əs̯aIdla̯Ik

149. tʰulIvĨɾ̃imoɹ so

150. a̯Idᶻəste̯IhIɹau̯əzo

151. hɑɾɑŋgoIŋæ⌣ʊ̯tʰəi̯ɯnoeleI̯

152. a̯Isɛd̤boI̯ætsɹIliə

153. fa̯Impʰḷe̯Isæ⌣ʊ̯tIɹfˀm̩u̯əaI̯

154. ɹɛɾəbɑɾItɛ̤nhɛɹəbɑə^tɛ̃kʰ⌣ʊdn̩

155. u̯e̯Itʰə̆gItæ⌣ʊ̯tʰIˇɹæftɚa̯Igɑt

156. a<tɛ⌢ɹa̤Ik⌣ʊdn̩u̯eItʰə̆gIhə̃m

157. noðəsbagdĩnbaʊ̃ɚmiərɔItʃIs

158. səf·æspeIsəvlaIfiɯno

159. nɛobaInozĩiθIŋiɯroyətsgoIŋɑr̃

160. atɛɚɛɹrIsgoĩthyə̃r̃ifɔɹaɹzs

161. deIsə̃mnIŋlaIknIiɚ kbərətsmoɹ

162. spæstIkægtIɹɛ̃sga·larəv

163. Iɹtheɪ̯rIŋθɛŋz·batIsIibəraIɹIyi

164. dõnoIr̃ipleIsaIlaIkIr̃ibɛrɚ

165. Ixæ̃r̃ævɛɹI~θIŋðəueI·əuə̃r̃I·dal

166. ðəthaIm

167. IsnaIsItsgarəlarənukhyImənt

168. ?ItskyaIrətʃæləndʒõθirɚbIzə̃səz

169. yɛ̃tə·Itskə̃mphiɯrɚaIsɹaI?næo

170. iɛəɛ̃r̃Itsarəmeɪ̯r+tɛ̃nəvkhɔɹs

171. θəhoθIɹəvapɹeIʃnhæzkmphlili

172. tʃe͂InʒtɯiævədIfɚlaIrIŋsoɹts

173. næoyidõhækaɹbə̃naɹksIr̃imaɹ

174. ɯihævəlaI·ŋəskhɔrIgzian

175. Igziãnlaɪ̯rIŋθɹidIfɚ?ɹums

176. sIksyɛlthuməʃinzphɚɹu·m

177. kãəkhipʂəɹər̃Iŋsə̃mthaĩmzyi

178. hæðɛ~mstaɹalõəthaɔlõəthaIm

179. yigaəkə̃nthɹobaksɦyɛɹyikhĩ

180. staɹthu·əðiaIthɔɹmsə?uə̃nthaIm

181. ɛ̃niə·hæftəgItõəiɯnogIt͡θə

182. tθɚduə̃n?Ixip̃ʃəmuvIŋ

183. Iɾ̃Iu̯eIəlʊ kʰɛə?

184. u̯ɛe̯ItsmɑˑbəImpʰɚpʰoɹʃn̩tʰəðə

185. saI̯zöiɑItʰoɹIəm?aI̯ɾõθĨxɛɾIts

186. sætsmou̯ɛIu̯əzbIltsɛvɚl

187. i̯Iɹzəgobətʃɛstopɪn

188. əbæo̯tʰumənts·go

189. u̯ɛli̯ɛðəgaI̯əhæɾI..u̯əz·l·bi?hie̯zə

190. əl·bIɾənɾəðəhu̯ɛðɚnohi

191. bIltIsbIlɾIŋɛ̃ɾ̃Iu̯əskʰlozdæʊ̯n

192. hiu̯əzəi̯ɾoəmɔɾImIi̯ənɛɹbəɾidĨn

193. laI̯ktʰə̃spɛm·əɾ̃iæ̃ɾ̃

194. æshidtʰɛɹdæu̯niolɾɚθiɚs

195. hitʰeI̯kˣiɯnositsˑəməðəbɛɾɚsits

196. æʊ̯ðəθiɾɚi̯ɯnõɛmpʊ̯tɛmĨnIs

197. pleI̯sɛ̃laI̯xiɾhævəblusi?

198. ɛ̃əi̯ɛləsi?ɛ̃əɹɛzsiʧ+nɯ

199. ɹaI̯nɛkstyitʃəɚ

200. æ˷nəsɛ̃I̯mu̯əθəkʰɑɹpə̃tʃnoəlIdlsku̯ɛɹəv

201. kɑɹp+ɾhIɹInɛɹhiu̯əzɹIli

202. fɹuɾinoðeI̯spɛ̃?nIɹli

203. əmIi̯əndɑlɚ zuɣθəfdʒ+s

204. f˔ðəsiIŋInəpʰle̥Isi̯ɛəðɛɹnu

205. sitsfɛɹiIlæbɚsiɾIŋ

206. əvkʰɔɹshu̯ɛɾ̃idaI̯də·bĭgIɾ̃Iŋəðə

207. i̯Iɹðətʰɚɾ̃Istui̯ɯno

208. ðətʰɚizfəiəsteI̯?ðɛI̯dIsɑI̯əd

209. tʰə?op+nəpθəθIŋi̯ɛ̃o

Speaker RC, Conversation

1. o·u̯i̯əi̯uʒəʉ̯igɪʔbɛɚ
2. fɹikuəntsiɹispɔntsfɚu̯ə·n
3. tᶿɛ˗ɪŋn̩dᶞɛɹbɪʉ̯ɾəlɪl
4. bɪʔmɔɹ·əgɨd
5. æ·ɛndə·dɨpɛntsəpɔniɪmpidn̩ts
6. s·ɨtʃəu̯ə̃nʔhu̯ɛɚ i̯əu̯ənɾəɹənɨtʔɔ̃ɾə
7. lɔŋlã͠ɪ̯ni̯əɪfi̯ədui̯ə
8. u̯ə̃:gouu̯əlou̯ɪmpidn̩tsɛɪ̯tᶿɚɾiɚ
9. fɪftiõ͠u̯mn̩ni̯ə͠ɚŋɹəɾ̃ɪtəptʰ̦
10. sɛvɚl̩həndɚdfi·tʰ
11. hu̯ɛɹɪfi̯əi̯uu̯zəhaɪ̯ɪmpin̩ts
12. i̯uʒuʉ̯iʔɔ̃nətʃipɚmaɪ̯kɚ
13. fou̯ndszɛɹə
14. ou̯iŏɚəkʰɹ̣ɪstõɚsɚæmɪk
15. maɪ̯kɚfou̯ɾ̃ənæɛɪʔnou̯ɛɪ̯ɹən
16. əbæ˃ɾəmæksɨ̥məmətɛnfitpʰfɔɹ
17. dᶞ̆ɛ^pɪkəpʔhʔeɪ̯si·həm
18. ənɔɚkaɪ̯nᵈənoizn̩stəflaɪ̯k
19. ð̆æət
20. kɔɹdəhæzkʰɨ̆pæstiᵛ
21. bɪtʰu̯̥inðiɪ͂ɾ̃ɚkəndəktɚ
22. ɨniɑ˂ɾɚkɨndəktɚɔntu
23. kɨndəktɚstəf
24. æɾ̃əzɪʔgɛozɪnlˈɪŋtθɪt͜ʔɛfɛksə
25. fɹikuəntsiɹispɔnts

26. ɨnɑʉ̯soʊ̯ə·

27. baɪ̯i̯uzɨnəloʊ̯Impin̩tsʃkŋi̯uz

28. ʈukʰɨndəktɚʃiəʉ̯dədᵊ

29. ΔMItʃiəʉ̯dzəlã͂ɪ̯nfɬm̩Ir̃istɹeɪ̯

30. pIkəplaɪ̯kə;həm·æɣ̃ nɛIkfiəu̯ds

31. ɚniɔnᵗsaɪ̯nᵈzɚstəflaɪ̯kõæɨt

32. soi̯əkaɪ̯ndəpɛɪ̯fɔɹʔbɨʈæʉ̯

33. ʈɛxõeɪ̯vɑʉ̯ivzmeɪ̯gʋɾIku̯Ipmənᵗdæt

34. u̯eɪ̯ãɚu̯͡əəioʉ̯ɾIsʈæɔlIʃnɛɪ̯mz

35. ɨnə   s̫ɛɪ̯bɹɑkæs

36. bIznɛsɚl̩ɛkʈɹɑnIkbIznɛs·æʔu̯ɛɪ̯

37. ʎ̯ii̯ustʰɦænl̩Iɾovɚɾə

38. mæɣ̃ nɛIksɚvɨs

39. m̩i̯ɛəaɪ̯spIntfaɪ̯vn̩əhæIfi̯Iɹzɛɹ

40. ou̯aɪ̯·ndʒoɪ̯ɾItʔetsʍɛɹə

41. gɑt·ənou̯əlɑ·izpi·pʉ̯əphIɹʈəhastɛɪ̯t

42. pʰɬɛstn̩fɚ u̯ənaɪ̯soʉ̯dhIməlɑɾə

43. pɑɹtsæɛndə

44. mɑɹlinəeɪ̯gɑtɬnohɚθɹu

45. hõaɪ̯zɛɹəʈmæŋnɛɾIkn̩

46. mosõəgaɪ̯zovɚInə

47. o:ʈɛʉ̯kɑmɨn̩ivn̩hiʴn

48. nəlIsɱIŋsɛnɚ·lIɾl̩əʔõæʔ

49. ʈaɪ̯mɾɨɾaɪ̯noaɪ̯̩zgə̆nəIndəpbæk

50. ʔi̯əphIɹɛ̃·dIsu̯͡əðou̯zθæ‿ŋz

51. ð:u̯aɪ̯dIdᶻə·

52. aIuɻktuIθ·ə

53. ɹɛIdɛIɾəkɔɹpɹɛIʃnəphIɹ

54. ɑ<zɛɹəbɑɛI?eItinaIə

55. eI?məntsɻsə̃?mlaIkɑ·ɾ<zIn

56. ɹisɻtʃndɨvɛlpmə̃t

57. ɹeIdeIɾəItstʃeIndʒneImnæIo

58. æ̃nuimeIdə

59. uɛɵuimɛIɾəsInɨəleIʃnkæmɹə

60. fɻuənIŋaIɑ<zInɑɹndiɹisɻtʃn

61. dɨvɛlpmə̃tŋəuidizaInɾə

62. sInɨəleIʃnkæmɹəfɻ>ðəditɛkʃnəf

63. kæntsɻ·məlIgnənsiInhiumənoɹgənts

64. ænI?tuɻktɔnɛIə

65. ɨədɹæŋkədɹIŋkənæktIvə

66. ɹeIɾioæktIvdɹIŋksi

67. ɣgɛouzdæunθɹuiɻbɑinIfɨəhævɛɛ̃i

68. məlIŋnəntsiɻsɛəʁsəmpθIŋIneIə

69. kIdniɻblæɾɻ·sə̃?m

70. dðəɹeIɾioæktIvsɑʁtsuədkaIndə

71. klIŋtuuIt? ɛvɾ̃ɛnIs

72. foɾoseʁəd pʰæs

73. ðəɹeIzsfɹəmnI˜sɹeIɾioæktI

74. mətIɹiəʁdpæsθɹuðəbɑiɑ<ɾõndðIs

75. fouɹosɛʁ ɛ˜neIə

76. əsIuəskopuəzhʋktəp

77. ɔuntuI t? IdæxʃiəʁigIviə·

78. pIktʃɻəvhaʋbæɾI?uəznsofɔɹθ

79. aɪ̯dɪdədizaɪ̯nᵈu̯ɚkɔnəgreᵛʔ

80. dᶻɑɹnɪŋzu̯eɪ̯rəbæu̯t·utəns

81. kəzeɪ̯u̯ɚs̩ u̯ihɛdlɛ·dɪnɨm

82. kæstɑɛ̯ɹ·nənɛvɹiθɪŋənɚðəsən

83. ɛ̃˞aɪ̯rɪdɔ̃u̯ɚktɔnəpɹɪnns̩ɚkɨt

84. bɔɹdizaɪ̯nz̩ stəf

85. laɪ̯kæʔbəʔbəfɔɹðætᴼɑn

86. ɑu̯əzu̯ɪθə

87. ou̯dəβi̯əvi·keɪ̯ou̯

88. i̯ɛɑspɛ̃ʔbau̯tu̯ɛu̯vi̯ɚzðɛɹ

89. oũ̯ɪ̃ɦu̯ɛ̃ɑɦædtu

90. laɪ̯khu̯ɛn·æ ʊ̯riənɛou̯ɚ

91. sɔ̃ʔm̩laɪ̯kætbətʰɑ<zm--Indʒn̩iɹn̩

92. tɹæ̃nᵗsmɪɚ Indʒɛ̃ɹtʃifIntʃn̩ɪ~ɹ

93. ɑ<u̯ɛ̃æ̃ʊ̯ɔ̃·lɑɚimɛou̯ʔbɹɑdkæstʰ

94. æ:uʉpɹɛstn̩ŋ

95. ɛɹɑnou̯ei̯ɨ˞ɛvɚɦævhɪmtɔkɨn

96. histɪu̯ɪnᵗstou̯ɚ

97. bətəhaɪ̯spɛ̃tu̯ɛu̯vi̯ɪɹsu̯əθ

98. ə:hfikeɪ̯ou̯

99. u̯ibɪɵtn̩ubɪu̯rɪ̃ŋɑ<tðɛɹɔ̃nhɛ~ndɚsn̩ɹoʊ̯d

100. nustudiou̯zn̩mudɛvɹiθɪŋ

101. æʊ̯ t̥ɛɹn̩pərɪntɹæ̃nᵗsmɪrɚzn̩

102. sofɔɹθn̩ ʔɪgɑtəbiji̯ə

103. u̯ɛɹn̩tɛɚɔn̩i̯ɨæftɚɦu̯æ^ɪ̯ɪ̃n̩ɛɹz

104. n̩ kəzɑətaɪ̯mi̯əzɔn

105. tɹænᵗsmɪɚduu̯ri̯jəkʰʊ̃ntɹɪlæks

106. aɪnɛvɻkɹədkəzaʊɪz·fɹoɪd

107. sə̃ʔmʔədhæpmɪn:iɔ̃ĩ

108. n:iədʒski·dəpn

109. ɔɻraɪzgoɻɨntəbɛdhʊɛnəoɻpipɯuɻgɪʔn

110. əpnətaɪmzvaɪsəvɻsən

111. soʊɻkɔʁnaɪtiəʌnoɻəkeɪziə̃

112. ʈiĩnə·hmeɪbɪgɪɾəp

113. fɔɹə̆kɭɑkʰmoɹnɪŋgɛoʊɾəʊ·ɻkn

114. ʊɛə̃ʊ̃æftɻəhʊɑʁʃçgɑʔɨustuɪʔ

115. ʊiəz·ɔnətuɪɪɹtude?

116. ʊiksəvdeɪznʈuʊiksənaɪts

117. nɪfðɛɹʊəzmeɪʔnə̃ntsɻsəʔm

118. spɛʃlɛnʊidʊɻkdɪɾəlɑ·ɹimɛo̯ʊt

119. uɻknvɛɹiəstʃɻtʃɬznɨuz

120. kʰɑɹlɑtsn

121. stəfəəɔŋætlɑʌnɨn

122. vɛɹʃɑpɪŋs̃ɛɻzʔɪ̯əzɹæə́ɻ

123. Iɾ̃ɻɛstɪŋbəgɑtsoʊɨəʌdɦæʰtələgs

124. mətʃkʊɪʔmə̃nɻæ̃ɪʊndn

125. lɑtsətaɪmzɔntsəndizɑ·tstɑɹtæɻɾət

126. sɛvnəkɭɑkɨnəmɔɹnɪŋnhaɪʊɻ̃ngɪɬbæk

127. hɛɻəmnʈɪlbəneɪɻnɑʌnəkɭɑkəʔnaɪt

128. ɔ̃ʊ̃ilɑŋnəfti·tdɪnɻ

129. æʌftɻaɪgɑðæɑɛuɛ̃ntdæɻndə

130. dəbɨəɛmɛnaɪnaɪuɻktdaɻnɛɻ

131. fɻkʰəpʁiɪɹsəndizdʒɛstfɻ

132. tɨæ̃ntsmIɚIntʃɨnIɹnaIkʊItdaʊneɹ

133. læstɔogəsthI?gatəbi

134. kaIndəuə̃öouzdiəʉzhuɛɹIəskIfn

135. tumiiəlIɾIbIt

136. æ̃nəbəɾaIIn?ndʒoIɾIt

137. səmbətəæ̃õphtIkliInɚɛstɨdn

138. goʊInbæktuuIt

139. ouðəlɛktɹaɾIksItsgItnkaInəvənɛɹo

140. fiəʉdtuIɾimoɚ

141. ə:vɛɹiəslaIkhpipʉɚkn

142. uIθəkəmpiuɾɚzɚ?Its

143. gIfndəə̃lɔŋənɛɹopæθtu

144. uɚaɛzmeinliInbɹadkæstIŋ

145. nIfgathbiənɛɹo

146. fioʉdɛ̃ɦuIiəthɹaIɾəgIɾæ>əvIt

147. tshaɹdkaIndəhaɹɾəgIdæ>ɾəvɨt

148. ætsuaIuIθɦuɛɾəmæɣnɛɾIkə

149. aIIθöteIpɹikɔɹɾɚntsofoɹθ

150. əzeIβʉəgItæoɾəvItsəm

151. æ̃mbɹæntʃɛutbəaIIndʒoI

152. uɚxnuIθəhoma

153. hɛĨdzantθIŋznɹipɛɹɨntθIŋz

154. nstəflaIkθæfuənθIŋəphIɹt

155. dəlIsnIŋsɛ̃ɾɚtsə̃?mdIfɚntʃIst

156. əbæɾɛvɹidɛi·əɾo

157. ɛ̃dəiəɾoũ?gI?boɹdəhaavga

158. mIʉ·iənənuənθIŋzəuəɾəduovɚdɛɚ

159. əɦævn̩æd·tʃǣntstʰduu̯əmn̩

160. ã·u̯ɔ˞ Iəbæ I̯tᴼæ I̯tɹa I̯tnæ I̯o

161. eI̯vhædsəmɑɹ Iku̯z Inɔnspitʃ

162. ɨntsəmaɹe I̯riomægəzinᵗszæ˞daI̯f

163. sinɦu̯ɛɹə

164. ɛvɹibuɑrizvoI̯sIspostəhæv

165. i̯unoədIfɚntəpʰɹ̥It

166. tʃɨslaI̯kfIŋgɚpʰɹ̥Ints

167. u̯leI̯dᴼeI̯bInfidn̩voI̯s

168. spærɚnᵗsi̯ənoɔntuənəs

169. sIləskopn̩ɛnteI̯kŋpIkʃɚ səvəm

170. foɹəkmp̩ɛɹɨsən

171. ŋ̩kɔɹsi̯ənoðɛɹu̯ɚknu̯Iθə

172. o:ɦu̯ʊɹsæonkmbi

173. tʰɹ̥ǣtsfɚdnæo̯təta I̯pɹa I̯rɚkiz

174. ŋ̩ɦævðəlɛɚspɹĨæo̯tᵈəu̯ɚdzn̩

175. əIrIrItsɹiu̯ikəmənəf

176. əf lɔŋ

177. Ĩɛæətshu̯ətəpʰfɛsɚhɛI̯ə

178. u̯əztɛu̯mihu̯ɛnu̯iu̯ɚtɔkŋəbæo̯t

179. tᴼəspæ͡IʃnəɦuəzəuɚdəthI

180. i̯ust təfɑθIŋk

181. ɑθIŋkəu̯ɚdu̯əztəf

182. ẽisɛsIti̯əIsdoutspɛu̯I?

183. lɑkɨtsɛou̯nts

184. ɛnəaI̯ɣ ɑəθIŋkŋəβɑtətənɚsk

185. kʰṷɑ<əfjuuIŋɡlIʃu ʸdsətə

186. əlɔŋæt̂laInət

187. ðəiədɨsdoutspɛʉɹaIt

188. jəiuʒɝ saɾ̞ntʃeImbɣ hIɹvɛɹimətʃ

189. ɔɔbɛtᵒəteIpsmeIdf˩mIn

190. ɦIɹʉbiəlɑʔdIfɤntsɑ<ʔIŋnɛn

Speaker RC, Reading

1. ouiuiuʒuuigɪʔbɛɾɚ
2. fɹikuɨntsɪɹispɑntsfɚuəntθɪŋ
3. ænoɛɹbɪɰɾəlɪlbɪʔmoɹ·əgɨd
4. ɹəgɨdɛ̃ɪdɨpɛndzəpɑn·iɪmpinsæt
5. ætʃɨuə̃ʔʍɛɚiəuəɾ̃əɹənɪt
6. ɹənɪtʔoneɪlɔŋlaɪnɪfiə
7. ɪfiədu·uən·əgɛotʰueiloɪmpidnts·ei
8. seiθɚtiɚfɪftioumzöɪn
9. öɪniukʰɪnɹəɾ̃ɪdəptʰəsɛvɹəlhənɚdfi·t
10. huɛɹfiɨiuzeɪhaɪɪmpidnts
11. ɪmpidntsiuʒuuiɑnətʃipɚmaɪkɚfoun
12. maɪkɚfountsöɛɹiöɚeɪkʰɹɪstɚɚ
13. kʰɹɪstɚɚ>sɚæmɪkmaɪkɚfon
14. ɛnaɪdõtnəuöɛɪɹəɾ̃əbɑ<əm
15. əmæks·mə̃məftɛnfitbɨfoɹöeɪ
16. pɪkʰəpeɪsihəmənoɰkaɪ
17. oɰkaɪntsənoɪznstəflaɪ
18. aɪköætkoɹdhæzkʰəp
19. kʰəpæsɨɾisi·pʰtʰui·ni
20. pʰtʰui·niɪɾ̃ɚnɑ<ɾɚkəndəktɚɑn
21. tʰukʰəndəktɚstəfɛɪ̃g
22. ɛ̃ɪgɛouzɪnlɛ^ŋθɪʔɛfɛks
23. fɛksθəfɹi·kʰuɨntsiɹispɑnts
24. ɛ̃nɑlsobaɪuzɪŋeɪloɚɪmpi
25. mpintʃiukɨniuztʰukʰəndəktɚʃ

26. ɚ˄ʃiɚɾɨdhuItʃiuzəlaĨn

27. fɨəmInistɹeIpIkʰəplaIkhəm

28. həm·æŋnɛɾIkfildsɚ˄niɔn

29. niɔntsaInᵈzɚstəflaIkõæʔ

30. soiukaIndəpeIfoɹIt

31. bəɾæɵtʰɛkõɛIvaɵIzmeig·ɚɾ

32. gɚɾikʰuIʔmənõæʔueIõɛɹũõoioɵdɨstæb

33. ɨstæbɵIʃneImzInõə

34. bɹadkʰesʔbIznɨs

35. nlɛktʰɹaɾ̃IkbIznɨsæʔueI

36. ui·ustəhændəIɾovɚʔmægnɛɾIks

37. IksɛɹvIs   naĨɛ·

38. ʔaIspɛ̃tfaIvənəhæfiIɚzõɛɹ

39. aĨndʒɔIɾIʔ   ætsuɛɹaIĝat

40. ĝatunoueIlaɾəõizpʰipɵəpʰIɹɾəhaIə

41. pɵəpʰIɹɾəhaIəsteIʔpʰɹɛ

42. pʰɹɛstənfʎuən   asoɵdIməlaɾəpaɹts

43. soɵdIməlaɾəpaɹts   maɹlinə

44. aIĝatˢənoɦɚθ

45. θɹuhuɛnaIuəzətmɛg   õɛɹʔmɛ

46. mɛ˷gnɛɾIkm·ostəõəgaIz

47. zovɚt·ʰɛɵkʰamənivɨnhIɹɨnõəlĨsnIŋ

48. IsnIŋsɛɾ̃ɚ lIdlətõæʔ

49. õæʔtaImdIɾᵊInoaIuəzgɛuIŋtʰu

50. ɛ˷ndəp·ʰIɚ

51. dʒɨstʰuə̃əõozᵗθIŋs

52. aIuɚktʰIθɹɛidɛidəkʰɔɹpʰɚɹei

53. ɹeiʃə̃nəpðɛɚaɪuəzɛɹ

54. əbɑ>t?eɪ?məntsɚ

55. səmtθɪŋlaɪkhæ?aɪuəzɪnɹisɚtʃ

56. ənd+vɛopmɛ̃?

57. ɹɛɪdɛɪɾə

58. ?ɪstʃɛ̃ɪndʃnejmnɛoɣ

59. æ̃nuimeɪuɛouimeɪɾə

60. sɪnjəlɛɪʃəŋkhæmɹəfɚuəntθɪŋ

61. haɪuəzɪnɑɹndi

62. ɹisɚtʃndɪvɛopmɛ̃?ɛ̃uidis

63. saɪnɾəsɪŋəlɛɪʃ+nkhæ̃mɹəfɚðəɾi

64. tɛkʃnəvkhænts ɚ:məlɪŋnə̃tsi

65. jɪnhjumə̃nɔɹg+nts

66. ɛñɪ?uɚktɔnɛ:

67. judɹɪŋkə?æktɪvɚ

68. ɹɛɪðioæktɪvdɹɪŋksiɛ̃ɪgoz

69. dæɣnθ·ujɚbɑɾiɪnɪʧjuhævɛni

70. məlɪŋnə̃tsiɚ?+sɛl

71. səmtθɪŋnəkhɪdniɚblæɾɚ;

72. səmtθɪŋɚeɪɾioæktif

73. sɑətsətkhaɪnɾəkh!lɪŋtuuɪ?

74. nɪnɪsfoɾosɛ·uədpæs

75. ðəɹeɪzf·əmnɪsɹeɪɾioæktɪv

76. məthɪɹjəəuədphæsfmðəbɑ·ɾi

77. ɑɾɔnɪsfoɾosɛl   ɛɾ̃ən

78. nəsɪləskopuəzhvktəpɔnɪt>

79. ɛ̃Iuəræk∫uiɑIviuɛpIk∫ɻəvhɛo

80. bæɾI?uəznsofɔɹθ

81. dɑɹndIŋzueIɾəbɑˈt·ʰu·tʰənz

82. kɑzóɛIuɻ

83. ?əuihædlɛd?In·

84. Imkʰæstɑˈɹr̃ɜ̃nɛvɹi

85. θIŋənɾɻðəsən

86. ɛ̃nInəIu ɻktɔnpʰɹĨdsɻkʰt

87. bɔɹdizaIñən·stəf

88. laIkθæ? bə?

89. bIfɔɹɔIndæt?

90. dInaIuəzæ?vikʰɛiɛo

91. iɛəIspɛr̃əbɑˈ?tʰuɛovil·ɻz·ɛɹ

92. õũihuɛñəɦ

93. ɦædtʰulaIkʰuuɛn·næoɻ

94. səmtθIŋbəɾɑuəzmẽi?nɛ̃ts

95. Int∫nIɻ nthɹæ̃ntsmIɾɻIndʒIɹ

96. t∫ifInt∫nIɹæɛuɛ̃r̃ɑˈɾɔn

97. əlɑɾəɹimo?bɹɑgkæstsöɛ^n

98. uibIoɾənubIodIŋ

99. ɑˈtθɛɹɔnhInɾɻsnɹodɦ

100. nustud̆ioznmuvdɛvɹiθIŋ

101. ɛ^otθɛɻnpʰəɾIntʰɹæ̃tsmIɾɻz

102. nsofɔɹθən

103. I?gɑtəbiəɣɛɹntʰɛɹɔniəæftʰɻ

104. əɦuɑɛlɛ̃nɾənɻzə̃n

105. b̥ɪ̆kʰɑzɑlθəṱʰaɪ̯mi̯uu̯ɚɔn

106. ṱʰɹæ̃ṱsmɪɾɚduɾɪ̯ɯkʰʊdn̩ɹilæks

107. ʔaɪ̯nɛvɚkʰʊdb̥ɪkʰəzᵊɪ̯

108. u̯əzɑu̯ɪzəfɹ̥ɛɪ̯dsəmᵗθɪŋu̯ɔhæpɨnən

109. i̯ɯnʌi̯ədʒəskid̆əpɛn

110. o˂aɪ̯u̯əzgou̯ɪŋɾəbɛd

111. u̯ɛn̆əöɚ pipəe̯u̯ɚ gɪˑŋəpɛ̃n

112. ndəṱaɪ̯mzn̩vəɪ̯səvɚsə

113. soaɪ̯u̯ɚkṱɔˑnaɪ̯ṱn̩i̯ɯno

114. əkʰɛɪ̯ʒn̩əɯ̯i̯n̩mɛbigɪ

115. əpʰətfoɚəkʰl̥ɑxɨnˑəmɔɹɪ̃ŋŋ̩orə

116. u̯ɚkʰ

117. u̯ɛo̯æftɚəhu̯ɑo̯ʃigɑʔi̯ust

118. ṱuɪʔu̯iu̯əzɔn

119. tʰuu̯iksəvdeɪ̯zn̩ṱʰuu̯iks

120. əvnaɪ̯tsn̩ɪfðɛɹu̯əzmɛ̃ɪ̯ʔnɛ̃nts

121. ɚsəmθɪŋspɛʃlŏɪnu̯ɪdu̯ɚk

122. dɪɾəlɑɾɚimoʔu̯ɚkʰɨnvɛɹiəs

123. tʃɚtʃɨzn̩i̯uzkɑɹlɑtsn̩

124. stəflaɪ̯köæt

125. laɪnˑvɛɹi̯əʃɑpɪŋsɛɾ̃ɚz̥

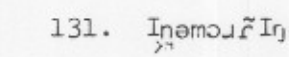
126. ʔɪʔu̯əzɹæŏɚ̃ɪnɚɛsṱʰɪŋ

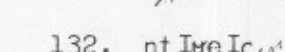
127. bəgɑṱuhæveɪ̯

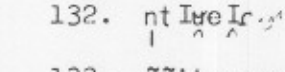
128. ləgs̩mətʃ

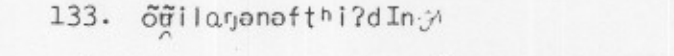
129. ɪkʰu̯ɪʔmɛ̃ɾ̃əɹɛ̃onɾənlɑtsəṱaɪ̯mz

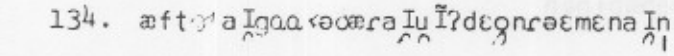
130. ɔnsəndɪ˄zɑ˂dstɑɹɾæ˃ɾəṱsɛvn̩o˂ᵛkʰl̥ɑx

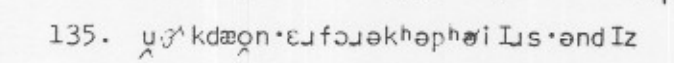
131. 

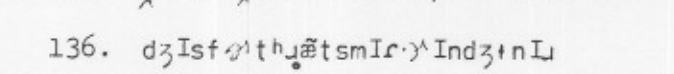
132. 

133. 

134. 

135. 

136. 

137. 

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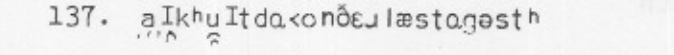
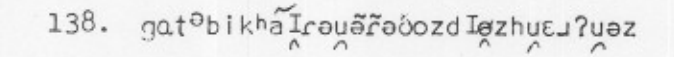
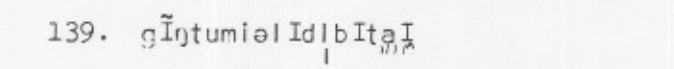
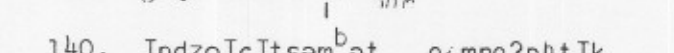
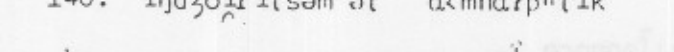
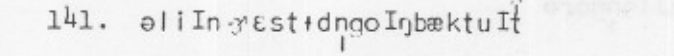
139. 

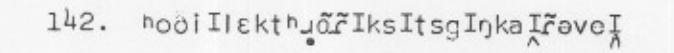
140. 

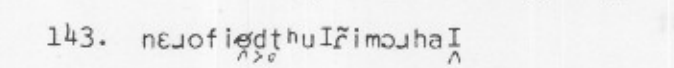
141. 

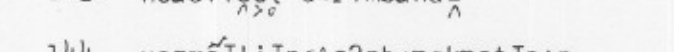
142. 

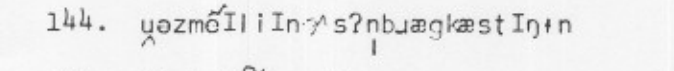
143. 

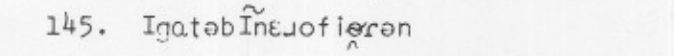
144. 

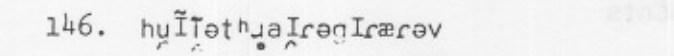
145. 

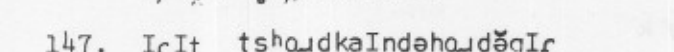
146. 

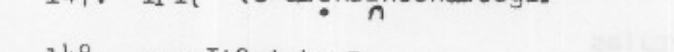
147. 

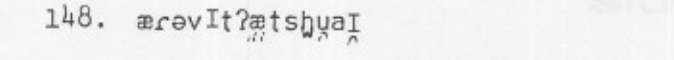
148. 

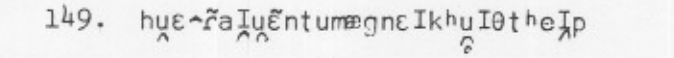
149. 

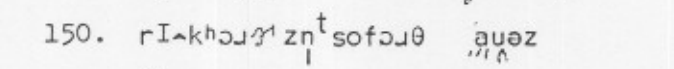
150. 

151. 

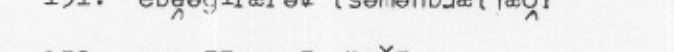
152. 

153. 

154. 

155. 

156. 

157. 

158. aIgaɹəmIoienə̃nyəntᶿIŋz

159. aIuəɾ̃ədu·ov·ɚ ðɛɹnáIævnæɾə

160. tʃæ̃tsthduðImĨn

161. oamna?uɚ Iəba<tᶿɛ?ɹaI?nɛo

162. ðɛIvædsə̆mɔɹɾIklzInɔ̃n

163. spItʃnsəməðə:ɹeIɾio

164. mægəzInz·ədaIvsinuɛɹ

165. ɛɹibaizvoIsIzspostʰəɦæveIə

166. iunouɛdIf·ɚ mpʰɹɹĨtdʒɛslaIk

167. fĨg·ɚ pʰɹĨnts

168. uɛoɛIˇbInfiɾIŋvoIspæ ɚ nz

169. iɯnoIntuə̆nəsIøəsk opŋIn

170. teIkIŋpʰIkʃɚ zóɛmᵖf ɚ kə̆m

171. pɛɹ·sn   ɛnəvkɔɹʃiuno

172. óɛɹu·ɚ kIŋ?ouuIθə·

173. hɥɛɹsæuŋkɛnbitʰɹæ̃ts

174. f·ɚ dnæotʰutʰaIpɹaIɾɚ

175. kiznhæðəlɛɾɚzpɹĨɾ̃ɨd

176. ɛot?dᴼəuɚ dz

177. ɛ̃ɾ̃Its˩ɹIɰikʰəmIŋəlaŋ

178. iɛ̃ðætshətpᵊfɛs·ɚ əheIə

179. uəztʰɛɰIŋmiæ̃Ĩnyiuɚ

180. tʰɔkIŋʰbæutᶿəspæ̃nIʃɨn

181. ɱətᶞəuɚ dʱdæ?hi

182. iuzt:ʰəfa<θĨŋk

183. a   hisɛz

184. ytʃydʒɛsdonᵗspɛøI?la<kItsɛunᵈz

185. ɨnaɪ̯̃ɡɑəθɪŋɪŋəbɛo̯t˂ɛt

186. ɪ˜ndɛɹzkʰu̯aɪ̯əfi̯u?ɪŋlɪʃ

187. u̯ɣ˂dzöɛ˅t?ʰələŋóæ?laɪ̯n·ɛtʃu̯

188. dõnᵗspeø̯ɹaɪ̯?

189. i̯ɨi̯uʒɣ˂sæ̃o̯ntʃembɣ˂hɪɹvɛɹimətʃ

190. u̯ɛɔbɛtᴼə̆teɪ̯psmeɪ̯dʰfɹəm

191. ɪnhɪɹl̩biəlɑtdɪfɣ˂nᵗsɑɾ̃ɪŋ

192. nɪnʰu̯ətiumeɪ̯k

193. sei̯əi̯əmeɪ̯kɪneɹɛɡlɣ˂

194. studioɣ˂ɪ̃ʔhɪ̃ŋlaɪ̯dæ?

195. xəʒɨdõnhɛᵛvɪ̃isæu̯mbau̯nᵗsɪŋ

196. ɣ˂ɛu̯ndəu̯ɔzɣ˂ɛni

197. ɛkstɹeɪ̯ni̯əsnoɪ̯zɨz

198. ?ɪf̧ iuɡɑɾeɡɾʳdteɪpɹɪkʰɔɹɣ˂æts

199. p·ɣ˂ikʰu̯u̯aɪ̯ɨt˃tsəmθɪŋlaɪ̯kθæ?

200. i̯ɯmaɪ̯t·ʰɹaɪ̯fiɪŋsəmə

201. ðiɑɾiofəmhɪɹbækθɹu

202. ənəsɪu̯əskop

203. i̯ɨɡɑənəsɪu̯əskopɑ˂tᶿɣ˂hævntiu̯

204. oi̯unohu̯əɾɪ?lɣ˂ksklaɪ̯kʰ

205. obɔɪ̯i̯ukɪŋɡoɛ̃ɾ̃ihu̯ɛɹfəmə

206. bɑ˂ɾəhənᵈɣ˂dn̩fɪftidɑu̯ɣ˂zəptə

207. θɹiθɑ˂zn̩tpɛnᵈzəpɔnʰu̯ət

208. ?ɔi̯õu̯ə̃?ɔnóɪmɨn

209. hu̯ətçəu̯ə̃ntᶿɛmɾə du

210. hiθkɪtskɪŋ:ɡɪɾe

211. hiθkItn̩gIɾəpʰɹ̥ɛstn̩ɾə

212. bIɵ̞ɾItfɔɹi̯ʑʳ

APPENDIX B

The following pages contain a spelling transcription of the six texts described in Chapter I. The line numbers are keyed to the corresponding lines of the phonetic transcriptions in Appendix A.

Speaker BN, Conversation--spelling transcription

1. we have a list of priorities right
2. of things to
3. buy in the near future
4. some of them I agree with and some of them I
5. dont you remember the size of our
6. place she wants to buy what she
7. calls a monster chair for about you know
8. how much I forgot exactly how
9. much it costs and its over at
10. Schottensteins its uh she calls it a monster
11. chair its about so you know two yards
12. wide uh
13. three yards yeah two people can fit on it
14. its about maybe that high off the floor and it has this
15. big square thing you know that you can put your
16. feet on but its covered with fur
17. right
18. uh its sexy very sexy
19. anyway she fell in love with the thing
20. and uh she wants to buy it and I kept on
21. arguing with her about it she wanted
22. I argued the place was too small which
23. of course it is
24. anyway she was quite adamant
25. about it and finally one
26. weekend she completely
27. rearranged the house and moved everything like
28. all the books are in the bedroom now of all
29. places right and uh
30. uh like we have shelves piled all the way half
31. up to the ceilings on most of the walls
32. except this one and
33. uh well she convinced me theres enough
34. room in there for a monster chair
35. and anyway of course now there wouldnt be any room for
36. bicycles
37. Well I would if we got new bicycles
38. right for the time being weve got old

old rusty
used
slow difficult to pedal
uh unstealable
well to me the monster chair isnt uh even isnt
even on the list
but you know shes gotten it so much into her head that
yesterday she wistfully said Barry would you
like to go see the monster chair she wants to go
look at it you know shes already
seen the thing twice now she wants to go look
at it again anyway
we just found out that that that
that the car needs a an expensive repair
they have to pull the engine out
and fix the uh gaskets or something
its fifty six on it
fifty six thou thousand miles
its gone the Alaska highway you know
you didnt know that
yeah that that was the uh the first
summer that we were actually married
the Alaska highway oh well its
fine except that uh
trucks coming the other way tend to go real
fast and kick up gravel
and the gravel tends to you know lodge
itself in your windshield
or in your headlights
any anyway your car can get pretty
beat up from all the gravel
basically and of course we went through a set of tires
Im not sure exactly but you you
figure uh its four days each way
from Dawson Creek to Fairbanks
well no theyre not
paved theyre uh ni theyre
theyre gravel roads you know graded
theyre theyre well maintained
like they they they always have these maintenance
uh they have maintenance sheds you know every
fifty miles or something you know theyre always
out there youre always passing graders
and you know people working in the road
oh its fantastic Edmontons a really beautiful city
and the universitys really really nice
and you know the campus is really really beautiful
cleaner than here this place is incredibly clean
I came from Philadelphia
Philadelphias very dirty
yes the wind blows the wrong way you can smell it

oh there are a lot lot of uh chemicals and
oil refineries and
you know petro chemical stu uh
plants which are
you know you can see them actually from
the university area and if the wind blows the wrong way
you know it
I mean its a nice campus University of Pennsylvania
I mean its a big city it feels like a
big city its dirty as hell
compared with here right
oh sure well theres the academy of music
which is fantastic like theres no place on earth like
the academy of music in Philadelphia
like we would sit in the
highest balcony
the last row back right in the middle
its the best seat in the house
well I went to sleep at nine thirty you know
so when you go to sleep that early you expect almost
half expect that somebodys going to call you
isnt that so
no I didnt trip over the weekend
Kelleys Island yeah we were there
uh the weekend before that
uh you go across on a ferry
its a little ferry that carries you know
maybe twenty cars
fewer than that maybe fifteen cars
and passengers and bicycles
and the island is really small you
could probably walk around it in an hour
you can swim and camp there its a state park
you camp right by the beach
and the waters clear its very nice for that
funnily enough I mean its Lake Erie
right but the waters clear
huh uh thats because the beach is on the
the Canadian side right
where in Kelleys Island
yeah there are good parts of the Lake and bad parts you know on Kelleys
Island theres quite a difference between the south side of the
island and the north side of the island the ferry arrives on the
south side and the water looks awful
actually it looks like uh
I dont know just kind of green crap
you know
its really disgusting you know
it looks like seaweed soup
or I dont know

anyway the north side of the island is you know
quite different its very strange
but you know like there are parts of the lake that are nice
and parts of the lake that arent the way
it stands now of course they say that the whole
lake is dead quote dead
I dont know what that means but you know the there are
still fish I mean you know people fish and they
catch fish there
uh I suppose theyre smaller than the fish used to be
but the waters clear on the north side like you know if
you open your eyes under water and see your hand
its hard to imagine for an Ohioan right
like nowhere in Ohio can you find that kind of water
yeah where you wouldnt open your eyes anyway
cause the chlorine would kill you
I once broke my neck almost
I thought I did
so did the gym teacher
like he panicked and sort of
said you know run for the nurse run for the
doctor, run for the ambulance
he was really nervous
I landed on my head
on the trampoline I landed on my
head and uh I kind of
like my head went the wrong way
instead of going this way it went that way
I guess it was like whiplash
I suppose anyway I didnt need
anything from it it was just it was sort of
semi paralyzed for a few minutes
you know like you know for a good few minutes I couldnt move
you know thats why the gym teacher was so panicked
oh I felt really horrible but you know
when I came out of it I came out of it you know Id
realized that I was okay
well what do you say
about three days we went to a
homosexual party where they were shooting heroin
Im absolutely serious and it was
really nuts
uh we knew this guy who uh
took us to this you know this
party and it turned out to be like that you know
we hung around and there were these people all spaced
lounging around it was really
kind of strange
so we saw them doing it in the back room
you know and they had a pot boiling on the kitchen stove
it was really pretty pretty disgusting I kind of
felt very bad about it

anyway I have happier memories of London
too like it being very cool
in the summertime but it was like maybe sixty
sixty two degrees very humid kind of
misty and like
walking along and its a you know suburban
London sort of
Yugoslavia I saw through a jun a jaundiced
eye as they say
because I had uh hepatitis
when I was there
I started getting sick on the uh on the train
from Trieste to Ljublana
I didnt know I had jaundice until I was almost
through with it like I
had a fairly mild case they only found
out in uh when I got to Israel
you know maybe three weeks after the whole
thing started they uh
oh yeah yeah it was uh a kibbutz doctor
right I had seen
uh two
Yugoslav doctors an American doctor in
Yugoslavia and a Greek doctor in
Athens and it took uh
this hick doctor in
this Kibbutz in Israel to
finally diagnose it and he did it by looking at the
whites of my eyes he saw yellow in the whites of the eyes
it must have been a mild case
because there wasnt a day that I didnt uh get
up and walk around you know what I mean

Speaker BN, Reading--spelling transcription

1. we have a list of priorities right
2. of things to buy in the near future
3 some of them I agree with and some of them I dont
4. you remember the size of our place
5. she wants to buy what she calls a monster chair
6. for about you know how much I forgot
7. exactly how much it costs and its
8. over at Schottensteins its she
9. calls it a monster chair its about so you know
10. two yards wide three yeards yeah
11. two people can fit on it its about
12. maybe that high off the floor and it has this big
13. square thing that you can put
14. your feet on its covered with fur right
15. its sexy very sexy
16. and anyway she fell in love with the thing
17. and she wants to buy it and I keep on
18. I I kept on arguing with her about it
19. she wanted I argued the place was too
20. small which of course it is anyway she
21. she was quite adamant about it and finally
22. one weekend she completely
23. rearranged the house and moved everything like all of the
24. the books are in the bedroom now of all places
25. right and uh like we have
26. shelves piled all the way up to ha
27. uh all the way half up to the ceilings
28. on most of the walls except this one
29. well she convinced me theres enough room
30. in there for a monster chair anyway of course
31. now there wouldnt be any room for bicycles
32. well I would if we got new bicycles
33. for the time being weve got old old rusty
34. used slow difficult to pedal
35. unstealable well to me
36. me the monster chair isnt even on the list
37. but you know shes gotten it so much into her
38. head that yesterday she wistfully said
39. Barry would you like to go see the monster
40. chair she wants to go look at it you know shes
41. already seen the thing twice and now she
42. wants to go look at it again
43. we just found out the car needs an expensive
44. repair they have to pull the engine out
45. and fix the gaskets or something its
46. fifty six on it fifty six thousand
47. miles its gone the Alaska highway
48. you know didnt you know that
49. yeah it was the first summer that we were actually
50. married is it hard to drive the Alaska
51. highway well it was fine except

that trucks going the other way tend to go real
fast and kick up gravel
and the gravel tends to lodge itself in your
windshield or in your headlights
anyway you know your
car can get pretty beat up from all the gravel
basically and of course we went through a set of
tires Im not sure
exactly but you figure it's four
days each way from Dawson Creek to Fairbanks
well no theyre not paved theyre
gravel roads you know graded
theyre well maintained like they always have these
maintenance they have maintenance sheds you know every
fifty miles or something you know theyre
always out there youre always passing
graders you know people working on the road
oh its fantastic Edmontons a really
beautiful city and the universitys
really really nice and you know the campus is
really really beautiful
cleaner than here this place is incredibly
clean I came from Philadelphia Philadelphias
very dirty yes the wind blows
the wrong way you can smell it
there are a lot of chemicals and oil
refineries and you know petro chemical
plants which are you know you can see them
actually from the university area if the wind
blows the wrong way you know
I mean its a nice campus University of
Pennsylvania its a big city it
feels like a big city its dirty as hell
compared with here right
oh sure well theres the academy of
music which is fantastic theres no place on earth
like the academy of music in Philadelphia
like we would sit in the highest balcony the last
row right in the middle is the best seat in the house
well I went to sleep at nine thirty so when you
go to sleep that early you expect almost half
expect that somebody going to call you isnt
that so Kelleys Island yeah we
were there the weekend before that
you go across on a ferry its a little ferry that
carries you know maybe twenty cars fewer than
that maybe fifteen cars and
passengers and bicycles and the island
is really small you can probably walk around it
in an hour you can swim and
camp there theres a state park you camp right by
the beach its very nice for that and the waters

clear funnily enough I mean its Lake Erie
right but the waters clear
uh huh thats cause the beach is on the
Canadian side there are good parts of the lake and
bad parts you know on Kelleys Island its quite a
difference between the south side of the island and the
north side of the island the ferry arrives on the south
side the the water looks awful
actually it looks like I dont know just like a
a kind of green crap you know its really disgusting
it looks like seaweed soup anyway the north side of
the island is you know quite different
its very strange but you know like there are parts
of the lake that are nice and parts of the lake that
arent the way it stands now of course
they say that the whole lake is dead quote
dead I dont know what that means
you know there are still fish
I mean you know people fish and they catch fish there
I suppose theyre smaller than the fish
used to be but the waters clear on the north
side like you know you can open your eyes under
water and see your hand thats
hard to imagine for an Ohioan right
like nowhere in Ohio can you find that
kind of water except in a pool yeah where you
wouldnt open your eyes anyway because the
chlorined kill you
I once broke my neck almost I thought
I did so did the gym teacher like he
panicked and said you know run for the nurse, run for the
doctor he was really nervous
I landed on my head on the trampoline I landed
on my head and uh I kind of like my
head went the wrong way instead of
going this way I went that way it went
that way I guess it was like whiplash
I suppose anyway I didnt need
anything from it I was just sort of
semi paralyzed for a few minutes like you know
for a good few minutes I couldnt move thats why
the gym teacher was so panicked
I felt really horrible and you know when I came out
of it you know I realized I was
okay about three days
to a homosexual party where they were shooting
heroin Im absolutely serious and it was
nuts I knew this guy who took us
to this you know this party and it turned out to be
that you know we hung around and there were these
people all spaced out lounging around

it was really kind of strange so we saw them
doing it in the back room you know and they had a pot
boiling on the kitchen stove it was really pretty
disgusting I kind of felt very bad about it and
anyway I have a happier I have happier memories
of London too like being very
cool in the summertime but
it was like maybe sixty sixty two degrees
very humid kind of misty and kind of walking along
in suburban London sort of Yugoslavia
I saw through a jaundiced eye as they
say because I had hepatitis when I was there
I started getting sick on the train from Trieste
to Ljublana I didnt know I
had jaundice until I was almost through with it
I had a fairly mild case the I only found out when
I got to Israel you know maybe three weeks
after the whole thing started they oh yeah it was a
kibbutz doctor I had seen two Yugoslav doctors
an American doctor in Yugoslavia
and a Greek doctor in Athens
and it took this hick doctor in this kibbutz in Israel
to finally diagnose it and he did it by
looking at the whites of my eyes he saw yellow in the
whites of my eyes it must have been a mild case because there
wasnt a day I didnt get up and walk around you know what I mean

Speaker DJ, Conversation--spelling transcription

1. then of course uh its not
2. only him but its the
3. Congress that uh also that
4. thats uh prolonging the thing
5. things we should be you know working on they you know say
6. the hell with I think they should
7. take the put more money in the space program
8. and
9. you know go towards space and uh
10. you know and than the war business
11. but how long as were over there lets get the
12. thing over with
13. oh its benefitted mankind already
14. oh
15. thatd be kind neat now I just uh
16. think the
17. you know just interesting to visit uh
18. uh you know another uh world you know
19. and uh Im not like many scientists I
20. I very strongly believe that there are there is
21. uh definitely life on other planets
22. and uh in fact uh if you read
23. the paper last week that the scientists have
24. completely taken another look at Mars theyve changed their
25. whole outlook on the thing you know
26. I think once they once they get even
27. closer theyre going to change it even more uh
28. cause I very strongly believe that uh
29. Mars does have intelligent life on it uh
30. and is inhabited
31. oh no I just strongly believe it I just kinda
32. well Ive you know read about it and
33. yeah yeah itd be really far out
34. and I think that uh theyre not telling us all
35. that they know about the moon you know thats the thing with
36. our government they keep so many things uh you know uh
37. you know hush hush that you know its
38. so ridiculous
39. yeah yeah you know like theyve proven you get out
40. of this planet here so many you know
41. thousand miles and you look out and
42. hell you cant tell this place is populated
43. I mean uh theres no way of telling
44. you look at that you know and so they send
45. one of these capsules like to Venus and they say
46. well hell its uh its five hundred degrees
47. you know nob nothing could ever live there
48. what the hell you la you know if you land a
49. certain place in this planet here youve got uh extreme
50. cold or extreme heat uh
51. you could say well hell theres nothing there

because you know you got sand or you got icebergs
now what the hell could live there uh I mean
thats so narrow minded
yeah hes promising a lot lot of phoney
baloney that just you know theres just no way
what you know like he wants to increase uh
the uh the uh good
will what do you call it the unemployment not the unemployment uh
no not the unemployment uh
no not social security the
welfare type of thing you know people not
working are getting money and hell
you know pretty soon the guys going to be
making seven eight thousand dollars a year for sitting home on their can
no really I mean you start doing something like this and hell
the uh rest of the American people are just going to
rebel and say the hell with it and lets all sit home
have a big party
well hell theres a lot of people thats doing it now I mean
yeah I used to do a lot of door to door selling and its
surprising you know the things you see
you get these big healthy dudes that theyre too damn lazy
to work and just you know go and get their welfare
check every week
and these uh you know little broads that
uh have all eight or
nine kids and poppa not home not married you know
oh hell yeah I went to this one that she pulled out a wad
of bills that would choke a horse
well they got this thing now that uh
if you youre you know low income you make four to
six thousand dollars a year or something of this nature
well hell they can buy a place just as nice as I have to live in
and uh you know the government pays for sixty per cent of it
and its non repayable you dont have to pay it back or anything
so you know uh after a while
you kind of start adding up two and two and getting
four and you say what the hell why should I you know go out there and
bust my head working and these other
guys are just sitting back and
you know Mexi thats the one thing I uh really
respect the Mexican people for they dont have any
welfare or anything of this nature everybody
gets out and does their fair share even grandma
and thats also one reason why they have such large
families
because the young take care of the old
no I cant really say that so much but
on the average they usually have fifteen sixteen kids
a family

either they dont have any tv or any books to read or something
we went in a restaurant you know and a cat comes out
you know and he says
uno wheres wheres the rest of them at
and I says rest of what you know
wheres the other fourteen, fifteen
well they start pretty early over there
they get the show on the road.
oh twelve eleven twelve
hey they dont mess around
yeah its a whole place is incredible
I think Robert Kennedy should be president but hes already dead
I think he was I think he would have got the show on the road
I think if uh J F K was alive we
wouldnt have Viet Nam
well yes there is but hes in the hospital right now
hes a little bit down on the on the you know Negro people
which uh of course theres good and
bad in all races Im not you know down on anybody
but uh you know the thing I like about him
he doesnt beat around the bush you know he comes right out and
says what he whats on his mind
and thats what we dont have now
well thats very true its just like this you know
town here I dont like that much because
its got a lot of you know just petty things that
you know that just kind of make you unhappy like those
Gestapo police force we have
like you know if youre in a you know traffic accident
or if you get a ticket or anything
or the officers give you a ticket you cant you know say you know
cant voice your opinion or anything or youre you know
hit you on the head with something
yeah if you go to court you might as well just stay home and forget about it
cause youre found guilty regardless unless you
invest some fantastic amount of money in a crooked lawyer
but on the other hand uh even though I dont like it I cant think of any
place else Id like to live any more so just
I was so hot uh on going out to you know L A
I said boy that a you know really fine place out there
from what I read about it and heard about it and couldnt wait to get
no hell the smog didnt bother me at all
its just the fast pace of life you know
nobody knows anything you know whats going on out there
cause and uh it just uh
hell theyre just going twenty four hours a day
something like New York but its more spastic out there
it a nice place to visit but I wouldnt want to live there
yeah its you know its got a lot of irritating

things about this city but
uh I really dont know any place I like any better
I mean you cant have everything the way you want it all the time so
oh its nice its got a lot of new
equipment its quite a challenge uh
theater business has went uh
computer its computerized right now
yeah its automated yeah
and of course the whole theory of operations has completely
changed we have a different lighting
source now we dont have carbon arcs any more
we have a lighting thats called xeon
xeon lighting
three different rooms and six well two
machines per room
kind of kind of keeps you running
some times we have them all start at the same time
you got to be quick
not really no weve got a
control box where we can start two of the auditoriums at
one time then you have to run and get the
you know the third one but uh
its it keeps
you moving any way you look at it
well it was small but uh in proportion to the
uh size of the auditorium I dont think it was that small
well it was built several years ago but uh
just opened about two months ago
well yeah the guy that had it he was a little bit uh
yeah he was a little bit under the weather
no he built this building and
as he closed down he was a you know a multimillionnaire
but he didnt like to spend money
no really and as hed tear down his older theaters
hed take you know seats some of the
seats some of the better seats out of the theater you know
and put them in this place and like hed have
a blue seat and a yellow seat and a red
seat you know right nex next to each other
and the same with the carpet you know these little
squares of carpet here and there you know
he was really fruity
no no no they spent pretty nearly a
million dollars worth of sea for the sea seating in the
place yeah theyre new seats
very elaborate seating
of course uh when he died uh
beginning of the year well the
attorneys to the you the attorneys for
the you know the attorneys for the estate
they decided to open up the thing you know

Speaker DJ, Reading--spelling transcription

1. of course its not only him but its
2. Congress that also thats prolonging the thing
3. things we should be you know
4. working on they say the hell with
5. I think they should take the put more
6. money in the space program you and
7. go towards space and uh rather than
8. the war business but as long as
9. were over there lets get the thing over with
10. oh its benefitted mankind already
11. now I just uh think you know its
12. interesting to visit you know another world you know
13. and Im not like many scientists
14. I very strongly believe that
15. there is different definitely life on other nlanets
16. and in fact if you read the paper last week
17. that the scientists have completely taken another look
18. at Mars theyve changed their whole outlook
19. on the thing you know
20. I think once they get over I think that
21. once they get even closer theyre going to change it even
22. more because I very strongly believe
23. that uh Mars does have intelligent
24. life on it and its inhabited
25. I just think of you know
26. all Ive you know read about it
27. and I think that theyre not telling us
28. all that they know about the moon you know
29. thats the thing our government
30. they keep so many things
31. thats you know hush hush
32. thats that its ridiculous
33. like theyve proven you get out
34. of from this planet here
35. out so many thousands of miles and you look at it
36. and you cant tell this place is populated
37. so they send one of these capsules to Venus
38. and they say oh its five hundred degrees
39. you know nothing could ever
40. live there
41. what the hell you land a certain place on this planet
42. here its got extreme
43. cold and extreme heat you could
44. say theres nothing here because you know
45. they got sand or you got
46. icebergs now what the hell could live
47. there thats so narrow minded
48. yeah its a promising
49. of yeah hes a promising lot of
50. phoney baloney you know

that just no way
you know like he wants to increase
uh the welfare type of thing you know
people that arent working are getting money
pretty soon those guys are going to be making
seventy thousand dollars a year for setting home
on their can
no really I mean you start doing
something like this and the rest of the American
people are just going to rebel and say the
hell with it and lets set all all sit at home
and have a big party
there are lots of people thats doing it now
yeah I used to do a lot of door to door selling
and its surprising you know the things you see
you get these big healthy dudes that are just
too damn lazy to work and go
and just go and get their welfare checks
every week and these you know
little broads that have eight or nine
kids and papa not home
not married you know I went to this
one she pulled out a wad of bills
that would choke a horse
well they got this thing now that if youre
you know low income you make
four to six thousand dollars a year
or something of this nature you can
buy just as nice a place as I have to live in
and uh you know that the government pays
sixty per cent of it and its nonrepayable
you dont have to pay it
back or anything
so after ea a while
you know you kind of start adding two and two and
getting four you say what the hell why should
I you know
to go out there and bust my head working
and those other guys are just setting back and
you know
Mexico thats one
thing I really respect the Mexican people for
they dont have any welfare or you know
anything of this nature everybody
gets out and does their fair share even grandma
and thats also one of the reason they have such a
large families because the
young take care of the old not because theyre
Catholics no I really cant
say that so much but on the average
they usually have fifteen sixteen
kids a family either
dont have any tv or no books to read or something
we went in a little restaurant you know and

a cat comes out and you know
and he says uno
wheres the rest of them at I says
rest of what you know the
theres the other fourt wheres the other fourteen
fifteen well they start
pretty early over there they get the show on the road
eleven twelve no really they
dont mind they dont mess around
I think Robert Kennedy should be president
but hes already dead I think he
would have got the show on the road
I think if J F K was alive we wouldnt
have Viet Nam.
Well yes there is but hes in the hospital
right now hes a little bit down
on the you know Negro people
which of course theres good and bad in all races
Im not you know down on anybody
but uh you know I think
you know the thing I like about him
he doesnt beat around the bush you know
he comes right out and says wnats on his mind and
thats what we dont have now
thats very true
thats just like this town here
I dont like that very much because its
got a lot of you know just pretty
things that just you know kind of
make you unhappy like
those Gestapo police force we have
like you know if youre in a traffic
accident or you get a ticket or anything
or the officer gives you a ticket you cant you know
say you know cant voice
your opinion or anything or they hit you
in the head with something yeah if you
go to court you might as well stay home and
forget about it because if youre found
re guilty regardless unless you
invest some fantastic amount of money in a crooked
lawyer but on the other hand
even though I dont like it
I cant think of any place else Id like
to live any more so I
just stay here I was so
hot on going out to you know L A
I said boy thats really
a fine place out there from what I
read about it and heard about it and I couldnt
wait to get out there after I got there
I couldnt wait to get home

no the smog didnt bother me at all its just
the fast pace of life you know
nobody knows anything you know whats going on out
there theyre just going twenty four hours a day
something like New York but its more
spastic out there and its got a lot of
irritating things about this city but I really
dont know any place I like any better
you cant have everything the way you want it all
all the time
its nice its got a lot of new equipment
its quite a challenge the theater business has
went uh its computerized right now
yeah and its automated and of course
the whole theory of operation has completely
changed we have a different lighting source
now we dont have carbon arcs any more
we have a lighting thats called xeon
xeon lighting three different rooms
six well two machines per room
kinda keeps you running sometimes we
have them start all the t on all the time
weve got a control box where we can start
two of the auditoriums at one time
and you have to get the you know
get the third one it keeps you moving
any way you look at it
well its small but in proportion to the
size of the auditorium I dont think
its that small well it was built
several years ago but just opened
about two months ago
well yeah the guy that had it was a little bit he was
a little bit under the weather you know he
built this building and it was closed down
he was a you know a multimillionnaire but he
didnt like to spend money and as
he tears down the older theaters
hed take you know seats some of the better seats
out of the theater you know and put them in this
place and like hed have a blue seat
and a yellow seat and a red seat you know right
next to ea each other
and the same with the carpet you know a little square of
carpet here and there he was really
fruity you know they spent nearly a
million dollars worth of just for
the seating in the place yeah theyre
new seats very elaborate seating
of course when he died uh beginning of the year
the attorneys to you know
the attorneys to the state they decided to
open up the thing you know.

Speaker RC, Conversation--spelling transcription

oh you usually get better
frequency response for one
thing and theyre built a little bit more
rugged
and uh depends upon the impedence that you
want whether you want to run it on
a long line you if you do you
want to go to a low impedence say thirty
or fifty ohms and then you can run it up to several
hundred feet
where if you use a high impedence
usually on the cheaper
microphones theyre uh
oh either a crystal or ceramic
microphone and I dont know they run
about a maximum of ten feet before they
pick up a c hum
and all kind of noise and stuff like
that
cord uh has capacity
see between the inner conductor
and the outer conductor on two
conductor stuff and
as it goes in length it affects
the frequency response
and also uh
by using a low impedence you can use
two conductors shielded
which shields the line from any stray
pick up like hum magnetic fields
or neon signs or stuff like that
so you kind of pay for it but Altec
theyve always made good equipment that way
and theyre one of the old established names
in the say broadcast
business or electronic business that way
we used to handle it over to
Magnetic Service
yeah I spent five and a half years there
oh I enjoyed it thats where I got
to know a lot of these people up here at Ohio State
Preston for one I sold him a lot of
parts and Marlena
I got to know her through
when I was there at Magentic and
most of the guys over in uh
oh TELECOM and and even here in
the Listening Center little at that
time did I know I was going to end up back
up here just one of those things

Oh I did uh
I worked with uh
Ray Data Corporation up here
I was there about eight eighteen nayah
eight months or something like that I was in research and
development
Ray Data its changed name now
and we made uh
well we made a scinulation camera
for one thing I I was in R and D research and
development and uh we designed a
scinulation camera for the detection of
cancer or malignancy in human organs
and it worked on a uh
you drank a drink an active
a radioactive drink see
it goes down through your body and if you have any
malignancy or cell something in a
uh kidney or bladder or something
the radioactive salts would kinda
cling to it and then this
photocell would pass
the rays from this radioactive
material would pass from the body out on this
photocell and a uh
oscilloscope was hooked up
onto it and itd actually give you a
picture of how bad it was and so forth
I did uh design work on a
grea darn things weighed about two tons
cause they were s we had lead in them
cast iron and everything under the sun
and then I did uh worked on the printed
circuit board designs and
stuff like that but before that then I
was with uh
oh Doubleyou Vee Kay Oh
yeah I spent about twelve years there
only when I had to
like when now you know or
something like but I was engineer and
transmitter engineer chief engineer
I went out on a lot of remote broadcasts
and old Preston
there I know you ever have him talking
hes still in store
but uh I spent twelve years with
uh Vee Kay Oh
we built a new building out there on Henderson Road
new studios and moved everything
out there and put in transmitters and
so forth and it got to be a

wear and tear on you after a while and nerves
and cause all the time you was on
transmitter duty you couldnt relax
I never could cause always afraid
something would happen and you know
youre just keyed up and
oh I was going to bed when other people were getting
up and the times vice versa and
so I worked all night you know occasionally
and uh maybe get up
for o clock morning and go to work and
well after a while she got used to it
we was on two year two day
weeks of days and two weeks of nights
and if there was maintenance or something
special then wed work did a lot of remote
work on various churches and
used car lots and
stuff along that line in
various shopping centers it was rather
interesting but got so youd have to lug so much
equipment around and
lots of times on Sundays Id start out at
seven o clock in the morning and I wouldnt get back
home until n eight or nine o clock at night
only long enough to eat dinner
after I got out of that I went down to
Doubleyou Em En Aye and I worked down there
for a couple of years Sundays just for
transmitter engineer and I quit down there
last August it got to be
kind of one of those deals where it was getting
to me a little bit
and uh but I en enjoyed it
some but uh I dont particularly interested in
going back to it
oh the electronics its getting kind of a narrow
field too any more
uh various like people working
with uh computers or its
getting to uh along a narrow path too
well I was mainly in broadcasting
and it got to be a narrow
field and when you try to get out of it
its hard kind hard to get out of it
thats why with when I went to Magnetic uh
I with tape recorder and so forth
I was able to get out of it some
and branch out but I enjoy
working with uh oh my
hands on things and repairing things
and stuff like that one thing up here

at the Listening Center is something different just
about every day you know
and uh you dont get bored Ive got
a million and one things I want to do over there
I havent had a chance to do them and
Im not worried about that right now
theyve had some articles in on speech
in some of the radio magazines that Ive
seen where uh
everybodys voice is supposed to have
you know a different uh print
just like fingerprints
well they theyve been feeding voice
patterns you know onto an
oscilloscope and then taking pictures of them
for uh comparison
and of course you know theyre working with uh
oh where sound can be
transferred now to typewriter keys and
have the letters print out the words and
it it its really coming
of along
yeah thats what uh Professor Egea
was telling me when we were talking about
the Spanish and uh what was the word that he
used tough I think
I think the word was tough
he says that you just dont spell it like it
sounds
and uh I got to thinking about that and theres quite a few
English words that uh
along that line that
you just dont spell right
you use your sound chamber here very much
well Ill bet the tapes made from in
herell be a lot different sounding than

Speaker RC, Reading--spelling transcription

oh you usually get better
frequency response for one thing
and theyre built a little bit more rugged
and it depends upon the impedence that you
want whether you want to run it
on a long line if you
do want to go to a low impedence say
thirty of fifty ohms then
you can run it up to several hundred feet
where if you use a high impedence
usually on the cheaper microphones
theyre either a crystal
or a ceramic mircophone
and I dont know they run about a
maximum of ten feet before they
pick up a c hum and all kinds
of noise and stuff like
that cord has capacity
see between the
inner and outer conductor on
two conductor stuff and it
goes in length it affects
the frequency response
and also by using a low
impedence you can use two conductors
shielded which shields the line
from any stray pickup like hum
magnetic fields or neon
signs or stuff like that
so you kinda pay for it
but ALTEC theyve always made good
equipment that way theyre one of the old
established names in the
broadcast business and
electronic business that way
we used to handle that over at Magnetic
Service uh yeah
I spent five and a half years there
I enjoyed it thats where I got
to know a lot of these people up here at Ohio
State Preston
for one I sold
him lots of parts and Marlena
I got to know her through
when I was at Mag there at
Magnetic and most of the guys
over at Telcom and even here in the Listening
Center little at that
time did I know I was going to
end up here

just one of those things
I worked with Ray Data Corporation
up there I was there
about eight months or
something like that I was in research
and development
Ray Data
its changed name now
and we made well we made
a scinulation camera for one thing
I was in R and D research
and development and we designed
a scinulation camera for the
detection of cancer or malignancy
in human organs
and it worked on a
you drink a active
radioactive drink see and it goes
down through your body and if you have any
malignancy or cell
something in a kidney or bladder or
something the radioactive
salts would kinda cling to it and
and then this photocell would pass
the rays from this radiocative
material would pass from the body
out on this photocell and an
oscilloscope was hooked up on it
and it would actually give you a picture of
how bad it was and so forth
darn things weighed about two tons
cause they were
uh we had lead in
them cast iron
everything under the sun
and then I worked on printed circuit
board design and stuff like
that but before
then that
then I was at Vee Kay Oh
yeah I spent about twelve years there
only when I had
to like when now or something
but I was maintenance
engineer and transmitter engineer
chief engineer I went out on
a lot of remote broadcasts and
we built a new building
out on Henderson Road
new studios and moved everything out
there and put in transmitters
and so forth and
it got to be a wear and tear on you

after a while and the nerves and
because all the time you were on
transmitter duty you couldnt relax
I never could because I was
always afraid something would happen and
you know youre just keyed up and
uh I was going to bed
when other people were getting up and
the times and vice-versa
so I worked all night and you know
occasionally and maybe get
up at four oclock in the morning and go
to work
well after a while she got used
to it we was on
two weeks of days and two
weeks of nights and if there was maintenance
or something special then wed work
did a lot of remote work on various
churches and used car lots
and stuff like that
line and various shopping centers
it was rather interesting but got
to have a
lug so much
equipment around and lots of times on
Sundays Id start out at seven oclock in
the morning and I wouldnt get back
until eight or nine oclock at night
only long enough to eat dinner
after I got out of that I went down to M N I and
worked down there for a couple of years Sundays
just for transmitter engineer
I quit down there last August
it got to be one of those deals where it was
getting to me a little bit I enjoyed
it some but Im not
particularly interested in going back to it
oh the electronics its getting kind of a
narrow field too any more I was
mainly interested in broadcasting and
it got to be a narrow field
and when you try to get out of it
it its hard kind of hard to get
out of it thats why
when I went to Magnetic with with tape
recorders and so forth I was
able to get out of it some and branch out
but I enjoyed working with
my hands on things and repairing
things and stuff like that
one thing up here in the Listening Center its

something different just about every day
you know and you dont get bored
Ive got a million and one things I
want to do over there and I havent had
a chance to do them and
oh Im not worried about that right now
theyve had some articles in on speech
in some of the radio
magazines that Ive seen where
everybodys voice is supposed to have a
uh you know a different print just like
fingerprints
well theyve been feeding voice patterns
you know onto an oscilloscope and then
taking picture of them for comparison
and of course you know
theyre working uh with uh
where sound can be transferred
now to typewriter keys
and have the letters printed out
the words and its
really coming along
yeah thats what Professor Egea
was telling me when we were talking
about the Spanish and
what the word that he
used tough I think
the word was tough he says that you
just dont spell it like it sounds
and I got to thinking about that
theres quite a few English words
that along that line that you
dont spell right
you use your sound chamber here very much
well Ill bet the tapes made from in
herell be a lot different sounding
than what you make
say you make in a regular studio
or anything like that
cause you dont have any sound bouncing
around the walls or any
extraneous noises
if youve got a good tape recorder thats pretty
quiet something like that
you might try feeding the
some of the audio from here back through
an oscilloscope you got an
oscilloscope out there havent you
oh you know what it looks like
oh boy you can go anywhere from
about a hundred and fifty dollars up to

three thousand depends upon what
all you want on them and
what you want them to do
Heathkits can get a
Heathkit and get a Preston to
build it for you

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Suprasegmental Aspects of Icelandic Vowel Quality*

Sara Garnes

1. Introduction

The sources for phonological analyses of languages are frequently provided by data found in grammar books, hand-books, or in articles written on particular languages. Data based on instrumental phonetic analyses may not be available. While this is inevitably the case in historical phonology, it is also often true of phonological analyses of contemporary languages.

In abstract phonology phonetic facts are frequently taken for granted, and verification of phonetic facts is largely ignored. This is due in part to the separation of the level of abstract phonological patterning from that of the actual physical menifestation of the pattern in sound. Because of this separation, however, I have often felt that even though a particular phonological solution may be very interesting, the reality of the final surface phonetic forms is questionable. If the resulting surface forms are not attested in the spoken language itself, the phonological analysis loses its credibility.

If a phonologist attempts to take phonetic evidence into consideration, that phonetic evidence is usually based on impressionistic observation. However, phonetic transcriptions of a given language by different researchers frequently conflict. The variations may be due to different backgrounds in phonetic training and degrees of experience, different linguistic backgrounds or differences in perception. In researching a language one often reads conflicting phonological analyses which are based on divergent impressionistic phonetic observations. The validity of these analyses is also questionable.

Because of these conflicts, whether attributed to the theoretical position held by the phonologist or to the kinds of data available, the results of phonology often become something more to be believed in than believed. One alternative which is available is to allow instrumental phonetic data as a source for phonological analyses. These data can be more objective than impressionistic phonetics allows, although they too are subject to interpretation. The optimal situation appears to me to be one in which the predicted phonetic outputs of an analysis are compared to data gained through instrumental phonetics. The resulting fit or lack thereof can be considered as proof or disproof of the phonological analysis.

2. Phonetic Evidence

2.1. Previous Work

The various phonological analyses of the Icelandic vowel system and parts thereof provide an excellent background for a phonetic

investigation. The phonological theories attempt to account for the present Modern Icelandic vowel system. However, very little is known about the physiological or physical aspects of the vowels constituting that system. Einarsson (1927, 1931, 1949) based his instrumental phonetic investigations of vowel quality on tracings from palatograms and his studies of vowel quantity on duration measurements based on limited corpora. Garnes (1973) presents formant measurements of the monophthongs. No analysis of the diphthongs had been published until recently.

Pétursson (1969-70) presents radiocinematographic tracings of one token of each monophthong. Recently, Pétursson (1972) has expanded his studies to include spectrograms and measurements thereof for each of the tokens in his 1969-70 article. In addition, he includes one production of each diphthong by the speaker in the 1969-70 article. There is also a complete set of spectrograms and radiocinematographic tracings with measurements for one set of the monophthongs and diphthongs produced by a second speaker. Although the presence of the spectrograms and tracings are a welcome addition to the literature on Icelandic vowel systems, there are serious problems with his measurements.

2.2. Experimental Procedure

In this study I measured the formant structure of five tokens of each of the long and short allophones of the eight monophthongs and five diphthongs--a total of 130 vowel nuclei. All nuclei received primary stress and occurred either in monosyllabic words or in the first syllable of disyllabic words. The informant was Ólafur Ingólfsson, age 27, a native of Reykjavík, who has made only short and infrequent trips out of Iceland. Tape recordings were made in a recording studio at the State Radio Station in Reykjavík. Wide-band spectrograms were produced on a Voiceprint 700 spectrograph.

I based segmentation of plosive consonants, postaspiration, and releases on the criteria presented by Naeser (1970). Nasals were segmented at the onset and release of a low, broad, F_1 band. Nasal releases were often accompanied by a spike release. Liquids were segmented according to major changes in the formant structure. Fricatives were segmented by either the onset and offset of frication in the higher frequencies, major changes in the formant structure, and/or the lack of voicing in the case of voiceless fricatives. The frication in the high frequencies due to preaspiration frequently began before voicing ceased--in these instances the segmentation was made at the last vocal fold flap.

In measuring formant values it is important to distinguish between transitions and steady states. The transitions vary as a function of the place and manner of articulation of neighboring segments. The vocalic steady state is represented by bands which are horizontal to the base line. This state frequently occurs mid-way in the duration of monophthongs. For long allophones of three of the eight monophthongs, /e/, /ö/, and /o/, there was a second steady state of a minimum of three to four periods in duration before the final transition. For short allophones of diphthongs, the expected second

steady state was not realized, rather, there was a constant movement throughout the latter portion of the vocalic nucleus. In these instances, measurement was made well before the onset of the final transition.

2.3. Vowel Quality

Table 1 lists the mean values, rounded off to the nearest five Hz, for the first three formants for the long and short allophones, which are indicated by an I.P.A. transcription, of the thirteen vocalic nuclei. The thirteen vowel phonemes are given in traditional Icelandic orthography. Nuclei which were diphthongized have two values for each formant. The durations, rounded off to the nearest five ms., appear in the column on the right.

TABLE 1
Durations (ms.) and Formants (hz.) of Short and Long Allophones

Phonemes	I.P.A.	F_1	F_2	F_3	ms.
Monophthongs					
/í/	[i:]	255	2200	3290	180
	[i]	265	2140	2885	80
/i/	[I:]	350	2055	2915	200
	[I]	345	1960	2835	105
/u/	[Y:]	380	1350	1995	195
	[Y]	385	1390	2185	110
/e/	[eɛ:]	505 > 610	1880 > 1735	2720 > 2685	195
	[ɛ]	640	1710	2590	100
/ö/	[ø̞œ:]	500 > 590	1295 > 1220	2260 > 2015	250
	[œ]	600	1250	2290	105
/a/	[ɑ:]	815	1235	2380	225
	[ɑ]	760	1265	2370	100
/o/	[oɔ:]	545 > 640	805 > 875	1935 > 2020	200
	[ɔ]	660	980	2195	95
/ú/	[u:]	280	620	----	210
	[u]	320	735	----	100
Diphthongs					
/ei/	[ei:]	525 > 305	1915 > 2175	2780 > 2960	185
	[eI]	560 > 395	1880 > 1970	2475 > 2705	100
/au/	[øY:]	490 > 365	1485 > 1665	1980 > 2100	200
	[øY]	525 > 380	1450 > 1495	2250 > 2385	130
/æ/	[ɑI:]	800 > 340	1405 > 1995	2420 > 2850	220
	[ɑɛ]	775 > 685	1405 > 1670	2530 > 2570	105
/á/	[ɑʏ:]	720 > 400	1180 > 785	2580 ----	190
	[ɑɔ]	665 > 605	1070 > 985	2395 > 2250	110
/ó/	[oʏ:]	505 > 370	850 > 735	---- ----	215
	[oʊ]	515 > 385	830 > 805	2000 ----	110

Figure 1 represents an acoustic vowel diagram of the F_1 and F_2 values listed in Table 1. Triangles represent long allophones; circles represent short allophones. Phonemic monophthongs are indicated by filled figures, phonemic diphthongs by unfilled figures. The directionality of formant movement is indicated by lines which terminate in arrows at the point of the measured formant values. A dashed rising line indicates the directionality of formant movement for short allophones of diphthongs which in many cases did not achieve a true second steady state. A solid rising line indicates long allophones of diphthongs and a solid falling line represents three of the phonemic monophthongs which are diphthongs phonetically, having two steady states.

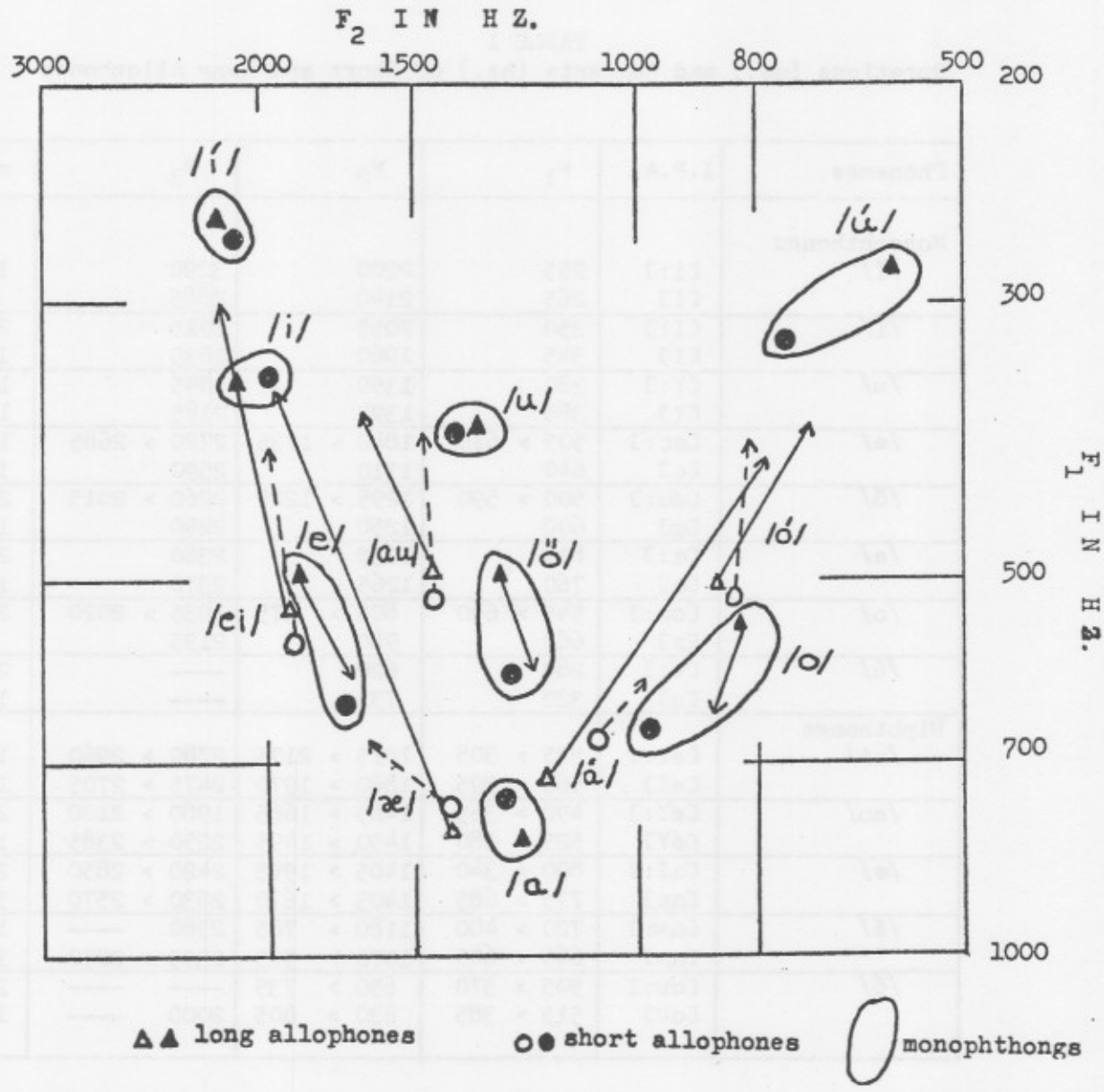


Fig. 1. Acoustic vowel diagram of short and long allophones.

The pattern formed by the phonemic monophthongs in this study is in general similar to that found in an acoustic analysis based on productions by a different informant who was also a native of Reykjavík (cf. Garnes 1973). The long allophones of all monophthongs are more peripheral in quality, e.g. the long allophones of the phonemes indicated by /í/ and /ú/ have lower F_1 values and higher and lower F_2 values, respectively, than do their short allophone counterparts. The long and short allophones of /ú/ vary a good deal in quality, but it is important to note that they represent an end point in the diagram and even the relative freedom of the short allophone does not bring it close to other phonemes. The long allophones of the phoneme /a/ have a higher F_1 value than the short allophones. Perhaps the most interesting phenomenon in the monophthongs occurs with the three mid-low vowel phonemes: /e/, /ö/, and /o/. The long allophones of these phonemes have considerably lower F_1 values than the short allophones. The directionality of the diphthongization is towards the quality of the short allophones in all three cases. It appears that the initial portions of the long allophones have risen in height and are diphthongized towards the quality of the short allophones. The short allophones are in turn closer to the phoneme /a/ than are their long counterparts.

Whereas the diphthongal movement found for the phonemic monophthongs is lower and towards /a/, the movement in the five phonemic diphthongs is rising and moves away from /a/. The initial portions of the long allophones of the diphthongs share a property similar to that found for the monophthongs--they are in general more peripheral than the short allophones which tend to be somewhat monophthongized. Thus the final portion of the long allophones is, not unexpectedly, more extreme than that of the short allophones.

Viewing the vowel system as an integrated whole, it is apparent that the initial portion of the long diphthongs is very similar in formant structure to the long allophones of the nearest monophthong. This relationship holds for all five diphthongs.

These observations regarding the quality of the vowels can be grouped into three classes based on one feature--that is a feature of movement. First, if there is no movement the long and short allophones will be very similar in quality--noting the exception of /ú/ above. Second, if the direction of movement is downward--as we see for the three mid-low phonemic monophthongs, the first steady state of the long allophones differs considerably in quality from their short counterparts. In other terminology--the high and mid-high vowels, /í/, /ú/; /i/, /u/; and the lower vowel /a/, are monophthongal and both allophones are similar in quality. The long allophones of the mid-low vowels, /e/, /ö/, and /o/, are diphthongized according to the feature of gravity, i.e. +low, while the phonemic diphthongs are diphthongized according to the feature of diffuseness, i.e. +high.

2.4. Suprasegmental Properties

As was noted above all vowels in this study receive primary stress. Since there is no evidence of a tonal contrast in Icelandic

the remaining suprasegmental feature is quantity. The mean durations of all vowel nuclei listed in Table 1 are illustrated in Figure 2.

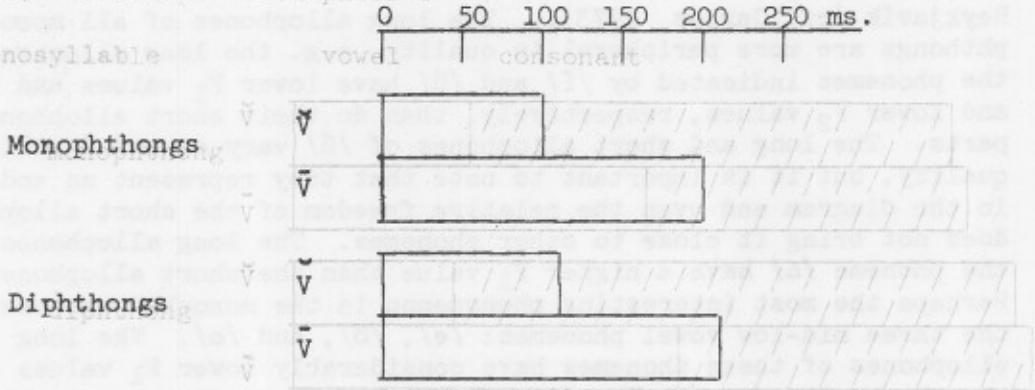


Fig. 2. Durations (ms.) of phonemic monophthongs and diphthongs in monosyllabic and disyllabic words.

The mean duration of short allophones of monophthongs is 100 ms.; the mean duration of long allophones is 205 ms. For diphthongs, the mean durations are 110 ms. and 200 ms. for the short and long allophones, respectively. The duration of short allophones in monosyllabic and disyllabic words constitutes half of the duration of long allophones. This 1:2 ratio of approximately 100 ms. to 200 ms. is perceptually far beyond that required for the difference limen (cf. Lehiste 1970: 10ff.). Furthermore, the 1:2, short to long ratio, holds for the diphthongs as well as for monophthongs.

Table 2 lists the durations found for stressed vowels and post-vocalic consonants in mono- and disyllabic words.

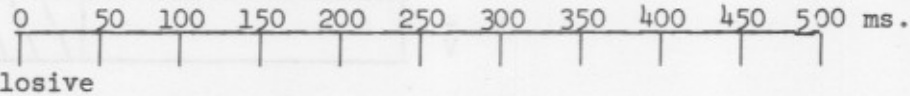
TABLE 2
Durations (ms.) of Stressed Vowels and Post-Vocalic Consonants in Monosyllabic and Disyllabic Words

(2A) Consonant = Plosive							
Monosyllabic Words				Disyllabic Words			
Monophthong	Pre-aspiration	Plosive	Total	Monophthong	Pre-aspiration	Plosive	Total
V̆ 110	125	165	400	V̆ 85	110	175	370
V̄ 210	---	155	365	V̄ 175	---	200	375
Diphthong							
V̆ 115	120	180	415	V̆ 95	105	190	390
V̄ 205	---	170	375	V̄ 175	---	195	370

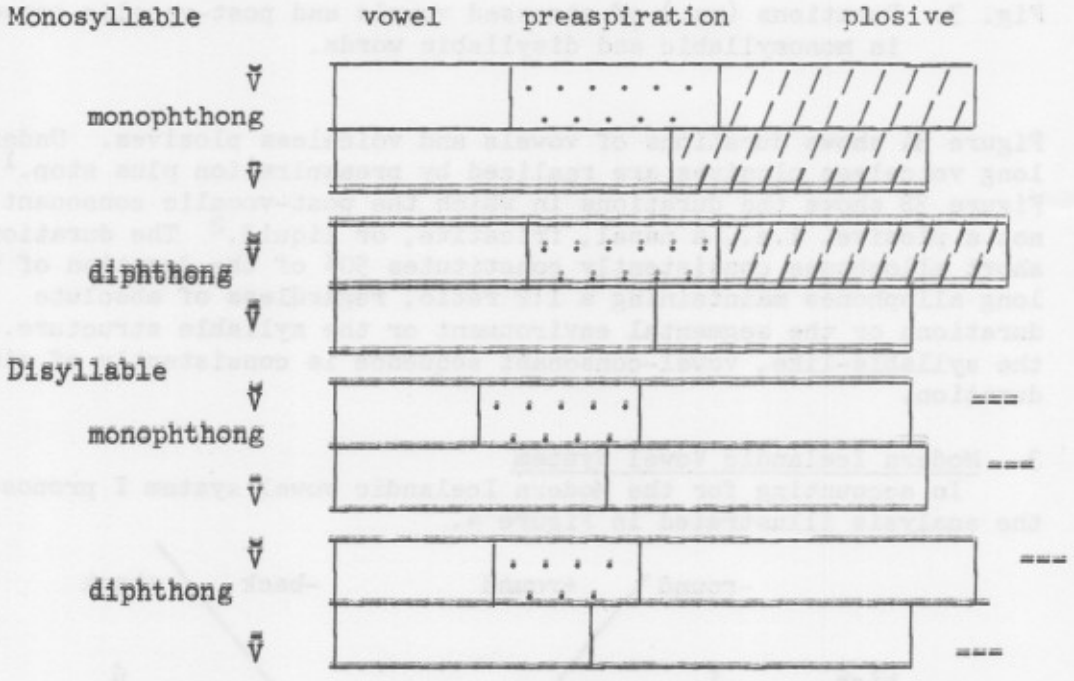
TABLE 2 (continued)

(2B) Consonant = Non-plosive					
Monosyllabic Words			Disyllabic Words		
Monophthong	Non-plosive	Total	Monophthong	Non-plosive	Total
$\breve{V}$ 115	305	420	$\breve{V}$ 90	240	330
$\bar{V}$ 225	200	425	$\bar{V}$ 200	135	335
Diphthong					
$\breve{V}$ 105	345	450			
$\bar{V}$ 235	240	475			

The durations are illustrated in Figure 3.



(3A) Consonant = Plosive



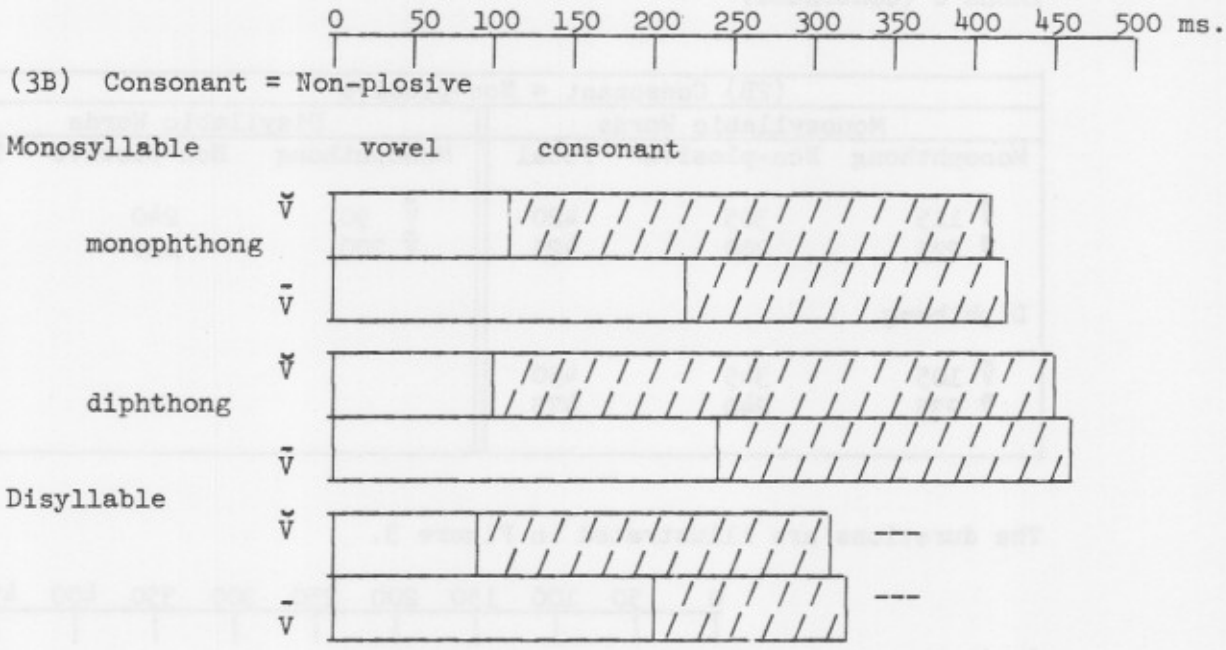


Fig. 3. Durations (ms.) of stressed vowels and post-vocalic consonants in monosyllabic and disyllabic words.

Figure 3A shows durations of vowels and voiceless plosives. Underlying long voiceless plosives are realized by preaspiration plus stop.[1] Figure 3B shows the durations in which the post-vocalic consonant is not a plosive, i.e., a nasal, fricative, or liquid.[2] The duration of short allophones consistently constitutes 50% of the duration of the long allophones maintaining a 1:2 ratio, regardless of absolute durations or the segmental environment or the syllable structure. Also the syllable-like, vowel-consonant sequence is consistently of similar duration.

3. Modern Icelandic Vowel System

In accounting for the Modern Icelandic vowel system I propose the analysis illustrated in Figure 4.

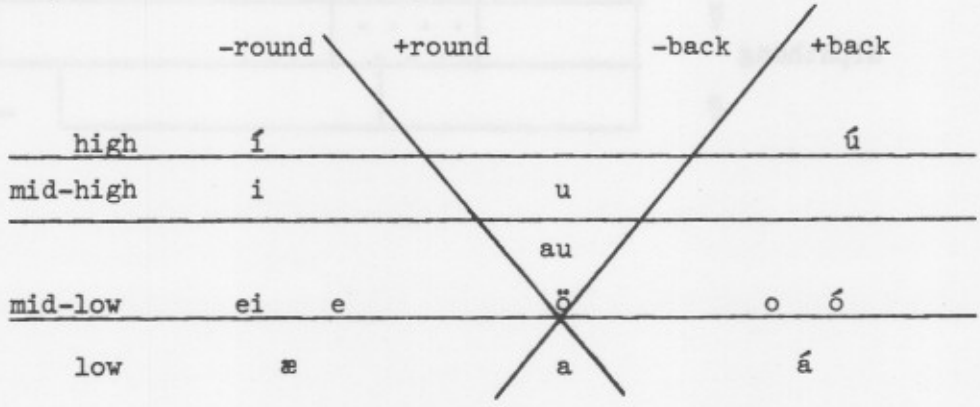


Fig. 4. Modern Icelandic vowel system.

It is based on a combination of the observations of quality and quantity made above. I posit four heights. An alternative would be to posit a tense-lax opposition between the vowels classified here as high and mid-high. However, no durational contrasts which would justify a tense-lax opposition for these vowels is present. These vowels appear to differ on a qualitative not a quantitative basis. The features ±round, ±back are straightforward.

As noted above there are three basic properties of the nuclei--lack of movement, and rising or falling movement. This configuration permits an easy statement of these relationships. All phonemes in the mid-low level are subject to movement--the three internal members, /e/, /ö/, and /o/, are subject to falling movement. The three peripheral members, /ei/, /au/, and /ó/, are subject to rising movement, as are the two peripheral members, /æ/ and /á/, of the low series. The remaining vowels lack movement.

Phonologists have provided terminology for describing vowel systems in general which is helpful for understanding the nature of the relationships found in this particular vowel system. For example, Trubetzkoy (1971 [1958] 95ff) proposes two terms with associated properties, sonority and timbre. Sonority correlates with the degree of aperture; timbre correlates with properties of localization. With reference to vowel space Trubetzkoy's sonority appears to refer to the height or vertical dimension while timbre refers to the place of articulation or to the front-back, horizontal dimension. These relationships are accounted for by Stampe (1972) and Miller (1973) with the terms of sonority, equivalent to Trubetzkoy's sonority, and color, equivalent to Trubetzkoy's timbre. In attempting to account for the changes found in vowel systems they propose the related processes of coloring and bleaching. Bleaching depalatalizes and delabializes vowels while coloring palatalizes and labializes them. Thus, the optimally palatal vowel is [i], the optimally labialized vowel is [u], and the optimally sonorous or bleached vowel is [a].

The structure of the Modern Icelandic vowel system proposed here can be described by these features. The vowels with maximal color or sonority, /í, i, ú, u, a/ are not subject to movement. They appear to provide the anchor points for the synchronic vowel system. Palatality is optimized in /í/ and /i/. Labiality is maximized in /ú/. In the vowel /u/, phonetically [Y], palatality and labiality are combined. /a/ is the most sonorous vowel in the Modern Icelandic system. Thus the most highly bleached and colored vowels do not diphthongize. The remaining, less colored vowels move within the space determined by these anchor points. /e, ö/ and /o/ are subject to the process of bleaching, i.e. their long allophones gain in sonority: [eɛ, øœ, oɔ] while /ei, æ, au, á/ and /ó/ are subject to the process of coloring, especially in their long allophones. The front diphthongs /ei, æ/ and /au/ gain in palatality: [ei, ɑI, øY], while the back diphthongs /á/ and /ó/ gain in labiality: [ɑU, oU].

A physical account of the phonological properties of the vowels in the Modern Icelandic system is possible in acoustic terms. The

notion of optimal opposition (Kim 1966, chapter 7) offers an explanation for the oppositions claimed at the phonological level. Liljencrants and Lindblom (1972) use the principle of maximal perceptual contrast to explain the acoustic structure of vowel systems. They claim that the vowels with the greatest differences in formant structure are those which are maximally different at the perceptual level and are, therefore, those found in vowel systems. Thus, in Modern Icelandic the vowel nuclei which are not subject to movement are those which are in greatest perceptual contrast as well as those maximally acoustically opposed. /í/ and /i/ have the highest second formant value and /ú/ the lowest. /a/ has the highest first formant value. The remaining vowels have intermediate formant values to those found for /í, i, ú, u/ and /a/. It is in these non-maximally opposed nuclei that movement is found. The vowels with peripheral values /ei, æ, au, á, ó/ have lower first formants in their second portions, while the value of the second formant is higher for the front members, /ei, æ, au/ and lower for the back members, /á, ó/. The three less peripheral vowels /e, ö, o/ have higher first formant values in the second steady states of the long allophones. The differences in the directionality of the movement of the second steady states is primarily one of the increase or decrease in the value of the first formant.[4]

4. Historical Development

In studying a synchronic vowel system it is often illuminating to look at the preceding diachronic situation. For Modern Icelandic one looks to the Proto-Germanic and Proto-Nordic vowel systems and at the role of the suprasegmental features in these systems. Since the rising diphthongs have been restructured to consonant-vowel sequences in Modern Icelandic, I have not included them in this brief survey.

The Proto-Germanic vowel system presented in the handbooks (cf., e.g. Krahe 1960) appears in Figure 5.

Monophthongs				Diphthongs	
long		short			
ī	ū	i	u		
ē	ō	e		eu	
		a		ai	au

Fig. 5. Proto-Germanic vowel system.

In the monophthongal system there is a long and short vowel series. Five qualities are represented but the system is askew, since there are different distinctions in the low and back vowels. This situation arose when Proto-Indo-European ā and ō merged to ō, whereas Proto-Indo-European a and o merged to a. The three diphthongs are considered to be structurally similar to long vowels.

The next vowel system in a diachronic approach is that of Proto-Nordic illustrated in Figure 6 (cf. e.g. Ranke 1967. Antonsen (1967) argues for a more complex system).

Monophthongs				Diphthongs
long		short		
ī	ū	i	u	
ē	ō	e	o	eu
ā		a		ai au

Fig. 6. Proto-Nordic Vowel system.

It is the typical five vowel system with all qualities appearing in short and long subsystems, plus three diphthongs. ā and o had arisen filling the gaps in the earlier Proto-Germanic monophthongal system. Again, the diphthongs are considered to have been similar in structure to long vowels.

The vowel system of Old Icelandic, see Figure 7, reflects the effects of such phonological processes as i-, u-, and a-umlaut (cf., e.g. Benediktsson 1959, 1972, Haugen 1972).

Monophthongs						Diphthongs
long			long nasal		short	
í	ý	ú	ĩ	ỹ	ũ	i y u	
é	ø	ó	ẽ	ø̃	õ	e ø o	ei ey
ę́		ǫ́	ę̃		ǫ̃	ę ǫ	
á			ã			a	au

Fig. 7. Old Icelandic vowel system.

At the time of the First Grammatical Treatise, about 1200 A.D., the vowel system is represented by four subsystems: one of long vowels, one of long nasalized vowels and one of short vowels. The fourth sub-system consisted of three diphthongs which are "functionally equivalent to long monophthongs" (Benediktsson 1972:163), as they had been since the Proto-Germanic period.

The quantity system at this earliest stage of Old Icelandic was essentially that which it had inherited, i.e. long or short vowels and consonants could occur in all four possible combinations, see Figure 8.

				Monophthong	Diphthong
1)	$\bar{V}\,\bar{C}$	******	******	íss 'ice' gen. sg.	steinn 'stone'
2)	V $\bar{C}$	***	******	menn 'men'	----
3)	$\bar{V}$ C	******	***	ís 'ice'	stein 'stone' acc. sg.
4)	V C	***	***	men 'necklace'	----

Fig. 8. Admissible sequences of short and long segments in Old Icelandic.

Sequences resulting in three different durations existed, if it is assumed that the durations of vowels and consonants were similar. Since it is not the purpose of this paper to discuss Icelandic syllabication, only examples of monosyllables are given.

During the time of what has come to be known as the quantity shift which is dated as occurring in the 15th and 16th centuries (Benediktsson 1959:300), the four possible suprasegmental arrangements were reduced to two, yielding syllables of similar length. The shift can be interpreted as an increase in the scope of the suprasegmental feature quantity. At the pre-quantity shift period, the scope of quantity was the segment, whereas in the post-quantity shift period, its scope was the syllable. The two combinations which were eliminated were those which produced syllables of different lengths, i.e. types 1 ($\bar{V}\bar{C}$) and 4 (VC). These now inadmissible syllable types merged with the two surviving syllable types--2 ($V\bar{C}$) and 3 ($\bar{V}C$). Consonant duration dominated vowel duration in the resultant mergers, producing the realignments shown in Figure 9.

2)	V $\bar{C}$	***	******	íss, menn	steinn
3)	$\bar{V}$ C	******	***	ís, men	stein

Fig. 9. Admissible sequences of short and long segments after the quantity shift.

Vowels which had been long developed short allophones before long consonants, e.g. íss [is:] 'ice' gen. sg. Vowels which had been short now developed long allophones in the environment before a single consonant; e.g. men [mɛ:n] 'necklace'. What is perhaps most crucial is the fact that diphthongal vowel nuclei now developed short allophones, e.g. steinn [steidn] 'stone'. Before the quantity shift diphthongs had been structurally similar to long vowels. After the quantity shift, diphthongs were integrated into the total quantity system and developed short allophones.

5. Phonological analyses

The Icelandic vowel system has been subject to analyses from scholars representing various theoretical positions.[3] Hreinn Benediktsson (1959, 1972) gives a distinctive feature analysis to the Icelandic vowel system from the time of the First Grammatical Treatise to Modern Icelandic. He claims that the hierarchies of the distinctive features were different for the long, long nasal, and short vocalic subsystems. His analysis is supported by the mergers of different qualities of vowels within different subsystems. For the Modern Icelandic system he introduces the feature tense-lax to distinguish the high vowels í and ú from i and u, although he mentions the possibility of considering the distinctive difference between these nuclei to be one of diffuseness, i.e. height, rather than tenseness, since there is a difference of tongue height between these vowels. He notes that tense vowels should have longer duration than corresponding lax ones but states, "exhaustive measurements of the quantity of vowels in Icelandic have not been made" (Benediktsson 1959:302). Benediktsson posits two separate types of nuclei--monophthongs and diphthongs. He accounts for the diphthongization of Old Icelandic long monophthongs, but does not capture the tendency towards monophthongization of short diphthongs or the diphthongization of some of the long monophthongs in Modern Icelandic. He includes í and ú among the monophthongs, an analysis which is supported here.

Haugen (1958) in his phonemic analysis of Modern Icelandic proposes two sets of vowels, one consisting of a simple set of nuclei, the six historically short vowels: i, e, a, ö, o, u--the other a set of complex nuclei. Included in this set of nine complex nuclei are two nuclei which appear in restricted environments and the five falling diphthongs, ei, æ, au, á, ó, as well as the two high vowels, í, ú, analyzed by Haugen as /ij/ and /uw/. The results of this study indicate that the high vowels í, ú, are not complex nuclei but rather have become alligned with a, a simple nucleus. Haugen does not account for the diphthongization of long allophones of the mid-low monophthongs, e, ö, o, in Modern Icelandic.

Anderson (1969) gives an analysis of the Icelandic vowel system in terms of generative phonology. He posits two sets, one tense and one lax, of five underlying qualities, i, e, a, o, u; í, é, á, ó, ú plus two underlying diphthongs, ai, au. Except for the difference in the number of diphthongs and for the tense-lax rather than long-short opposition, this system is identical to the Proto-Nordic vowel system in Figure 6. Anderson proposes to be able to account for the phonetic level of the Modern Icelandic vowel system. However, his phonological rules produce a phonetic realization of í and ú as diphthongs: [ij], [uw]--productions which were not found to be extant in this study. His rules produce a phonetic realization of these segments which are equivalent to those Haugen posits as phonemic. Anderson dismisses quantity as a surface phenomenon in Modern Icelandic. Thus, it is not surprising that his rules do not provide for the diphthongization of the long allophones of e, ö, and o. By translating the quantity opposition of Proto-Nordic into a tense-lax opposition for Modern Icelandic, Anderson misses the "significant generalization" that quantity still exerts considerable influence on the phonetic realization of the Modern Icelandic vowel system.

Steblin-Kamenskij (1960) views the vowel system of Modern Icelandic as an integrated whole based on one feature which he claims cross-cuts the entire system--that of closing versus opening. Evidence supporting his analysis is found in neutralizations which have arisen since the 14th century (Benediktsson 1961:62-87). These neutralizations occur, e.g. in the environment before velar nasal plus stop--the underlying monophthongs are realized phonetically as allophones of the closest phonemic diphthongs or í and ú. In this velar environment, underlying monophthongal a is pronounced as its back-rounded diphthongal counterpart á [ɑ̯ʊ̯]. Steblin-Kamenskij correctly observes that all diphthongs are 'closing', i.e. that the second part of the nuclei rises in height. However, he claims that í and ú are also closing. In addition he claims that all long allophones of phonemic monophthongs are 'opening', i.e. that the second part of the nucleus is lower in height. The results of this study indicate that 'opening' is applicable only to the three mid-low monophthongs, not to the low and mid-high members.

6. Conclusion

I conclude with the observation that the combination of quality and quantity is responsible for the present vowel system of Modern Icelandic. Of primary importance is the role played by the quantity shift through which syllable types emerged which required the development of short diphthongs. Because of the change in the suprasegmental structure, the earlier subsets of long vowels, short vowels, and diphthongs merged into one integrated vowel system.

I hope that this paper shows that the practice of subjecting phonological hypotheses to phonetic analysis can be used to support or eliminate rival theories and optimally produce answers to old questions as well as to produce new hypotheses as a basis for future research.

Footnotes

*This work was supported in part by the National Science Foundation Grant GS-36252. I wish to express my appreciation to Ilse Lehiste, who read an earlier draft of this paper, for her suggestions, and to the personnel of the State Radio Station in Reykjavík, Iceland, as well as to the informant.

I presented a somewhat shorter version of this paper at the 1973 summer meeting of the Linguistic Society of America in Ann Arbor, Michigan.

1. The durations of the plosive gaps of the underlying long voiceless plosives is similar to the durations of the plosive gaps of the underlying short voiceless plosives. For the four pairs given in Table 2A the differences of plosive gap durations range from 5 ms. to 25 ms., which is below the difference limen for reference durations of 150 ms. to 200 ms. This relationship is similar to that found in an earlier study (Garnes 1972).

2. Some phonemically long nasals and liquids are in fact realized phonetically as plosive plus nasal or liquid, e.g. brúnn 'brown' mas. nom. sg. is transcribed phonetically as [brud·n] (Einarsson 1949), whereas menn 'men' nom., acc. pl. of maður 'man' is [mɛn:]. Since the purpose of this paper is to explore vocalic relationships, not to present data on consonant dissimilations, only the two consonant categories voiceless plosive and non-plosive are used.

3. In addition to the treatments mentioned here Kemp Malone (1923, 1952, 1953) contributed to the subject. Analyses of parts of the Icelandic vowel system have been proposed recently by Henning Andersen (1972), Patricia Miller (1973), David Stampe (1972), and Theo Vennemann (1972).

4. An explanation is proposed for the opposite movements of the first formants of /e, ö/ and /o/ versus /ei, æ, au, á/ and /ó/ on the basis of avoidance of merger in my forthcoming dissertation.

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Interaction Between Test Word Duration and Length of Utterance

Ilse Lehiste

The present paper is part of a general study of speech prosody in which I have been engaged for a number of years.[1] The study concerns itself primarily with durational aspects of spoken English. The specific topic discussed below is the interaction between test word duration and length of utterance.

It has been found that in Swedish and Dutch, the duration of a syllable nucleus decreases as the number of syllables which remain to be produced in the word at the beginning of the syllable concerned increases.[2] Lindblom and Rapp, analyzing nonsense words uttered in isolation by speakers of Swedish, found that the durations of stressed long vowels ranged from about 350 milliseconds in monosyllables to about 200 msec when three syllables followed. Analyzing nonsense words spoken in isolation by Dutch informants, Nooteboom observed durations of long vowels ranging from more than 200 msec in monosyllables to about 100 msec in the first syllable of words with four syllables. The question naturally arises whether the phenomenon is restricted to word level, or whether the principle might apply at the level of sentences. A further question that seems worthy of exploration is the question whether the results might conceivably be different if semantically acceptable words are used instead of nonsense words. Partial answers to both questions are presented in this paper.

Four sets of test words were used in the study. Two of the sets were similar to those used by Lindblom and Nooteboom. These lists consisted of monosyllabic, disyllabic and trisyllabic words made up of the syllables big and bag in one list and bick and back in the other list. All possible stress placements were represented. The lists contained 34 words each. The third list contained 34 English words, selected to match the described nonsense words with regard to syllable length and stress placement. The fourth list (subdivided into 4a and 4b) contained ten words in which the unstressed syllable be was combined with the stressed syllables big and bag in disyllabic and trisyllabic words, and ten similar words in which the unstressed syllable be was combined with the stressed syllables bick and back. List four thus comprised 20 words; all four lists together contained 122 words.

These test words were placed in three frames: a short frame, "Say ... instead", and two long frames, in which the test word appeared either near the beginning of the utterance or near its end. The first long frame was "Sometimes it's useful to say the word ... instead". The second long frame was "The word ... is sometimes a useful example".

In the short frame and the first long frame, the test words were followed only by the disyllabic word "instead"; the words were thus at an equal distance from the end of the utterance. However, in the short frame they were preceded by one syllable, and in the long frame by nine syllables. In the second long frame, the test words were preceded by two syllables and followed by nine syllables.

The lists of words were read by three informants in the three given frames. Each informant produced 366 utterances, for a total of 1098 utterances. The informants were graduate students familiar with recording equipment and used to a laboratory environment. The records were made in an anechoic chamber, processed through a Frøkjaer-Jensen trans-pitch meter and intensity meter, and displayed on a Mingograf operated at a speed of 10 centimeters per second. Measurements were made from Mingograms using generally known techniques. The duplex oscillograms produced by the experimental setup served as the principal basis for segmentation.

Since the main concern of the present study is the interaction between word duration and length of utterance, the duration of syllable nuclei within the different syllables of the test words will not be treated in this context. The basic units will be frames and word lists. Average word durations will be reported for each list; it should be kept in mind that words of one, two and three syllables have been averaged together within each list, and the average word duration for a given list is thus a somewhat abstract concept.

Tables 1, 2 and 3 present the average durations of the test words in the four lists as a function of the length of the frame.

TABLE 1

Average durations, in milliseconds, of test words produced in three frames by speaker SG.

	List 1 Words	List 2 bigbag	List 3 bickback	List 4a bebig	List 4b bebick
Frame 1: Sometimes it's useful to say the word ... instead	541	656	663	567	558
Frame 2: The word ... is sometimes a useful example	551	668	701	563	528
Frame 3: Say ... instead	586	755	761	607	601

TABLE 2

Average durations, in milliseconds, of test words produced in three frames by speaker LS

	List 1 Words	List 2 bigbag	List 3 bickback	List 4a bebig	List 4b bebick
Frame 1: Sometimes it's useful to say the word ... instead	546	575	584	477	470
Frame 2: The word ... is sometimes a useful example	537	565	571	463	496
Frame 3: Say ... instead	562	658	615	534	532

TABLE 3

Average durations, in milliseconds, of test words produced in three frames by speaker PM

	List 1 Words	List 2 bigbag	List 3 bickback	List 4a bebig	List 4b bebick
Frame 1: Sometimes it's useful to say the word ... instead	567	771	770	612	596
Frame 2: The word ... is sometimes a useful example	599	862	806	624	614
Frame 3: Say ... instead	539	842	831	663	639

Figure 1 summarizes the information for the three speakers. In the tables, List 4 is separated into 4a (containing stressed syllables with voiced final plosives) and 4b (containing stressed syllables with voiceless final plosives). A representative disyllabic word is given at the top of each column to illustrate the word types contained in each list.

A general observation may be made concerning the data for all three speakers: test words tend to be longest in the frame "Say ... instead". For speakers SG and LS, this is the case for all lists; for speaker PM, the test words are longest in the frame "Say ... instead"

in two out of four instances. In this frame as well as in the frame "Sometimes it's useful to say the word ... instead", the test words were followed by the same word, "instead". If the duration of the words depends on the number of syllables that remain to be produced in the utterance, test words should have the same duration in both frames. However, with only one exception (out of 12 instances), test words were found to be longer in the frame "Say ... instead". It seems obvious that the number of syllables remaining to be produced in the utterance does not fully determine the duration of the test words.

The frame "The word ... is sometimes a useful example" places the test words in a position in which nine syllables remain to be produced in the utterance. If the hypothesis to be tested holds, the test words should be shortest in this frame. This is true in one case out of four for speaker SG and in no instances for speaker PM. Only speaker LS has three cases out of four in which the test words are shortest in the frame in which the largest number of syllables follow the test word.

Individual variations are leveled off when all four lists and all three speakers are averaged together. Figure 1 shows the results graphically. The average durations, in milliseconds, are given inside the bars reproduced on the figure. The overall average duration of the test words was greatest in the frame "Say ... instead", noticeably smaller in the frame "The word ... is sometimes a useful example", and slightly smaller still in the frame "Sometimes it's useful to say the word ... instead". This result appears somewhat paradoxical: if the hypothesis would hold, we would expect the words to have the same duration when only the word "instead" follows, and we would expect the words to be shortest in the frame in which nine syllables follow rather than two. Clearly the results cannot be explained in terms of the number of syllables that remain to be produced in the utterance.

The apparent paradox can be solved by looking at the duration of complete utterances. Tables 4, 5, and 6 present average durations of the frame as a function of test word type and list for each of the three speakers; Figure 2 summarizes the information for all three speakers and four lists.

TABLE 4

Average durations, in milliseconds, of test words and frames in utterances produced by speaker SG

Frame and list	Duration of preceding part	Duration of word	Duration of following part	Total duration
Frame 1: Sometimes it's useful to say the word ... instead				
Words	1482	541	580	2603
bigbag	1470	656	509	2636
bickback	1460	663	506	2628
bebig	1467	567	559	2592
bebick	1478	558	540	2576
Overall average	1471	597	539	2607
Frame 2: The word ... is sometimes a useful example				
Words	233	551	1564	2348
bigbag	247	668	1545	2460
bickback	248	701	1566	2515
bebig	245	563	1598	2406
bebick	249	528	1603	2380
Overall average	244	602	1575	2421
Frame 3: Say ... instead				
Words	191	586	601	1379
bigbag	177	755	567	1499
bickback	197	761	606	1564
bebig	197	607	648	1452
bebick	197	601	611	1409
Overall average	192	662	607	1461

TABLE 5

Average duration, in milliseconds, of test words and frames in utterances produced by speaker LS.

Frame and list	Duration of preceding part	Duration of word	Duration of following part	Total duration
Frame 1: Sometimes it's useful to say the word ... instead				
Words	1629	546	574	2750
bigbag	1576	575	549	2701
bickback	1578	584	534	2696
bebig	1566	477	558	2600
bebick	1572	470	540	2582
Overall average	1584	531	551	2666
Frame 2: The word ... is sometimes a useful example				
Words	268	537	1588	2393
bigbag	253	565	1540	2358
bickback	223	571	1504	2298
bebig	239	463	1546	2248
bebick	238	496	1528	2262
Overall average	244	526	1541	2311
Frame 3: Say ... instead				
Words	216	562	603	1381
bigbag	204	658	601	1463
bickback	170	615	576	1361
bebig	183	534	623	1340
bebick	166	532	594	1292
Overall average	188	580	599	1367

TABLE 6

Average durations, in milliseconds, of test words and frames in utterances produced by speaker PM

Frame and list	Duration of preceding part	Duration of word	Duration of following part	Total duration
Frame 1: Sometimes it's useful to say the word ... instead				
Words	1760	567	529	2856
bigbag	1612	771	506	2889
bickback	1619	770	486	2875
bebig	1638	612	498	2748
bebick	1608	596	478	2682
Overall average	1647	663	499	2809
Frame 2: The word ... is sometimes a useful example				
Words	277	599	1647	2523
bigbag	301	862	1664	2827
bickback	298	806	1666	2770
bebig	312	624	1677	2613
bebick	298	614	1674	2586
Overall average	297	701	1665	2663
Frame 3: Say ... instead				
Words	181	539	549	1269
bigbag	194	842	525	1561
bickback	185	831	503	1519
bebig	175	663	544	1382
bebick	164	639	548	1351
Overall average	180	703	534	1417

For all three speakers, the duration of the whole utterance (comprising the test word and the frame) was shortest for "Say ... instead", followed by "The word ... is sometimes a useful example". When the word durations are averaged over the different lists, the duration of the words is inversely correlated with the length of the total utterance, so that the test words appear longest in the shortest utterance ("Say ... instead") and shortest in the longest utterance ("Sometimes it's useful to say the word ... instead"). This observation is supported by the fact that the duration of the word "instead" is likewise inversely correlated with the length of the utterance: in the short utterance, the duration of "instead" is greater by approximately 50 milliseconds, which is a difference of the same order of magnitude as was found for the test words.

The results of the study thus indicate that the duration of test words depends on total duration of the utterance rather than on the position of the test word within the utterance. A number of other conclusions may be drawn from these results.

I have often heard the comment that test words produced in a frame are really treated by the speakers as if they were produced in isolation, and that the use of frame sentences to simulate real utterances is at best a self-deception. I would have been convinced of that if the duration of the test words would have turned out to be completely independent of the duration of the frames in which the test words were embedded. The way the duration of the test words seems to interact with the duration of the frames shows clearly that the speakers integrate the test words into the utterance at the level at which the time program for the whole sentence is generated.

The test word lists used in this study contained both real English words and words made up of nonsense syllables. As far as interaction with the duration of the frames is concerned, there was no difference in the treatment of real words and nonsense words; both were integrated with the frame in the same way. Thus the study has also produced some evidence that at least for the investigation of the durational aspects of speech, the use of frame sentences and nonsense words may be considered justified.

Footnotes

1. The study has been supported by the National Science Foundation under Grant GS-31494 #2. A preliminary version of this paper was presented at the 86th meeting of the Acoustical Society of America on October 30, 1973, at Los Angeles.

2. B. Lindblom and K. Rapp, "Reexamining the compensatory adjustment of vowel duration in Swedish words." University of Essex Occasional Papers 13 (Colchester, 1972), pp. 204-224.

3. S. G. Nooteboom, Production and Perception of Vowel Duration: A Study of Durational Properties of Vowels in Dutch. Utrecht, 1972.

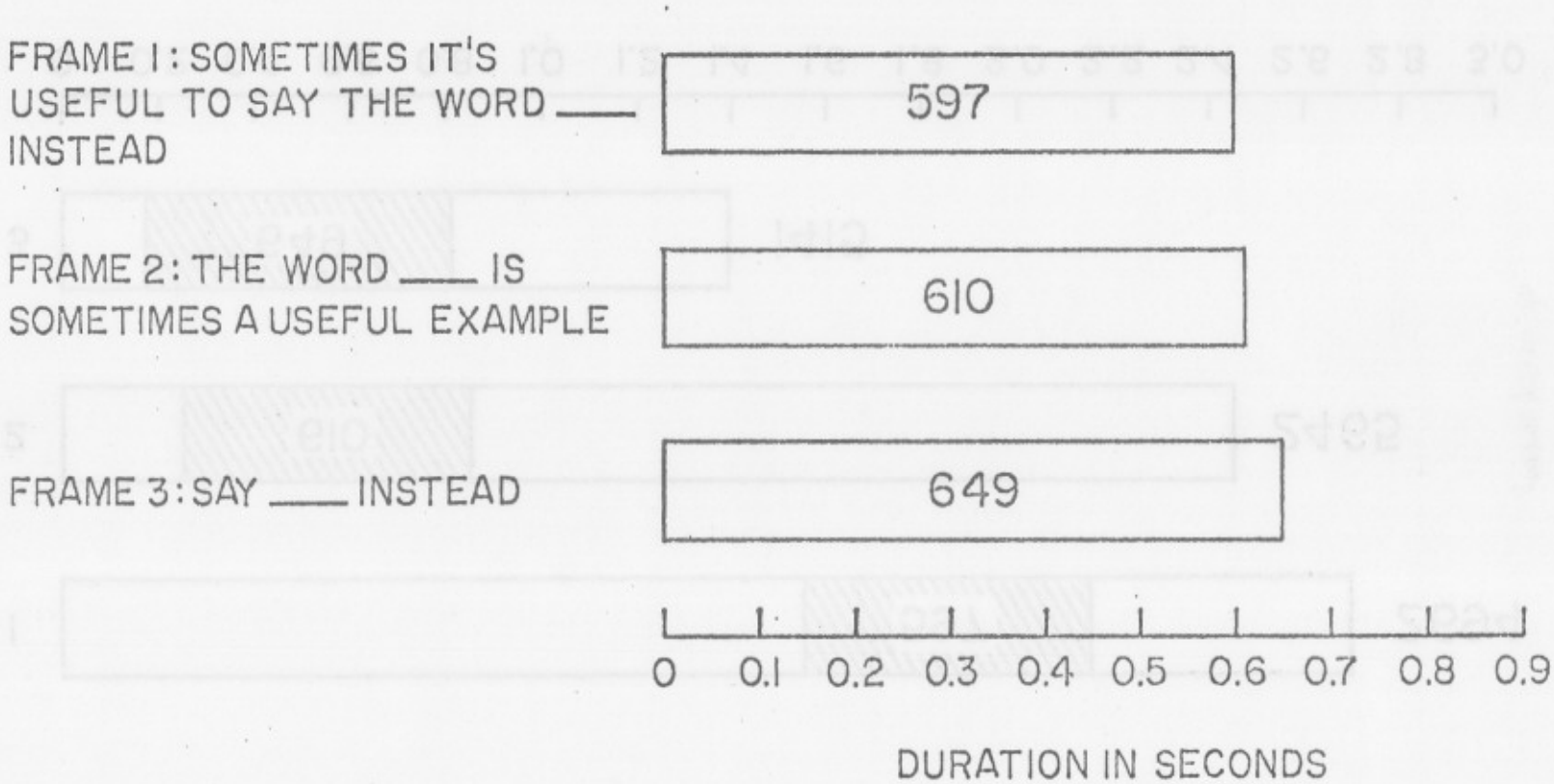

Fig. 1. Average duration of test words in different frames, averaged for three speakers.

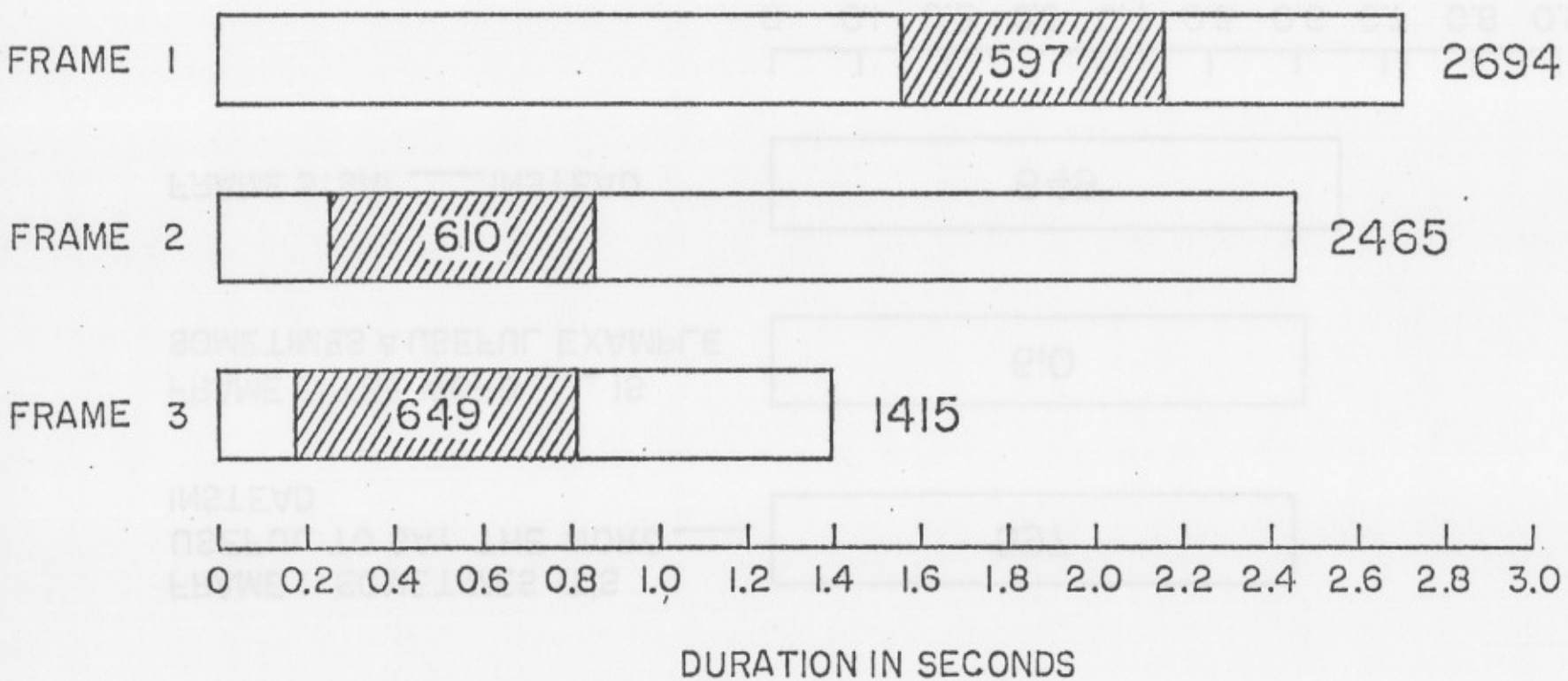

Fig. 2. Average duration of test utterances, averaged for three speakers.

OSU WPL 17.170-179 (1974).

Variability in the Production of Suprasegmental Patterns

Ilse Lehiste

This paper is an exploratory study of variability in the production of suprasegmental patterns. It has been observed before that in repeated productions of test words containing sounds whose duration is linguistically contrastive, native speakers are capable of great regularity in producing these repetitions. In one such study, Nooteboom (1972) observed regularities both in the production of spoken utterances and in adjusting the durations of synthetic segments to match an internal standard. His speakers produced Dutch nonsense words with long and short vowels, achieving standard deviations ranging from 2.3 to 9 msec. In adjusting the durations of synthetic vowels to produce words with phonemically long and short vowels, Nooteboom's subjects showed similar accuracy: standard deviations ranged from 1.7 msec for short vowels and 4 msec for long vowels (for the best subject) to 7 msec for short vowels and 9 msec for long vowels.

In Nooteboom's studies, it was the vowel whose duration was contrastive. In the present study, I investigated disyllabic Estonian words in which either the duration of the first vowel or the duration of the intervocalic consonant was contrastive, as well as words in which the duration of the first vowel co-varies with that of the intervocalic consonant. The question is then to what extent the fact that both the durations of the vowel and the consonant are contrastive may influence their variability. A second question introduced in this study concerns the importance of nativeness in the extent of variability.

In an earlier study (Lehiste, Morton and Tatham, 1973) we had investigated the production of intervocalic consonants in Estonian words like taba- tapa - tappa by one native and one non-native speaker. The study revealed that, as far as may be generalized from a single speaker, native speakers produce intervocalic consonants with syllabification patterns that differ from those by non-native speakers. Syllabification patterns are intimately involved in the production of contrastive quantity in intervocalic consonants: the difference between short and long geminates depends on the placement of the syllable boundary. It might be expected, then, that it is relatively more difficult for non-native speakers to produce contrasts in the duration of intervocalic consonants than in vowels. One might thus expect that, first of all, the productions of non-native speakers will show greater variability than those of native speakers, and further, that the difference in variability will be greatest in the production of intervocalic short and long geminates.

The present study addresses itself to both questions. A set of seven Estonian words constitutes the test materials. The quantity structure of the seven words is shown in Figure 1. The words included in the set are listed and glossed below the figure.

Duration of consonant	Duration of vowel		
	1	2	3
1	kodi	koodi (2)	koodi (3)
2	koti	gooti	
3	kotti		kooti

kodi - 2. sg. imperative of the verb kodima 'to roam around'
koodi (2) - gen. sg. of the (loan) word kood 'code'.
koodi (3) - part. sg. of the (loan) word kood 'code'
koti - gen. sg. of the noun kott 'sack'
kotti - part. sg. of the noun kott 'sack'
gooti - uninflected adjective, 'Gothic' (loanword)
kooti - part. sg. of the noun koot 'flail'

Fig. 1. Quantity structure of seven Estonian words.

While three words included in the set are loanwords, all are completely integrated into the phonological system. The word gooti is pronounced with an initial voiceless plosive.

Phonemically, the seven words consist of the same segmental sounds: /k/, /o/, /t/, and /i/. They differ in the quantity of the vowel /o/ and the intervocalic consonant /t/. In the set kodi - koodi (2) - koodi (3), the intervocalic consonant remains in quantity 1 (short), while the vowel /o/ changes from quantity 1 in kodi to quantity 2 (long) in koodi (gen.) to quantity 3 (overlong) in koodi (part.). In the kodi-koti-kotti set, the vowel /o/ remains in quantity 1, while the intervocalic consonant varies from quantity 1 in kodi to quantity 2 in koti and quantity 3 in kotti. In the kodi - gooti - kooti set, both the vowel /o/ and the intervocalic consonant vary from quantity 1 in kodi to quantity 2 in gooti and quantity 3 in kooti. As the figure shows, two combinations are not represented; quantity 2 does not combine with quantity 3 in either direction.

The words were produced by two speakers, one native (IL), the other non-native (LS). LS had been a student of IL for several years; her pronunciation of Estonian appeared to IL (and to several other native speakers) quite acceptable in isolated repetitions and adequate in longer spontaneous utterances. All the systematic instruction LS had received in Estonian had been given by IL, so from the very beginning the pronunciation of IL had served as a model for LS. Both speakers produced about 10-12 tokens of each word. IL read the words

from a list, repeating each word about ten times before going on to the next word. The words were read in the order kodi - gooti - kooti - koodi (2) - koodi (3) - koti - kotti. LS followed the same procedure; she made the recording by herself, without having heard IL's productions. The recordings were made in an anechoic chamber at the Linguistic Research Laboratory of the Ohio State University, using high-quality equipment.

The tapes were processed through a Frøkjaer-Jensen trans-pitch meter and intensity meter and displayed on a Mingograf operated at a speed of 10 cm/sec. Duration measurements were made using generally known techniques. The duplex oscillogram produced by the experimental setup served as the primary basis for segmentation.

Table 1 shows average durations and standard deviations of segments in this set of seven Estonian words, produced by the two speakers.

TABLE 1

Average durations and standard deviations of segments in a set of seven Estonian words, produced by two informants (N = 10); durations in milliseconds.

Word	Speaker IL					
	/o/		/t/		/i/	
	Dur.	SD	Dur.	SD	Dur.	SD
kodi	167.2	10.1	83.2	5.5	228.5	19.4
koodi (2)	253.5	14.3	73.2	6.1	192.0	16.4
koodi (3)	330.7	15.1	82.9	7.8	167.6	19.0
koti	161.3	7.6	211.5	15.8	214.2	19.2
kotti	151.8	4.5	475.0	29.3	172.9	13.3
gooti	205.7	12.2	177.7	10.1	188.6	29.4
kooti	225.9	13.3	298.9	30.8	172.7	25.4
	Speaker LS					
kodi	104.8	26.2	55.5	8.3	250.8	16.6
koodi (2)	176.2	19.3	78.8	12.1	204.9	20.2
koodi (3)	318.5	21.5	83.0	5.3	116.7	17.1
koti	105.8	14.7	229.0	21.1	290.2	16.3
kotti	120.1	13.7	342.4	43.5	239.3	21.4
gooti	246.9	23.0	152.3	35.3	183.9	22.7
kooti	322.7	22.8	228.2	70.4	151.7	21.9

Table 2 gives the overall word length for the two speakers.

TABLE 2

Average overall word length in a set of seven Estonian words produced by two informants (N = 10). Values in milliseconds.

Word	Speaker IL	Speaker LS
kodi	478.9	411.1
koodi (2)	518.7	459.9
koodi (3)	581.2	518.2
koti	587.0	625.0
kotti	799.7	701.8
gooti	572.0	583.1
kooti	697.5	702.6

Figure 2 is a graphic representation of the average durations of segments, showing at the same time the average durations of the seven test words. A casual inspection of the figure leaves the impression that the two speakers were producing essentially the same patterns.

Figures 3, 4, and 5 show graphically the differences in standard deviations between the two speakers. Figure 3 (p. 173) displays the words in which the vowel duration was contrastive. It appears that IL (the native speaker) had somewhat smaller variability in the duration of the first vowel and occasionally greater variability in the duration of the second vowel; the variability in the duration of the intervocalic consonant was about equal for the two speakers. Figure 4 (p. 174 shows again less variability for the native speaker in the two contrastive segments--the vowel of the first syllable and the intervocalic consonant, while the duration of the second vowel shows less variability for the non-native speaker. It is in the productions of vords from the third set, shown on Figure 5 (p. 175), that the difference in variability between the two speakers becomes really apparent. The native speaker has considerably less variability in the duration of the first vowel and the intervocalic consonant, while the non-native speaker has less variability in the final vowel in all three words.

Both starting hypotheses appear to be confirmed: the native speaker shows less variability in the production of phonemically contrastive durations than the non-native speaker, and it is in the production of intervocalic geminate consonants (/t/ in quantities 2 and 3) where the difference between native and non-native variability is greatest.

The absolute values of the standard deviations vary with the length of the contrastive segment. For a comparison with the Dutch data, it might be pointed out that the standard deviation for the native speaker (IL) in the production of short vowels was between 4.5 msec in kotti and 10.1 msec in kodi. For the long and overlong vowels, the standard deviations were greater, ranging from 12.2 msec in gooti to 15.1 msec in koodi (3). A better measure of variability might be provided by the use of a statistic called relative variance, which for this paper

is defined as s^2/m (variance divided by the mean) (Allen, 1973). Table 3 gives the relative variance for the segments /o/, /t/ and /i/ in the productions of the seven words by the two informants.

TABLE 3

Relative variances ($\frac{s^2}{M}$) of segments in a set of seven Estonian words, produced by two informants (N = 10). Values in $msec^2/msec$.

Word	Speaker IL			Speaker LS		
	/o/	/t/	/i/	/o/	/t/	/i/
kodi	.605	.363	1.656	6.568	1.230	1.099
koodi (2)	.811	.516	1.394	2.104	1.873	1.999
koodi (3)	.688	.732	2.164	1.450	.344	2.499
koti	.360	1.174	1.716	2.027	1.940	.911
kotti	.135	1.801	1.018	1.555	5.511	1.916
gooti	.721	.571	4.570	2.144	8.203	2.795
kooti	.788	3.177	3.742	1.606	21.714	3.158

The variability in the duration of vowels and consonants with different degrees of quantity appears less great when mean durations of the segments are taken into account. However, the use of relative variance helps bring out additional differences between the speakers. In the productions of IL, greatest variability both in absolute and relative terms was observed in the duration of the final vowel, which is not independently contrastive in Estonian. In the productions of the non-native speaker (LS), the variability in the intervocalic geminates is particularly prominent, while variability in the productions of the non-contrastive final vowel is in fact smaller than in productions by the native speaker. Table 4 shows the differences in relative variances of productions of segments by the two speakers.

TABLE 4

Relative variance ($\frac{s^2}{M}$) differences between productions of segments in a set of seven Estonian words produced by two informants (LS - IL). Values in $msec^2/msec$.

Word	/o/	/t/	/i/
kodi	5.963	.867	-.557
koodi (2)	1.293	1.357	.605
koodi (3)	.762	-.388	.335
koti	1.667	.766	-.805
kotti	1.420	3.710	.898
gooti	1.423	7.632	-1.775
kooti	.818	18.537	-.584

The values in the table represent the result of subtracting the relative variances of IL's productions from those of LS. Negative values indicate instances in which IL had greater variability than LS. If the values presented in Table 4 can be considered indices of nativeness, then it is indeed true that the productions of the non-native speaker differ from those of the native speaker mainly in the production of intervocalic geminate consonants. A further point emerges from this table: the relatively great variability of /o/ in the word kodi, produced by LS. The difference in relative variances is here noticeably greater than the difference in standard deviations. Control of the duration of the vowel in a short open syllable is evidently much more difficult to achieve for a non-native speaker than, for example, control of an overlong vowel. This may be attributed to the influence of English, which constitutes the substratum for LS. In English, there are no stressed open syllables ending in a short vowel.

It should be emphasized that the two subjects do not appear to differ in phonetic ability, which is indicated by the fact that speaker LS produced her final vowels with considerably less variability than IL. I believe this difference to be due to the fact that for IL, the duration of /i/ is not an independent variable and therefore not under the same kind of control as the durations of /o/ and /t/. For LS, it may well be that all three durations are subject to the same kind of control. This may be deduced from the fact that in her productions, the variability of all three segments is of the same order of magnitude. The difference between the two speakers is due to a more precise control of the durations of contrastive segments by the native speaker.

It was hypothesized at the beginning of this paper that a difference between native and non-native speakers might appear in the variability with which they produce repeated utterances containing segments whose duration is linguistically contrastive. It was hypothesized further that for Estonian, special difficulties might arise for non-native speakers in the production of intervocalic geminate consonants, and that these difficulties might be reflected in increased variability. Both hypotheses were confirmed. It is hoped that the results of this exploratory study may be validated by analyzing the speech of a considerably larger number of informants. More generally, the present study might serve as a basis for future investigation of suprasegmental foreign accents.

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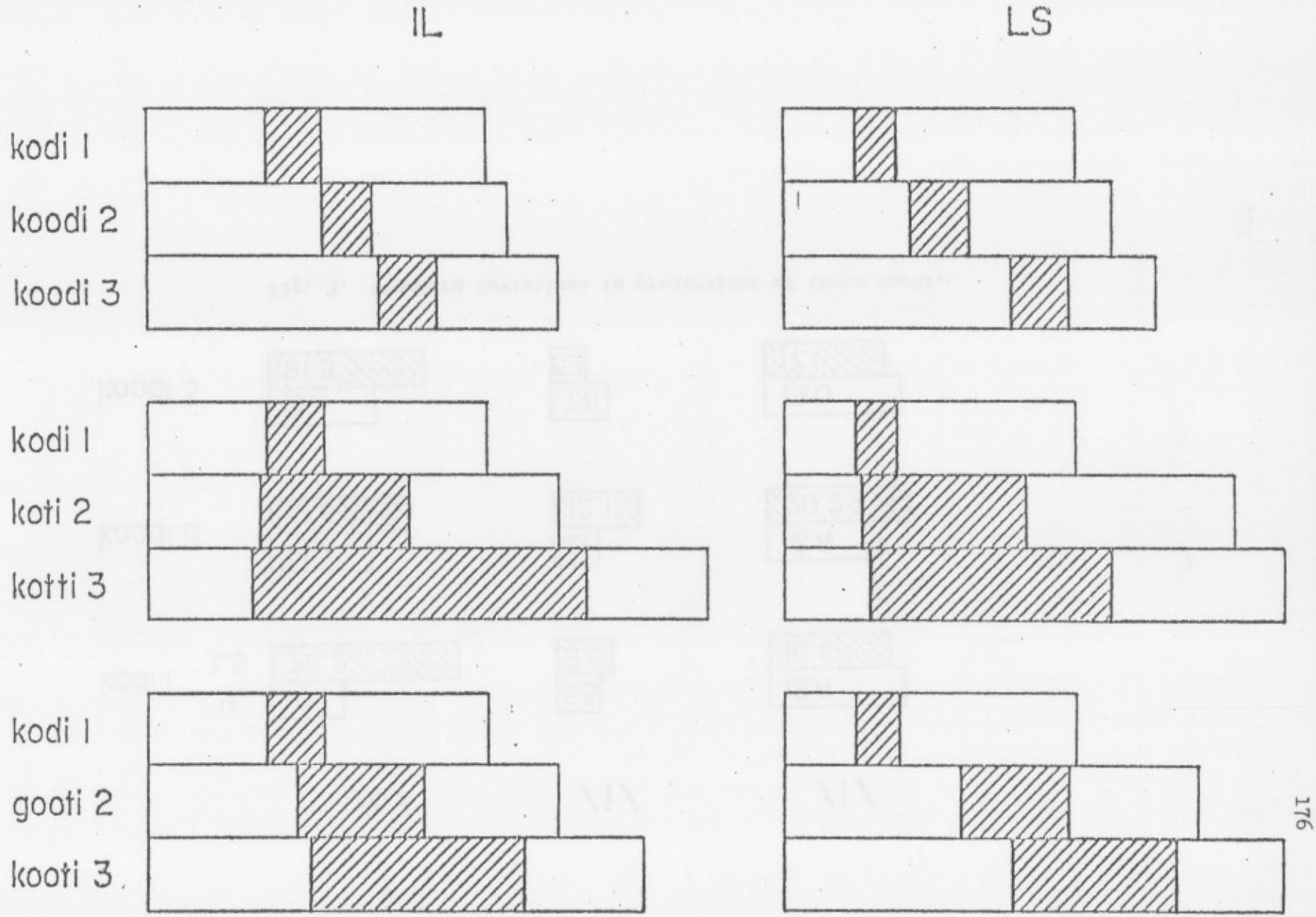

Fig. 2. Average durations of segments in seven Estonian words.

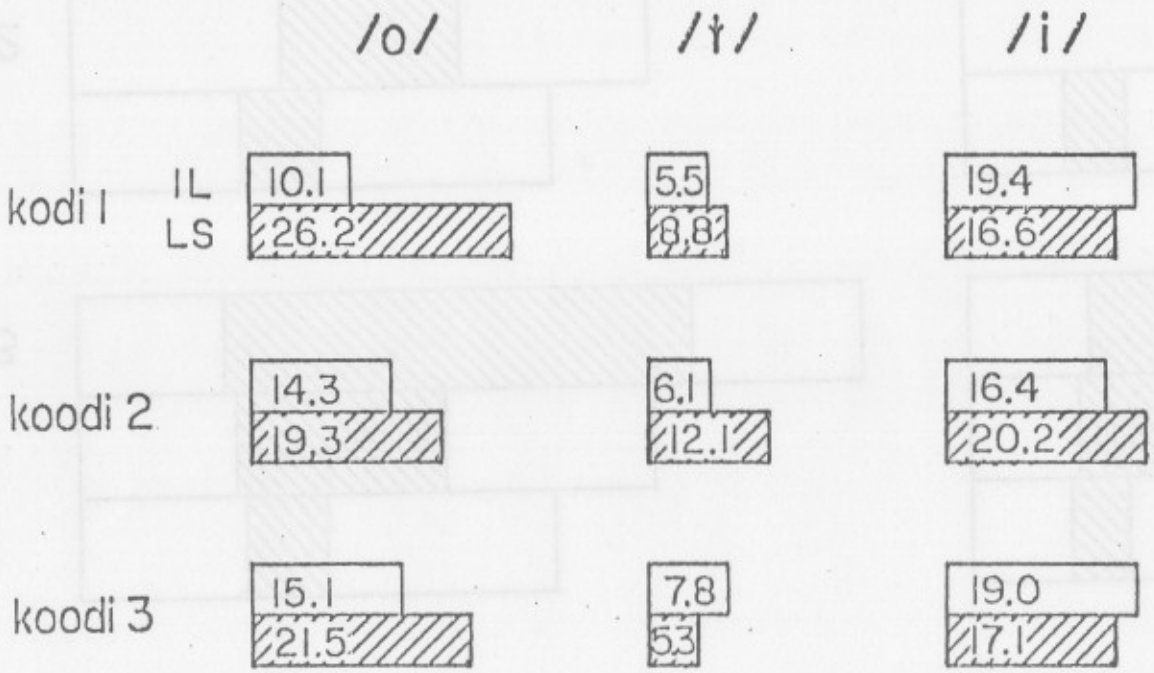

Fig. 3. Standard deviations in productions of three words.

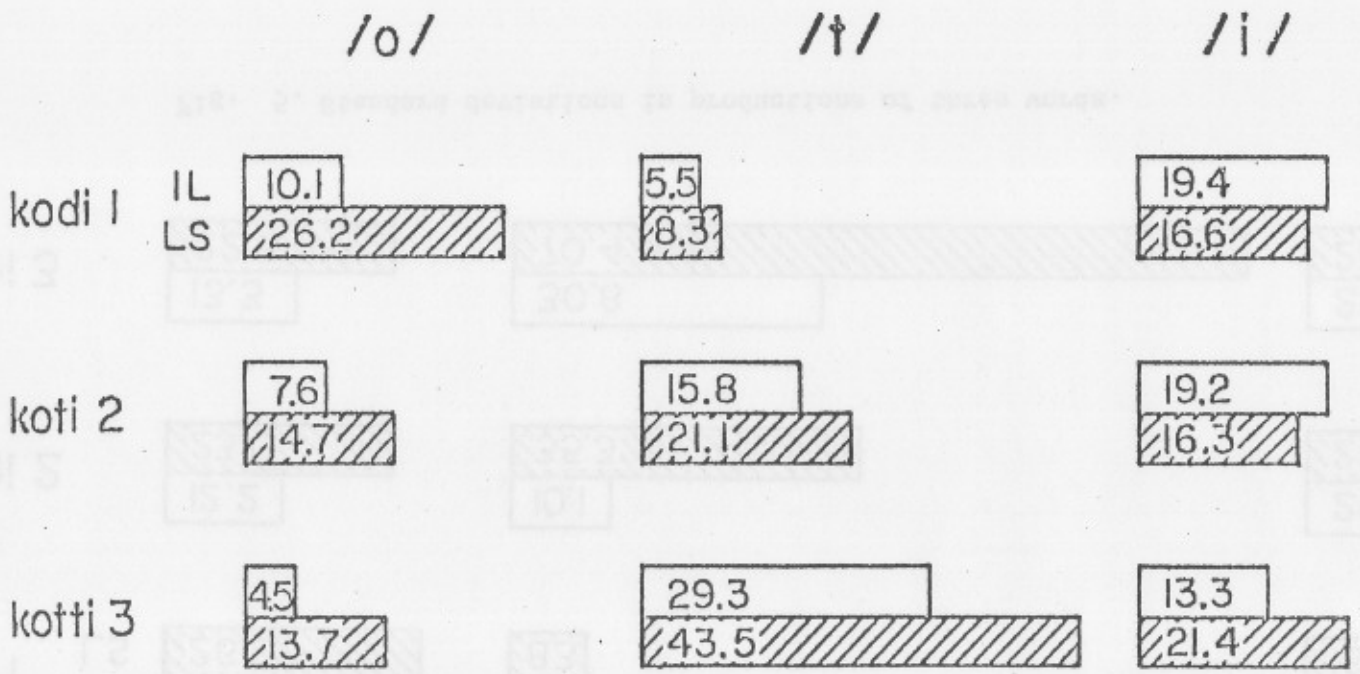

Fig. 4. Standard deviations in productions of three words.

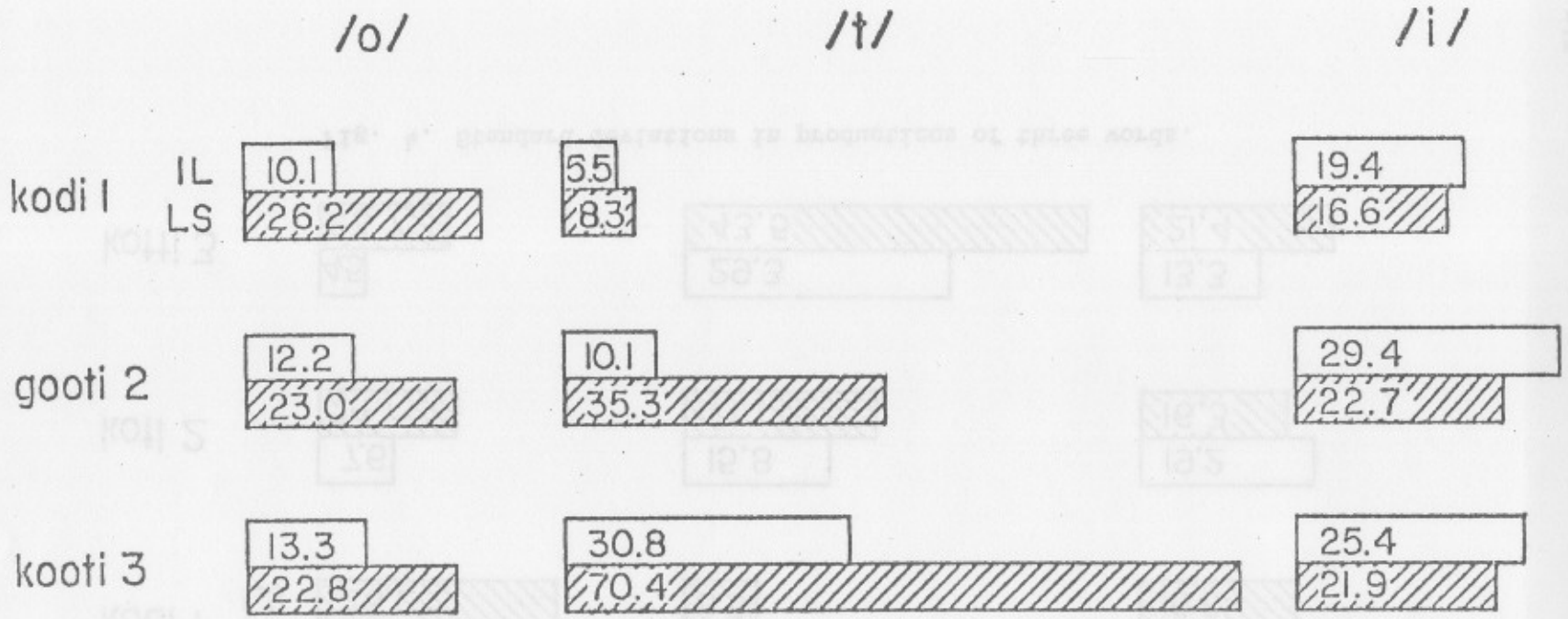

Fig. 5. Standard deviations in productions of three words.

OSU WPL 17.180-197 (1974).

On the Writer/Rider Distinction:

A Brief Experimental Study*

Patricia Donegan Miller

A standard example of the ordering of phonological rules relates vowel lengthening, or a related diphthong quality change, to voicing of intervocalic t. These processes can be formulated roughly as:

(1) vowels become lengthened before voiced segments, and
(2) t, d → ɾ intervocalically after main stress.

The relationship between these two processes was first noted (as far as I am aware) in an article by Martin Joos (1942), "A phonological dilemma in Canadian English". Joos discussed two dialects which "divide into two groups according to their pronunciation of words like typewriter. Group A says [tɐIpɹɐIdɚ] while Group B says [tɐIpraIdɚ]...Group A distinguishes writer from rider, clouting from clouding, by the choice of diphthong alone...Group B has shifted the articulation of all vowels alike before the new /d/ from earlier /t/...from write to writer there is both the phonemic alternation from /t/ to /d/, and the phonetic alternation from [ɐI] to [aI]" (143).

Halle (1962) quoted Joos' article as data and interpreted the distinction as a difference in rule ordering: in dialect A, the vowel change rule precedes the voicing of the intervocalic consonant; in dialect B, the vowel change follows the consonant voicing rule. Chomsky (1962) uses a similar example of ordering in which the vowel difference is one of length rather than quality. He gives the forms (90):

decide	[dɪ̄sa·yd]
decided	[dɪ̄sa·yDɨd]
delight	[dɪ̄layt]
delighted	[dɪ̄layDɨd]

and the rules:

a → a· in the context: __ (Glide) Voiced
[t, d] → D in the context: Stressed vowel __ Unstressed vocalic.

In Chomsky's example the rules apply in the order given. Chomsky does not discuss the alternative merging order, since it is not the ordering of rules which is at issue in this article, but rather the nonlinear relation between the phonemic (/ayd/ vs. /ayt/) and the

phonetic ([a·yD] vs. [ayD]) levels.

The example appears again in The Sound Pattern of English, where Chomsky and Halle (1968) cite Joos and give the rules (342):

Diphthong Laxing - ay → ʌy / __ [-voice]

and

t-voicing - t → [+voice] / V __ V,

noting that dialects differ by the ordering of the two.

Sanford Schane also refers to this ordering difference in Generative Phonology (1972:85-6), giving two rules "found in English":

$$V \rightarrow [+long] \; / \; \_\_ \; [^{C}_{+voiced}]$$

$$\begin{matrix} t \\ d \end{matrix} \rightarrow D \; / \; V \; \_\_ \; [^{V}_{-stress}]$$

Schane gives write/ride, and writer/rider as his examples.

The writer/rider distinction is also referred to in an exchange between Chomsky and Halle and Fred W. Householder in Journal of Linguistics (1965). Here, the question of whether the distinction is one of quality or length is mentioned. Joos had spoken only of a quality difference (aI vs. ɐI); other writers have regarded the difference as one of length (a·y vs. ay). As Chomsky and Halle note here (133, no. 3), both distinctions have been reported by Kurath and McDavid (1961, maps 26-7). Kurath and McDavid's distinction between "fast" and "slow" diphthongs depends on the duration of the initial element, but this difference may result in a quality difference. They note that slow diphthongs predominate before voiced consonants in most of the South and South Midland (109-10):

> ...we find more or less marked positional allophones before voiceless and voiced consonants, as in twice vs. five: [aɨ] ~ [a·ɛ] in West Virginia, [əɨ] ~ [a·ɛ] in Virginia, [aɨ] ~ [a·ə, a·ɛ] in most of South Carolina and Georgia, and [ɐɨ ~ ɑ·ɨ] in coastal South Carolina and along the coast of Georgia and Florida.

Because this particular dialect difference has been cited so frequently in duscussions of rule ordering, a topic of general theoretical interest, this experiment was designed to determine whether or not speakers actually do produce and perceive a linguistically significant difference in vowel length or quality in pairs like writer and rider, as Joos and others have claimed.

Experiment Design

The design of the experiment was as follows. Two informants were selected: one, RW, maintained that he did not have the distinction in question--that for him, pairs like writer/rider, or latter/ladder, were homophonous; the other, AMZ, maintained that he did produce and hear the distinction, at least at certain rates of speech, or in certain styles.

Three minimal pairs were selected: writer/rider (the "classic" example, with a diphthongal stressed vowel and merging intervocalic consonants), latter/ladder (a pair with a non-diphthongal stressed vowel and merging intervocalic consonants), and rapid/rabid (a control pair, in which the consonant voicing distinction is not neutralized).

In order to determine if the distinction occurred in running speech (as opposed to minimal pairs or word-list reading), six sentences were constructed, each using one of the six forms. The sentences were of approximately equal length and were constructed so that the members of each minimal pair appeared in metrically similar environments and did not appear at the ends of the sentences. Three dummy sentences were added to the list in first, last, and middle position to avoid irregularities caused by the positions of the sentences in the list.

The informants, without being informed of the purpose of the experiment, were asked to read the nine sentences "in an ordinary voice, at normal speed". The sentences were recorded in an anechoic chamber, on a Tandberg tape recorder, at 7 1/2 ips. Each informant read the sentences twice.

The six forms to be tested (twelve tokens for each speaker--24 in all) were then extracted from the tape and spliced into blank tape at five-second intervals. The order of the forms was randomized for each speaker, except that no two members of a minimal pair were allowed to appear consecutively. This tape was then duplicated, re-randomized for each speaker, and added to the original tape so that two instances of each production appeared on the finished tape. Thus, 48 forms appeared on the tape (12 tokens for each of two speakers, each token played twice). Two dummy forms were added so that the respondents could get started (these responses were discarded), making 50 required responses. Directions for responding were recorded at the beginning of the tape.

An answer sheet was constructed. Directions identical to those on the tape appeared at the top, and fifty numbered minimal pairs followed. The respondents were instructed to mark the member of the minimal pair that they heard for each utterance on the tape, choosing one member of each pair for each utterance even if they had to guess. A data sheet was attached to each answer sheet requesting the respondent's name, native language, place of birth, home city before starting school, and cities of elementary, junior high, and high schools.

There were two groups of respondents: one consisted of 48 undergraduate students who were given the listening test under classroom conditions, the other, 13 linguists and linguistics graduate students who took the test individually or in groups of two or three. The two informants are included in the latter group. All participants were native speakers of American English.

Results and Interpretation

The principal results of the experiment are presented here in the form of tables. These are attached.

The subjects seemed to be able to distinguish rapid and rabid with little difficulty (close to 90% correct answers) except for a problem with one item, which I will discuss shortly. The percentage of correct answers for the latter/ladder pair is close to 50%, which suggests that the subjects could not distinguish between these two items since a 50% correct score could as well have been achieved by guessing. The percentage of correct identifications for the writer/rider pair was somewhat higher--about 60%. (See Table VIII.)

Spectrograms and oscillograms were made of each of the 24 tokens in order to determine, if possible, what cues the respondents used in identifying the items.

Preceding-vowel length has been shown to be an important cue in the perception of the voiced-voiceless distinction for English consonants, and the identifications of rapid and rabid seem to confirm this. The RW rapid and rabid tokens were identified with 92% accuracy. Both rapid tokens had shorter vowels than the rabid tokens, but voicing of the intervocalic consonant must also have been a cue, since the longer rapid vowel was only 10 msec. shorter than that of the shorter rabid.

The AMZ rapid tokens were identified with 95% accuracy, but the AMZ rabids were identified correctly only 41% of the time even though the spectrograms indicate some voicing of the b. The length of the longer vowel of rabid, token A2, however, is only 10 msec. longer than the 110-msec. æ's of the rapid tokens, and the length of the shorter æ (rabid, token A1) is shorter than either of the æ's in the rapid tokens. Apparently, the failure of the informant to produce a vowel-length difference conflicted with the voicing cue and caused the respondents' confusion about AMZ's rabids.

The small differences in vowel length and intervocalic consonant length in the latter/ladder pair appear not to have been usable as cues. Responses to the AMZ tokens were essentially random. Responses to the RW tokens show some tendency to identify the items as ladder. There is a 72% correct score for ladder, but there is only a 31% correct score for latter. This may be related to the considerable length of the æ vowels in all of the RW latter and ladder tokens, which, coupled with the voicing of the intervocalic consonant, might favor the interpretation of this consonant as d rather than t. The fact that most of the intervocalic consonants in this group were over 20 msec. (the standard flap length) long does not seem to be significant, since the same consonant lengths did not produce this favoring of ladder in the tokens from AMZ, the other informant.

Vowel quality did not appear to be used as a cue in either the rapid/rabid or the latter/ladder sets of identifications.

As noted above, the respondents did a little better at identifying writer and rider than latter and ladder. The intervocalic consonant lengths show no pattern interpretable as a cue. The vowel lengths show no pattern for RW, but for AMZ they appear to be somewhat shorter before the underlying voiceless consonants (writer: 130 and 105 msec., vs. rider: 155 and 160 msec.). These small vowel-length differences do not seem to be perceptually significant, however: although AMZ produced small differences and RW did not, the percentages of correct scores for this pair were nearly the same for both informants (60% for RW, 61% for AMZ).[1]

Since the original dialect difference noted by Joos was reported as a vowel quality distinction--ɑi vs. ai--rather than a length distinction in writer/rider, vowel quality was examined as a source of the slightly higher distinguishability of writer/rider as opposed to latter/ladder.

As chart V indicates, RW produced no consistent difference between the diphthongs of writer and rider. Chart VI shows, however, that the diphthongs of AMZ's writer and rider were clearly different from each other; both the nucleus and the glide of the writer diphthong were higher than those of the rider diphthong. (The nuclei showed an F_1 difference of at least 200 Hz.) As with the length differences, however, the respondents did not seem to use this difference, since scores for the productions of both informants were nearly the same.

Since a writer/rider distinction was produced by one informant (at least for the four tokens used in this test), one would expect that at least this informant would be able to identify his own productions correctly. The responses marked on Table IX, however, show that AMZ was not able to distinguish his own productions with better-than-average accuracy.

It is possible, of course, that the number of tokens in question--two items, two tokens each--is too small to establish that AMZ makes the vowel quality distinction consistently, and it is also possible that his identification errors are due to some outside factor. But, as the data stands, it looks as if he produces the distinction but does not perceive it.

Most of the respondents, who apparently hear no distinction between latter and ladder or writer and rider, were Ohioans--as was RW, the informant who made no distinction. For these listeners (as for RW), the writer/rider distinction does not exist; judging from their scores, they appear to have had to guess at the identifications.

(An interesting indication that the linguists had to guess more often than the undergraduate is their low stability of response: The average difference in the number of correct answers for two identical tokens was 39% for the linguists, as opposed to only 9% for the undergraduates. Since the linguists took the test under better hearing conditions, this is an unexpected result; I have no idea why their responses were so unstable.)

It happened that one of the students, DS, was a native of Toronto, Ontario. It was in Toronto that Joos first noted the vowel distinction between writer and rider (in the dialect he called Group A). The responses of DS were examined to determine whether he was able to recognize the distinction that AMZ had produced. It is probable that he did. On the test, this respondent made four errors in identifying rapid/rabid, four in latter/ladder, and four in writer/rider. But two of his errors on writer/rider were due to his identification of rider, token R2, as writer, and if DS was using vowel quality as a cue, this would be an expected error, since the F_1 of the R2 rider nucleus is only 450 Hz, making this vowel nucleus non-low and therefore identifiable as the vowel of writer. The remaining two writer/rider errors that DS made, in 16 identifications

for this pair, could be due to chance or to simple mis-hearing, since they amount to fewer mistakes than he made for the uncontroversial control pair, rapid/rabid.

The two respondents who were from the San Diego, California area (one was a linguist; one, a student) gave similar indication that they perceived a writer/rider distinction: LS and JE each had five writer/rider errors, but both identified the R2 rider as writer, which leaves only three errors unaccounted for. LS made two rapid/rabid errors; JE also made two.

Examination of the responses of individual Ohioans (and of those of the few respondents from other areas--New York, New Jersey, Louisiana, Arkansas, Indiana, and Iowa) yielded no similar results among the students, although a few of the linguists did quite well. Apparently, most of the speakers in this sample merge latter/ladder and writer/rider--and, one would expect, all similar pairs. This fact, of course, does not indicate that no dialects exist which maintain a distinction. It does show that the respondents in this sample were speakers of dialects which have, in Chomsky and Halle's terms, the merging order of the two rules in question, t-voicing and lengthening (or Diphthong-Laxing).

Thus, the responses fail to support the claim that a length distinction remains in voiced-voiceless pairs when the consonant distinction is neutralized, since the participants failed to distinguish latter and ladder. And since most of the respondents failed to perceive the distinction produced by one of the informants, the generalized results also fail to support the claim that a quality distinction is maintained between the diphthongal nuclei of such pairs. Because of its limited scale, however, the experiment only fails to support--but cannot actually falsify--such a claim, because dialects may well exist in which the distinction is maintained. Some evidence that Joos correctly described such a dialect, and that other such dialects may exist, was found in the sample.

The problem posed by the failure of an informant to perceive a distinction which he himself produced and which was apparently large enough to be perceptible (AMZ's failure to discriminate effectively between his own writer and rider productions) certainly deserves further study. Reports of other instances of this kind should be reviewed, and further experiments might be conducted in order to examine this problem, since the solution could shed light on such varied topics as the relation of production to perception, the kinds of conclusions to be drawn from listening tests, aspects of test design, and the nature of phonetic and phonological representations.

Footnotes

*This paper was written for a phonetics course taught by Prof. Ilse Lehiste in Winter Quarter 1973. I would like to thank Prof. Lehiste for her guidance.

1. D. R. Sheldon (1973) has published the results of an experiment involving forced-choice identification of the American pronunciation of writer and rider. His data fail to support the view that first-vowel durations are a primary cue for discrimination in this pair.

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TABLE I

Number of correct answers for each token: undergraduate students, 48 respondents. 48 responses for each instance, total of 96 for each token.

Instance	token	rapid	rabid	latter	ladder	writer	rider
1		46	36	22	36	35	22
2	R1	48	41	8	39	34	25
total		94	77	30	75	69	47
1		45	46	22	30	37	20
2	R2	44	46	7	34	36	19
total		89	92	29	64	73	39
1		46	32	23	22	35	23
2	A1	44	8	21	26	38	27
total		90	40	44	48	73	50
1		46	25	23	22	38	10
2	A2	47	13	28	29	38	24
total		93	38	51	51	76	34

TABLE II

Percentage of answers correct for each instance and token. (Same data as Table I, in percentages)

instance	token	rapid	rabid	latter	ladder	writer	rider
1		96	75	46	75	73	46
2	R1	100	85	17	81	71	52
total		98	80	31	78	72	49
1		94	96	46	63	77	42
2	R2	92	96	15	71	75	36
total		93	96	30	67	76	39
1		96	67	48	46	73	48
2	A1	92	17	44	54	79	56
total		94	42	46	50	76	52
1		96	52	48	46	79	21
2	A2	98	27	58	60	79	50
total		97	40	53	53	79	36

TABLE III

Number of correct answers for each token: linguists, 13 respondents. 13 responses for each instance, total of 26 for each token.

Instance	token	rapid	rabid	latter	ladder	writer	rider
1	R1	13	12	2	10	10	5
2		13	12	0	12	11	10
total		26	24	2	22	21	15
1	R2	13	13	3	5	11	2
2		13	13	1	11	6	4
total		26	26	4	16	17	6
1	A1	13	12	9	5	10	9
2		13	0	3	6	8	11
total		26	12	12	11	18	18
1	A2	13	6	6	7	11	4
2		13	6	8	8	7	9
total		26	12	14	15	18	12

TABLE IV

Percentage of ans ers correct for each answer and token. (Same data as Table III, in percentages)

Instance	token	rapid	rabid	latter	ladder	writer	rider
1	R1	100	92	15	76	76	38
2		100	92	0	92	85	76
total		100	92	8	84	81	57
1	R2	100	100	23	38	85	15
2		100	100	8	85	46	31
total		100	100	16	62	66	23
1	A1	100	92	69	38	76	69
2		100	0	23	46	62	85
total		100	46	46	42	69	77
1	A2	100	46	46	54	85	31
2		100	46	62	62	54	69
total		100	46	54	58	70	50

TABLE V

Number of correct answers for each item or form: there were 244 responses to each item for each informant; 488 responses to each item, total.

	rapid	rabid	latter	ladder	writer	rider
RW	235	219	65	177	180	107
AMZ	235	102	121	125	185	114
total	470	321	186	302	365	221

TABLE VI

Percentage of correct answers for each item. (Same data as Table V, in percentages)

	rapid	rabid	latter	ladder	writer	rider
RW	96	90	27	73	74	41
AMZ	96	42	50	51	76	46
total	96	66	38	62	75	44

TABLE VII

Number of correct answers for each voiced-voiceless pair: there were 488 responses to each pair for each informant; 976 responses to each pair, total.

	rapid/rabid	latter/ladder	writer/rider
RW	454	242	287
AMZ	337	246	299
total	791	488	586

TABLE VIII

Percentage of correct answers for each voiced-voiceless pair.
(Same data as Table VII, in percentages).

	rapid/rabid	latter/ladder	writer/rider
RW	93	50	49
AMZ	69	50	61
total	81	50	60

TABLE IX

Informants' responses: Correct responses are listed here for each token. Since two instances of each token were played, the highest possible score is two. Percentages correct are given for each pair.

token	rapid	rabid	latter	ladder	writer	rider
RW's answers:						
R1	2	1	0	2	2	1
R2	2	2	0	1	2	0
% correct	88		38		63	
A1	2	2	1	0	1	1
A2	2	0	1	0	2	0
% correct	75		25		50	
AMZ's answers:						
R1	2	2	0	2	2	1
R2	2	2	1	1	1	0
% correct	100		50		50	
A1	2	2	1	0	2	2
A2	2	2	2	2	0	1
% correct	100		63		63	

TABLE X

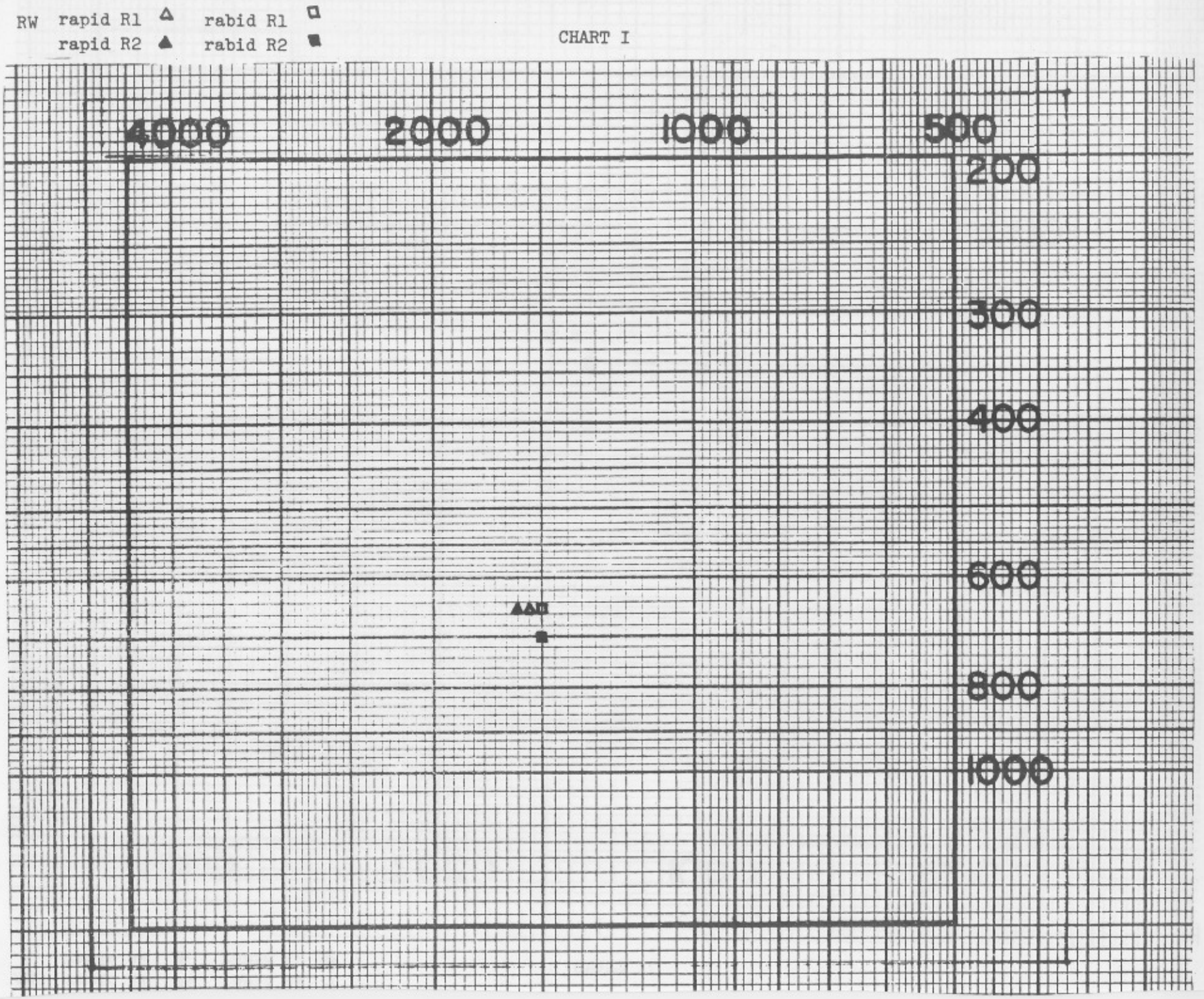
Length of stressed vowel and length of intervocalic consonant (in msec.) for each token.

		rapid	rabid	latter	ladder	writer	rider
R1	V́	100	130	175	190	140	190
	C	75	70	30	30	30	30
R2	V́	120	150	160	170	160	145
	C	80	50	30	20	30	25
A1	V́	110	90	110	115	130	155
	C	75	65	30	25	20	30
A2	V́	110	120	100	115	105	160
	C	65	60	30	20	35	30

TABLE XI

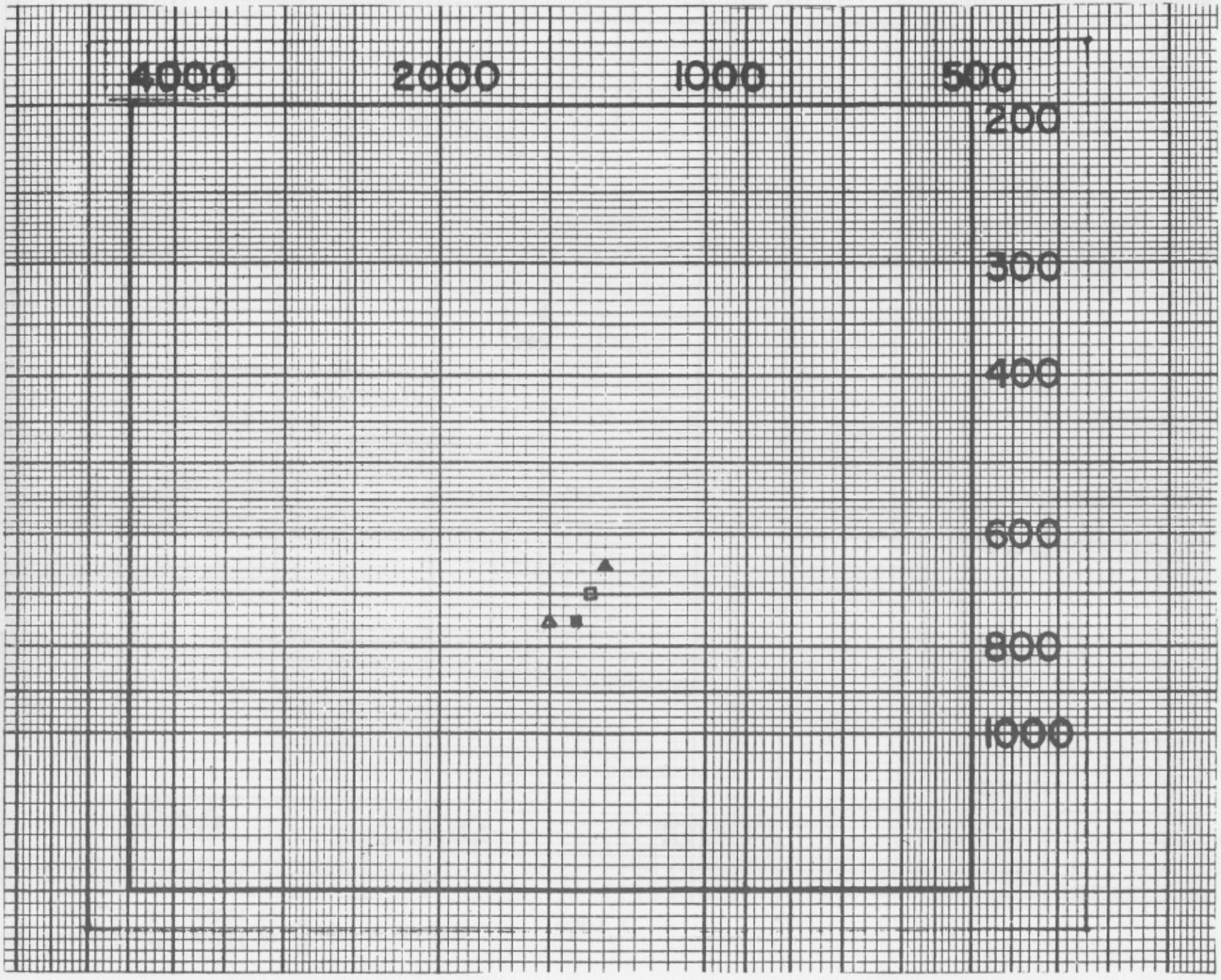
Vowel quality of stressed vowels of each token (first and second formants, in Hz). The extreme point of the glide is included for diphthongs.

		rapid	rabid	latter	ladder	writer	rider
R1	F_1	650	650	600	650	500- 500	650- 500
	F_2	1550	1500	1550	1450	1350-1600	1200-1700
R2	F_1	650	700	650	650	600- 600	450- 500
	F_2	1600	1500	1500	1400	1200-1800	1200-1750
A1	F_1	750	700	700	800	650- 450	850- 600
	F_2	1500	1350	1400	1400	1000-1700	1000-1650
A2	F_1	650	750	750	800	600- 500	850- 600
	F_2	1300	1400	1350	1400	1200-1600	1100-1550


RW rapid R1 △ rabid R1 □
rapid R2 ▲ rabid R2 ■
CHART I
192
4000
2000
1000
500
200
300
400
600
800
1000

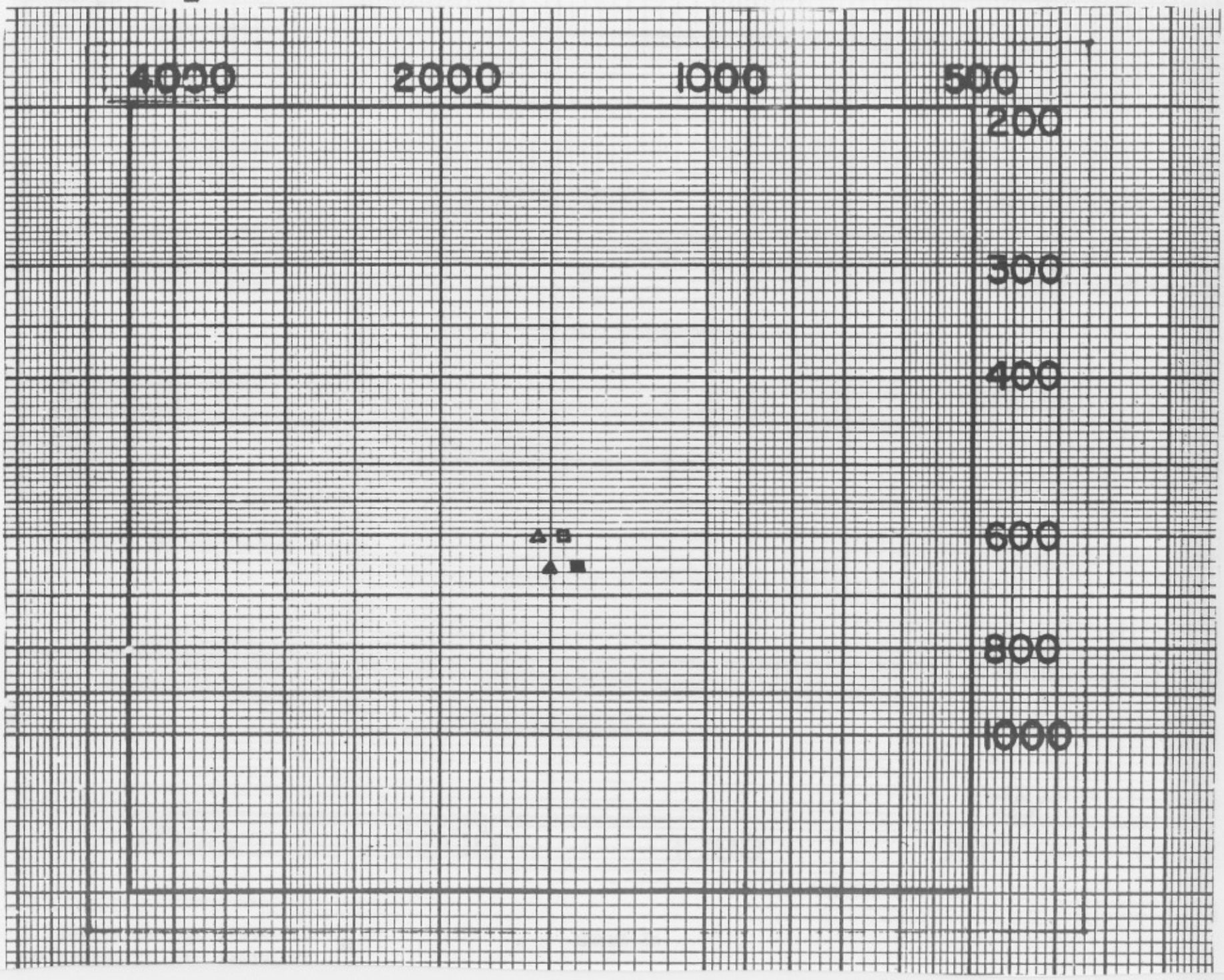
AMZ rapid A1 △ rabid A1 ▬
rapid A2 ▲ rabid A2 ■

CHART II



RW latter R1 △ ladder R1 □
latter R2 ▲ ladder R2 ■

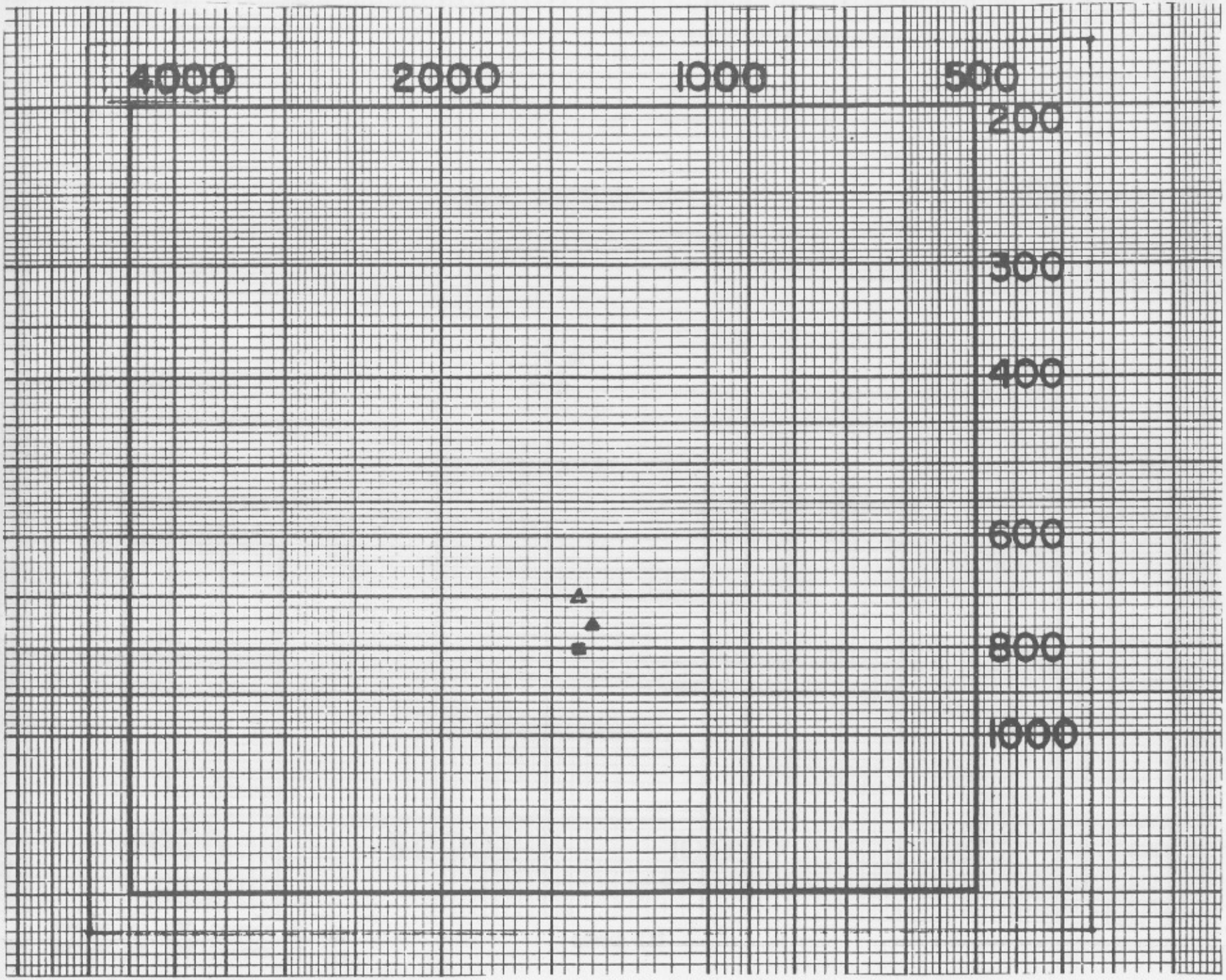
CHART III



AMZ latter A1 ladder A1

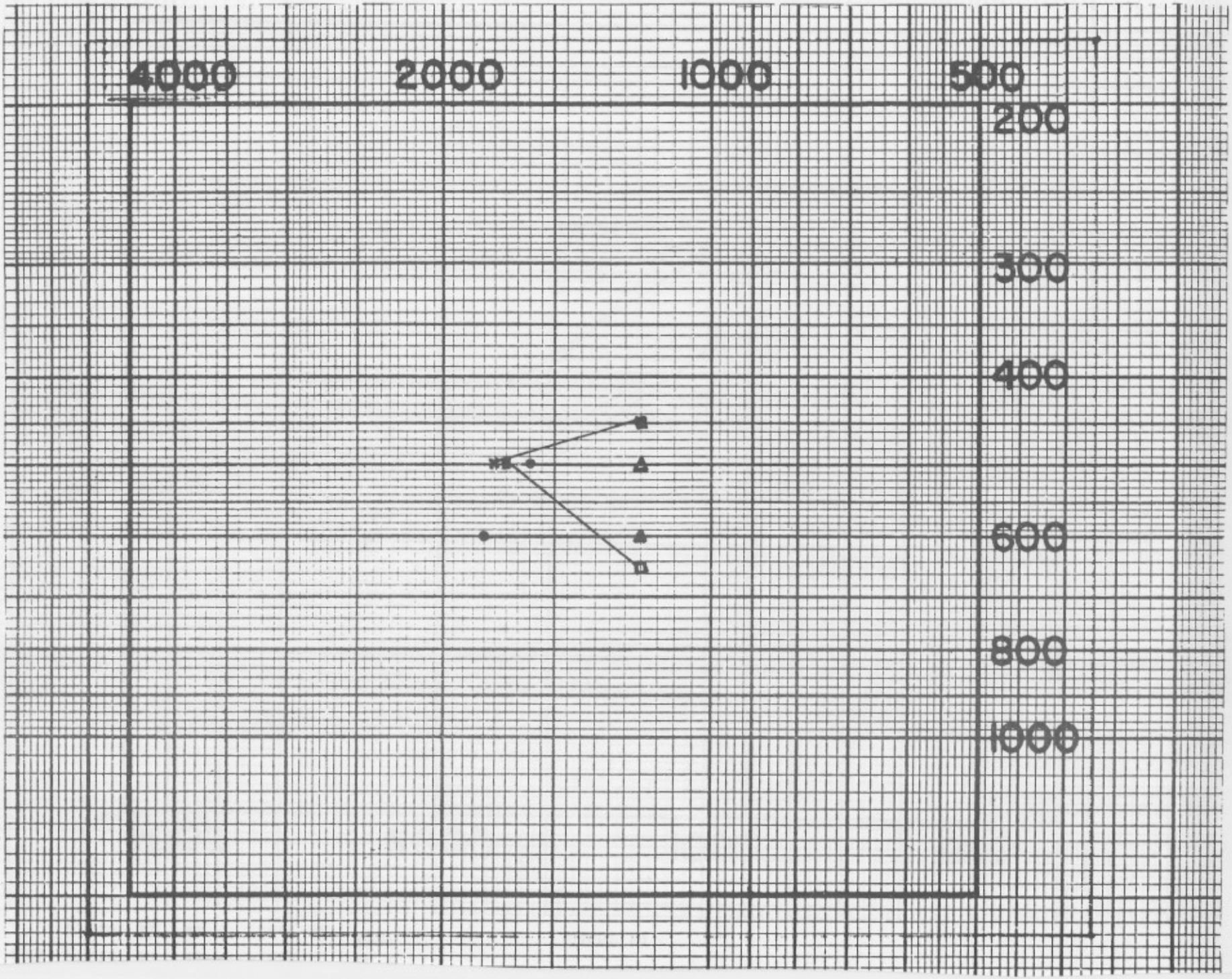
latter A2 ladder A2

CHART IV



RW writer R1 rider R1
writer R2 rider R2

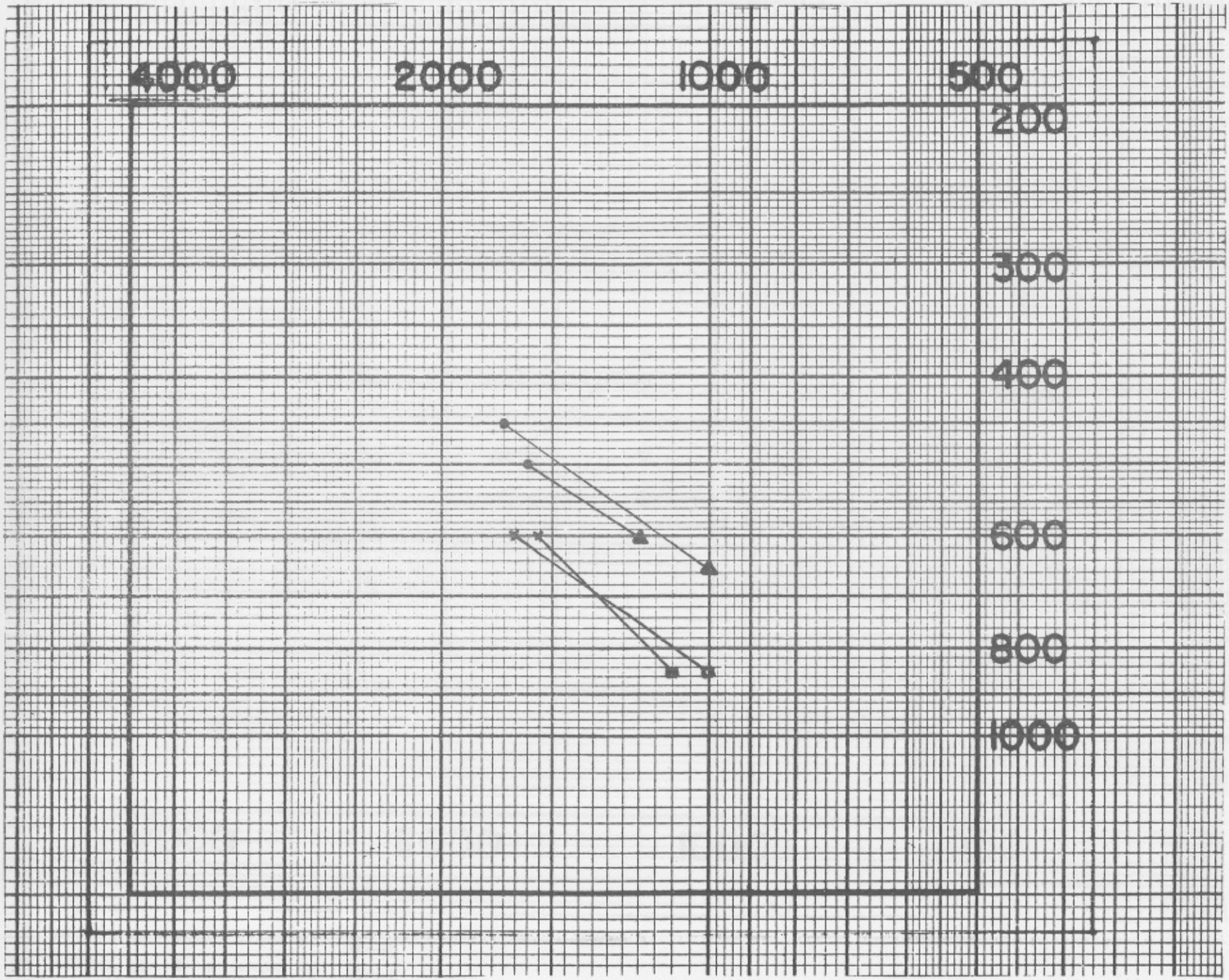
CHART V



AMZ writer A1 rider A1

writer A2 rider A2

CHART VI



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Bibliography IV

Direct and Indirect Discourse*

Arnold M. Zwicky

A. Introductory remarks

The relationship between direct and indirect discourse has been of interest to traditional grammarians, scholars of style, and philosophers of language. Jespersen 1924:ch. 21 treats indirect discourse as derived in some way from direct discourse: 'Either one gives, or purports to give, the exact words of the speaker (or writer)...Or else one adapts the words according to the circumstances in which they are now quoted' (290). In later pages (292-9) he lists principles for shifting direct speech to indirect.

Jespersen also distinguishes two kinds of indirect discourse, which he calls dependent and represented speech--the former appearing as a complement to a verb of report (say, think, hope, wonder, ask, want to know, etc.), the latter standing free, as in

(1) Herbert was terrified. What would happen to him?

Compare the direct

(2) Herbert was terrified. He thought, 'What will happen to me?'

And the dependent indirect

(3) Herbert was terrified. He wondered what would happen to him.

The type of reported speech illustrated in (1) has been the subject of considerable study as a point of style, following Bally's 1912 discussion of style indirect libre in French; see the items cited by Jespersen 1924:291 and Gragg 1972:81.

Philosophers' interest in quotations and reports arises from the issue of opacity (Quine 1960: secs. 30-32). For indirect discourse, as in

(4) Margaret said my paternal grandfather was Swiss.

the content of certain noun phrases (here my paternal grandfather) can be understood either as the contribution of the speaker of the

sentence (the de re, or transparent, understanding) or as the contribution of the subject of the sentence (the de dicto, or opaque, understanding). The philosophical problem is that only on the transparent understanding is truth preserved for alternative descriptions of the same object. Thus, despite the fact that my paternal grandfather was Melchior Zwicky,

(5) Margaret said Melchior Zwicky was Swiss.

is equivalent to (4) only when my paternal grandfather is understood transparently. Direct quotations, of course, are entirely opaque;

(6) Margaret said, 'Arnold's paternal grandfather is Swiss'.
(7) Margaret said, 'Melchior Zwicky is Swiss'.

are not logically equivalent. Partee 1973:418 lists some philosophical discussions of these matters.

B. The transformational literature

Examples of indirect discourse are analyzed as cases of that-complementation in a large number of studies, and there is some treatment of sequence of tenses (as in Ross 1967:sec. 5.1.3.2.6), but there seems to be no systematic discussion of direct and indirect discourse in transformational terms before Sadock 1969:315-32, a work primarily devoted to arguing for the so-called 'performative analysis' also advanced by Ross 1970. Sadock distinguishes between significant direct quotations, in which both the content and the form of a discourse are reported, and nonsignificant direct quotations, which report only the phonological form. For many speakers, the verb go occurs only with nonsignificant direct quotations:

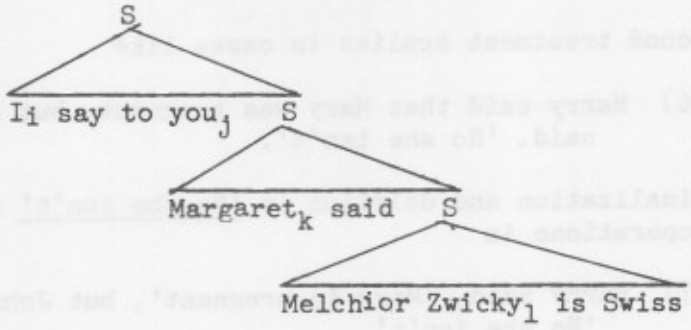
(8) Mark went, 'Yodelo-hi-ho'.[1]

Sadock claims that direct quotations with say are ambiguous as to their significance, so that

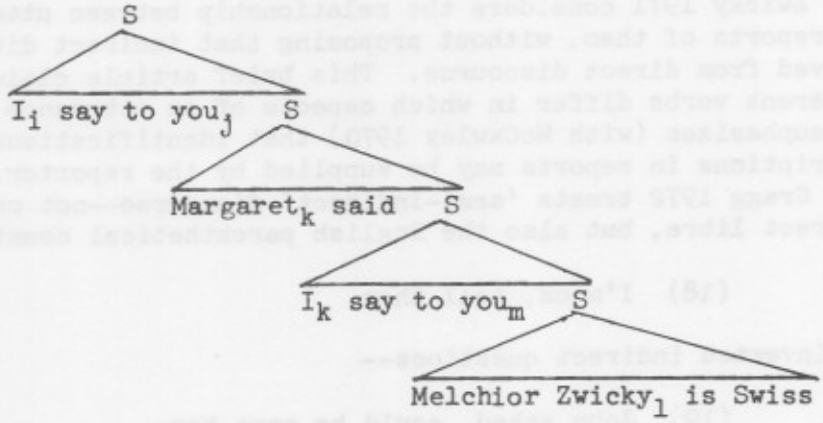
(9) Mark said, 'What a piece of work is man!'

may report only the approximate phonological form of Mark's utterance, or this form in combination with its significance.[2] He then associates higher 'performative' structures (hypersentences) with main clauses and with embedded significant quotations; at some point in their derivation, then, (5) and (7) would be represented as

(10)



(11)



respectively. At this level of representation, neither the structure for the nonsignificant reading of (9) nor the structure associated with verbs like believe that do not take direct quotation objects--

(12) Susan believes that Quaalude is dangerous.
(13) *Susan believes, 'Quaalude is dangerous.'

will have embedded hypersentences. Sadock points out in a footnote (363-4) that structure (10) might itself be derived from a structure with an embedded hypersentence, but that there are a number of arguments against deriving indirect discourse from direct discourse in this fashion.

The difficulties of mapping direct discourse into indirect[3] are exposed further in two papers originally presented at the 1969 winter meeting of the LSA, Gallagher 1970 and Lee 1970. Lee proposes, however, that the transformational position be saved by claiming that sentences in indirect discourse are ambiguous, with one reading derived from deep structure indirect discourse and the other from deep structure direct discourse. The first treatment is advocated for examples like

(14) John said that someone$_i$ would leave, but he$_i$ didn't.

where the direct discourse source is unavailable--

(15) *John said, 'Someone$_i$ will leave', but he$_i$ didn't.

while the second treatment applies in cases like

(16) Harry said that Mary was pregnant, but John said, 'No she isn't'.

where pronominalization and deletion in 'No she isn't' correspond to the same operations in

(17) Harry said, 'Mary is pregnant', but John said, 'No she isn't'.

Zwicky 1971 considers the relationship between utterances and reports of them, without proposing that indirect discourse is derived from direct discourse. This brief article claims that different verbs differ in which aspects of an utterance they report and emphasizes (with McCawley 1970) that identifications and descriptions in reports may be supplied by the reporter.

Gragg 1972 treats 'semi-indirect' discourse--not only style indirect libre, but also the English parenthetical constructions--

(18) I'm ok, tell them.

and inverted indirect questions--

(19) John asked, could he come too.

and constructions with the Amharic verb ālā 'he said', which takes direct discourse complements.

Parenthetical constructions bring to mind the mood markers that have been described in many languages--for instance, in Hidatsa (Matthews 1965:99-101),

> The Emphatic mood indicates that the speaker knows the sentence to be true...The Period mood indicates that the speaker believes the sentence to be true...The Quotative mood indicates that the speaker regards what he has said to be something that everyone knows... The Report mood indicates that the speaker was told the information given in the sentence by someone else, but has no other evidence of its truth value. However- it is not necessarily a verbatim repetition...The Indefinite and the Question moods are alike in that they both indicate that the speaker does not know whether or not the sentence is true. The Indefinite also means that the speaker thinks the listener does not know; whereas the Question means that the speaker thinks the listener does know.

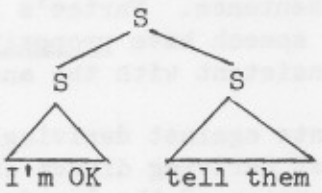
Note the contrast between all standard treatments of English (unembedded) direct discourse, which is morphologically unmarked, and this analysis of Hidatsa, where sentence final markers indicate the various moods. Darden 1973 similarly contrasts reported speech in Lithuanian, which can be expressed by apparently independent clauses with participles as their main verbs, and the situation in Bulgarian, which has distinct perfective past forms for reported and nonreported speech. The Lithuanian examples are fairly obviously derived from embedded clauses, whereas there is some evidence against the corresponding analysis for Bulgarian (though this evidence is not overwhelming).

English parentheticals have been treated by several investigators--by Ross ms. 1970, who derives sentences like (18) from sentences with embedded clauses, e.g.

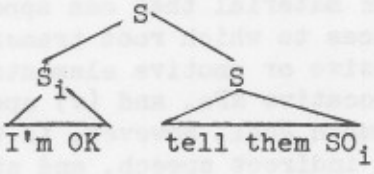
(20) Tell them (that) I'm ok.

by a rule called Sentence Raising, Sentence Lifting, or Slifting; by Emonds 1973, who follows an unpublished paper of Rardin's in advocating a concatenated source like

(21) a.



or b.



and by Nobel 1971, who suggests a concatenated ('adverbial') source for some parentheticals (namely, those subject to Neg-Raising--nonagentives, corresponding to Kimball's 1972a 'expressive' uses of verbs) and a higher sentence source for others (those not subject to Neg Raising--agentives, corresponding to Kimball's 'reportive' uses of verbs). Ross and Emonds both go on to discuss the insertion of parentheticals into the clauses with which they are associated:

(22) Margaret was accustomed to Caribbean tours, I said.
(23) Margaret, I said, was accustomed to Caribbean tours.
(24) Margaret was, I said, accustomed to Caribbean tours.
(25) Margaret was accustomed, I said, to Caribbean tours.

Emonds reminds us, moreover, that direct quotations are as easily interrupted by parentheticals as indirect quotations:

(26) 'Margaret', I said, 'is accustomed to Caribbean tours'.
(27) 'Margaret is', I said, 'accustomed to Caribbean tours'.
(28) 'Margaret is accustomed', I said, 'to Caribbean tours'.

That direct quotations can be interrupted in this way is another indication--besides the ability, pointed out by many authors, of various anaphoric elements to refer inside direct quotations--that they are not totally isolated from their linguistic context.

A novel distinction between direct and indirect discourse in embedded clauses is made by Partee 1973a,b who (expanding on a suggestion of Davidson's) concludes that a 'quoted sentence is not syntactically or semantically a part of the sentence that contains it' (Partee 1973 :418); she explains anaphoric reference into direct quotations on the basis of anaphora in discourse, thus following Dressler's 1970 exhortation to transformational grammarians to consider grammar beyond the sentence. Partee's 1973a position that verbs introducing indirect speech have propositions rather than sentences as objects is consistent with the analyses of Sadock and Lee.

Banfield 1973 lists arguments against deriving indirect discourse from direct discourse and against deriving direct discourse from indirect discourse (as in one version of the 'performative analysis') In the latter case, she cites material that can appear only in direct discourse: (i) sentences to which root transformations have applied, (ii) various expressive or emotive elements, (iii) incomplete sentences, (iv) vocative NPs, and (v) speech in other dialects or languages. Her main goal, however, is to ground an account of direct speech, indirect speech, and style indirect libre on the distinction between reportive style and nonreportive or expressive style, following Kuroda 1973.[4] Then,

> Indirect speech occurs when a verb of communication takes a sentence (S) complement as a direct object. As in all other embedded clauses, the elements which can occur only in the expansions of E [the category of expressive elements, or expressions]..., and not in that of S, are excluded. The speech act and its content are only reported, not reproduced. (17)

Banfield follows Partee in taking direct quotation to be equivalent to two independent sentences (actually, two expressions). Finally, 'the free indirect style attempts to fill a hiatus in the grammar by allowing expressions (E) to be introduced by verbs normally marked to take sentences as complements' (29). In all cases, the interpretation of deictic elements is accounted for by general principles that assign referents to them.

In addition to this literature concerning the relationship between direct and indirect discourse, there is a substantial literature on various specific types of embedded clauses (embedded questions and exclamations, in particular). I will not attempt to survey this material here, although it obviously has some bearing on the general problem. Similarly, I do not consider discussions of performative vs. reportive uses of particular verbs, as in

(29) I promise you I'll wash the dishes.
(30) I often promise you I'll wash the dishes, but I rarely do it.

although these matters, too, relate to the general problem.

Footnotes

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1. Partee 1973b:412 makes the same observation.

2. Quang 1971:fn. 10 points out that the object of _say_ doesn't have to be a sentence, or even be in English, or even be a speech sound. Partee 1973b:412 reports that in her speech the object of _say_ must be a sentence.

3. Gallagher distinguishes between the proposal that (5) is transformationally related to something like (7) and the proposal that transformations express in some way the fact that (5) is one speaker's report of Margaret's saying something like _Melchior Zwicky is Swiss_. Following most of my sources, I disregard this distinction in my survey.

4. Interestingly, Kuroda cites Russell for the distinction, while Kimball (who uses a very similar distinction) cites Wittgenstein.

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Bibliography V

The English Inflectional Endings*

Arnold M. Zwicky

A. Introductory remarks

English expresses the following nominal and verbal categories inflectionally--for nouns, nominative plural (Nom)Pl, genitive singular (Gen(Sg)), and genitive plural (GenPl); for verbs, third person singular present (Prs), present participle (PrsP), past (Pst), and past participle (PstP). For completely regular items, the stems show no change and the suffixes have the following forms--

(Nom)Pl = Gen(Sg) = GenPl = Prs: [s ~ z ~ ɨz] = S
PrsP: [iŋ]
Pst = PstP: [t ~ d ~ ɨd] = T.

In addition, there are various subregular and irregular formations. For nouns, there are 'internal' Pls (like leaves), in which stem-final continuants f θ s are voiced, as well as zero Pls (like sheep) and a number of entirely irregular forms (like oxen and seraphim, with exceptional Pl suffixes; mice and feet, with internal change; and phenomena, addenda, crises, virtuosi, formulae, and foci, with distinct Sg and Pl terminations). Zero-Pl nouns have only two distinct forms (NomSg/Pl vs. GenSg/Pl, as in sheep vs. sheep's). Internal-Pl nouns have three distinct forms, with the GenPl identical to the NomPl but distinct from the GenSg (leaf: leaves/leaves' vs. leaf's). And truly irregular nouns have four distinct forms (man, man's, men, men's).

For verbs, there are 'internal' Psts and PstPs, ending in alveolar stops (several types--hit, hid, bit, burnt, crept, built, left). In addition there are subregular formations (sank/sunk) and various irregular formations (came/come, went/gone, fought, etc.). Internal-Pst verbs, like regular ones, have the PstP identical to the Pst. Most irregular verbs have three distinct forms besides the PrsP (which is regular for all verbs).

These not very complicated facts have given rise to a number of interconnected problems in the description of English morphology. How are the regular, subregular, and irregular formations to be distinguished? In particular, how are the 'internal' formations different from the regular ones--in having different suffixes, different boundaries separating stem from suffix, segmentally different stems, stems different in their morpheme features, or some combination of these? Then, what are the underlying forms of the regular suffixes? In particular, do the S and T suffixes have a voiceless stop, a voiced

stop, or some lax vowel $\breve{V}$ plus a voiced stop (or even--though this is not one of the forms in alternation--$\breve{V}$ plus a voiceless stop)? Is the underlying form similar for S and for T, or even for S in nouns and verbs? If there is a $\breve{V}$ in any of these underlying forms, what vowel is it--i, e, ə, ʌ, ɨ, some vowel not fully specified?

The English facts might also bear on general problems in morphology. There is, for instance, the question of whether inflectional categories are to be treated as separate formatives or as features, or perhaps sometimes as one and sometimes as the other. Then there is the question of what mechanisms should be used to describe sub-regularities and irregularities of various types. And of whether the selection of morpheme alternants can be accomplished by principles that operate in a group, or whether they are interspersed among syntactic or phonological rules. These, and other central questions of morphological theory in generative grammar, have been treated by only a few writers in any detail--notably, for inflection, Matthews 1972 on Latin and Bierwisch 1967 and sections of Wurzel 1970 on German; and for derivation, Chapin 1967, 1970 on English. Among more general works, we have Schwartz 1968:774-82, with suggestions for a derivational mechanism; Schindler 1972, which surveys some of the problems and literature in derivational morphology; Halle 1973, which enunciates a program for a theory of word formation; and Hoard and Sloat 1973, a review of the treatment of subregularities.

A recurring question in such studies is the first listed above--whether the ordering of affixes and the selection of morpheme alternants should be given an account by principles that refer to formatives like Pl, Prs, Neg, Nml, etc., which are generated by syntactic rules (phrase-structure or transformational), or whether such principles should refer to features of major categories, features which are segmentalized (realized as affixes) by morphological rules. The formative approach is the only one taken in early transformational grammar, while various versions of the feature approach are offered by Bierwisch, Wurzel, Matthews, and Hoard and Sloat 1973b. A further development of the feature approach is Postal's 1966 proposal that some clitic elements (in particular, the English definite article the) are segmentalized; this position is reviewed in Stockwell, Schachter, and Partee 1973:67-70. For our purposes here, it is sufficient to note that the precise form of morphological rules is by no means settled, that different affixes or classes of affixes might require different treatments, and that these questions are bound up with others (among them, exceptionality, rule ordering, and lexical redundancy rules); the relevance of the English inflectional endings to such larger questions has not been explored in any depth.

B. The literature

The bulk of the literature focuses on selecting basic or underlying forms for the morphemes S and T.[1] Early discussions appear to rely on two simplifying assumptions: (i) S has the same underlying form in all of its functions, as does T; (ii) the underlying forms for S and T are parallel. These assumptions narrow the possible underlying forms to four sets: /s t/, /z d/,/Vs Vt/, /Vz V̆d/. Of these, /Vs Vt/ doesn't represent one of the actually occurring forms and so

would not be chosen as the underlying form unless the other alternatives were found to be unsatisfactory; and choosing /s t/ would make it very difficult to predict final voicing in forms like pens and penned, since English permits both voiced and voiceless finals after sonorants (cf. pence and pent). Consequently, for some time the only real discussion concerned the choice between /z d/ and /Vz Vd/.

The vowelless analysis for S is defended by Hockett 1958:282, on the grounds that setting up /əz/ as the underlying form would make it difficult to predict that [z] is the form that occurs after vowels, since English permits both [z] and [əz] after vowels (cf. bows and boas). That is, only with underlying /z/ would the selection of the allomorphs be automatic ('The discovery that an alternation is automatic, and the discovery of the base form, go hand in hand, each implied by the other').

The vowel analysis was first defended by Bloomfield 1933:212, citing 'an exact parallel in English syntax', namely the forms of the verbal auxiliary is. Nida 1948:sec. 3.03 gives the argument in some detail.

Each of these positions is represented in the generative literature. The vowelless analysis is assumed without argument by some writers (for example, Labov 1969). The vowel analysis is maintained by Luelsdorff 1969 and Zwicky 1970a:333f., who give Bloomfield's argument appealing to the parallel between the forms of S and the forms of is.

Lightner 1970 refines the discussion in several ways. First, he exposes the difficulties with the /s/ and /Vs/ analysis for S. Next, he attacks the identification of auxiliary reduction with the selection of forms of S, citing a number of conditions on auxiliary reduction (from King 1970, Lakoff 1970a, Zwicky 1970a, and Baker 1971) which do not apply to S (in particular, auxiliary reduction is never obligatory,[2] while the selection of forms of S is never optional) and difficulties that arise from treating is and has as themselves containing occurrences of S, so that in the vowel analysis a double deletion is required to get from /kæt#i#iz/ to [kæts]. The latter difficulty could perhaps be avoided by treating is and has as having Ø forms of Prs (like the modals), or by having contraction apply cyclically. The former difficulty is more serious, in the absence of parallel cases (rules that are obligatory for certain morphemes, optional and hedged with nonphonological conditions for others). Lightner's comments do not, however, decide between the vowelless and the vowel analyses; the vowelless analysis would require a deletion rule (auxiliary reduction) plus an insertion rule or rules (for S after s z š ž č ǰ, for T after t d), while the vowel analysis would have two deletion rules (auxiliary reduction plus deletion except in the cases just mentioned). Neither of these solutions is necessarily suspect on universal grounds, since a number of languages have been claimed to have two or more somewhat similar deletion rules (see the English examples in Zwicky 1972, for instance) and others to have deletion and insertion rules with related effects (compare the treatment of German e by Wurzel 1970:Part 3).[3]

Lightner also claims that 'poetic forms like winged chariot (with disyllabic winged) are of no help here because the extra vowel of [-ɨd] could be derived equally well by relaxing the conditions either of vowel-insertion or of vowel-deletion' (516). But Miner 1972:19f. points out that if such poetic forms--and disyllabic adjectives like crooked, wretched, aged, jagged--are taken to have underlying /ɨd/, then these forms are simple exceptions to a vowel deletion rule, whereas if the underlying representation is /d/, a vowel insertion rule must be extended to apply in new environments and these forms must be marked to undergo the extended rule.

Let us return to the differences between auxiliary reduction and the selection of forms of S. One way around this difficulty is suggested in Zwicky 1970a, where it is proposed that auxiliary reduction is, in effect, a syntactic rule that provides the input for a later phonological rule: 'the optional rule Auxiliary Reduction merely makes the auxiliary clitic to the preceding word...The deletion of the vowel would then be accomplished by an obligatory rule also operative in the plurals of nouns, the past tense of verbs, etc.' (333). Auxiliary reduction would then be a word-forming operation, presumably a readjustment rule (Chomsky and Halle 1968:9-11 and elsewhere) which reorganizes constituent structure without adding, deleting, or permuting elements (a 'rewiring transformation', in the terminology of Humberstone 1972); a similar treatment is suggested for negative contraction in Zwicky 1969:sec. 7, 1970a:fn. 7. However, independent arguments for a rewiring transformation of auxiliary reduction have not been given, as Shibatani 1972:121 has pointed out.

Shibatani defends the vowelless analysis by reference to two new sorts of considerations--forms from nonstandard dialects and the effects of surface phonetic constraints. First, Shibatani cites the observation of Labov 1969 and others that many Black English speakers distinguish contracted forms from inflected ones--fish is being realized as [fiš] or [fišɨz], but the Pl of fish as [fišɨz] only. This argues against the direct identification of the two rules in Black English, although it is consistent with auxiliary reduction as a readjustment rule. Second, Shibatani mentions a discussion by Wolfram 1970 of final stop clusters in Black English. Wolfram notes that the final t and k in forms like test and desk are regularly deleted, but often remain before words beginning with vowels or suffixes beginning with vowels; however, the final stop is always deleted in the Pl ([tes]~[tesɨz], [des]~[desɨz]), which indicates that the Pl affix has no vowel. I see no satisfying way to account for these data in the vowel analysis, even supplemented by Fasold's 1971 proposal that the optional nonappearance of S in Black English is the result of a syntactic deletion rule while the nonappearance of T results from phonological deletions.

These arguments from Black English do not necessarily bear on the underlying representations for the standard dialect, of course. We are not obliged to posit identical underlying forms for all dialects (see the brief discussion by St. Clair 1973), although the distribution of forms and rules throughout the dialects should be capable of historical explanation. In this connection, an account of the history of Modern English S from Early Middle English ēs might

illuminate our discussion (see the remarks by Miner 1972:13f. on both S and T).

Shibatani's reference to surface phonetic constraints (SPCs), independent constraints representing the phonetic pattern of a language (Shibatani 1973), permits him to revive Hockett's argument for the vowelless analysis of S:[4] if English has the phonotactic conditions

$$(1) \quad \sim \begin{bmatrix} -son \\ \alpha vcd \end{bmatrix} \begin{bmatrix} -son \\ -\alpha vcd \end{bmatrix} \; \# \; \#$$

$$(2) \quad \sim \begin{bmatrix} +stri \\ +cor \end{bmatrix} \begin{bmatrix} +stri \\ +cor \end{bmatrix}$$

then

> the base form or phonological representation of the plural must be /z/. This is because it is the only representation that involves processes which can be accounted for by the phonotactic conditions...The underlying form is derived just in case it comes in conflict with [(1)]. A schwa is inserted when two sibilants come next to each other [(2)]. No other processes are involved. (123)

The force of this argument depends on (a) the degree to which the need for SPCs in general has been motivated, (b) the arguments that (1) and (2) must be stated as SPCs in a phonological description of English, and (c) the implicit claim that SPCs should correspond to positive effects of rules rather than negative conditions (restrictions) on rules. Concerning point (c), note that a restriction on a vowel deletion rule would express SPC(2) just as much as the operation of a vowel insertion rule would, although the existence of the rule as a whole would not be motivated by (2). But we cannot expect rules as wholes always to be motivated by SPCs; standard examples of conspiracies (in the sense of Kisseberth 1970) involve the achievement of a target both by the positive action of some rules and by restrictions on others (note the discussion of the Yawelmani clustering condition by Kisseberth 1970:299, applied to the deletion and insertion analyses for the English inflectional endings by Miner 1972:22f.).

All the authors thus far cited appear to hold the assumptions (i) and (ii) at the beginning of this section (that each affix has the same underlying form in all of its functions and that the underlying forms of the two affixes are parallel). However, some analysts, notably Hoard and Sloat in a number of articles, reject these hypotheses of parallelism. First, there is Sloat and Hoard 1971, which fixes on /z/ for Pl, /s/ for Gen and Prs, and /t/ for Pst; all underlying forms are vowelless, but they are not otherwise parallel. The arguments Sloat and Hoard give are based on two considerations: markedness à la Chomsky and Halle 1968:ch. 9 and the properties of internal Pls and Psts. Markedness considerations would favor voiceless underlying consonants over voiced ones. To accomodate internal Pls and Psts, Sloat and Hoard suppose that they differ from the regular formations only in the boundary intervening between stem and suffix

(# for regular formations, + for the internal cases). This leads them to select a voiced underlying form for Pl, because of lives, baths, houses, but a voiceless underlying form for Pst, because of built, bet, slept.[5] Delack 1971:205-8 criticizes these conclusions on the basis of the rules involved, and then extends the discussion by referring to the acquisition of forms by children and by questioning the characterization of voiceless consonants as unmarked in English.

On the first point, Delack 208f. notes Berko's 1958 observation that different functions of S are mastered by children at different ages (Gen and Prs before Pl), but concludes that this fact doesn't necessarily bear on the choice of underlying forms in adult speech. Delack doesn't discuss Berko's further observation that different alternants are mastered at different ages ([z] and [s] before [ɨz]); the implications of acquisition studies of English morphology (for instance, the items cited by Ferguson and Slobin 1973:210f. introducing Anisfeld and Tucker 1968) for phonological analyses have not, in fact, been carefully examined.

On the second point, Delack 209f. uses differences in voicing onset time in different languages to suggest that voiceless stops might be unmarked in some languages, voiced stops in others (English, for instance). But the connection between markedness, whether universal or language-particular, and the content of underlying forms has not been clarified.

Hoard and Sloat 1973a reassess the role of internal Psts in deciding on underlying representations for the Pst suffix:

> In Sloat & Hoard 1971, we posited /t/ as the underlying form for the regular preterit marker; this is suggested by the internally suffixed preterits dealt, spelt, burnt etc. However, we failed to assess correctly the role of such internally suffixed preterits as sold, told, said, and heard. Both these groups of preterits can be accounted for in a general way only by positing an underlying /d/ for the preterit suffix, plus a rule of devoicing. The devoicing rule can be stated informally as d → t / [+consonantal, -syllabic] +__ #. (113f.)

They continue to assign the same underlying segment to the regular and internal Pst suffixes (and to the regular and internal Pls), so that regular verbs (and the irregular bring, think, teach, catch, seek, and beseech) have the suffix /#d/.

In their latest treatment of the English inflectional endings, Sloat and Hoard 1973 maintain /d/ for Pst, but opt for /iz/ instead of /z/ for Pl (perhaps for Gen as well; I have not seen a written version of this paper, and various details of the analysis are not clear to me). Their rejection of /z/ is based primarily on the nature of the schwa insertion rules in their earlier analyses:

$$(3)\quad \emptyset \rightarrow \text{ə} \;/\; \begin{bmatrix} -\text{son} \\ +\text{cor} \\ -\text{dist} \\ \alpha\text{stri} \end{bmatrix} \_\_ \# \begin{bmatrix} -\text{son} \\ +\text{cor} \\ -\text{dist} \\ \alpha\text{stri} \end{bmatrix} \#$$

They hypothesize that two paired variables cannot both occur in the environment of a rule (as is the case with the paired variables [αstri] in (3)). Their new analysis also eliminates two other peculiar features of the earlier treatments: the insertion of schwa by (3) as part of the stem rather than the suffix (note the criticism in Miner 1972:25), and the assimilation rule

$$(4)\quad [\alpha\text{vcd}] \rightarrow [-\alpha\text{vcd}] \;/\; [-\alpha\text{vcd}] \# \_\_\_ \;.$$

All the Hoard and Sloat analyses treat internal Pls as involving an intervocalic voicing rule also manifested in forms like worthy, brevity, mischievous, and (in some dialects) greasy. As Delack 1971: 206 points out, using intervocalic voicing this way with an underlying /+z/ for internal Pls requires including z as a possible second 'vowel', which is quite unnatural; this difficulty is avoided with underlying /+ɨz/, as in Sloat and Hoard 1973. But the intervocalic voicing analysis is not the only one that has been suggested. Lightner 1968:58-60 reviews three others: an analysis with a morphophoneme /F/ in knife (as opposed to /f/ in chief); one in which the morpheme knife is marked as undergoing voicing of its final spirant before the Pl suffix, while the morpheme chief is marked as not undergoing such a rule; and one in which knife is marked as undergoing a minor rule (Lakoff 1970b:ch. 5) voicing final spirants before Pl. The first analysis follows comments by Swadesh and Voegelin 1939 and Harris 1942, the second is essentially an alternative analysis offered by Harris, and the third is Lightner's revision of this. The Sloat and Hoard solution differs from all three of these approaches in that their voicing rule is phonologically motivated rather than arbitrary (their minor rule is the morphological rule that specifies a + rather than a # boundary before Pl for certain morphemes).

The spirant voicing in internal Pls may or may not be related to other voicing alternations in English. Chomsky and Halle 1968:213, 232f. consider both possibilities, without coming to a decision, for pairs like choice/choose, cloth/clothe, safe/save, life/live: either their rule devoicing z before the suffix -ive (as in abusive, evasive) is extended to devoice spirants in derived forms (marked [+ϕ]), or their rule voicing s in an assortment of positions, largely intervocalic, is extended to voice spirants in the environment V__V, with this voicing rule triggered by a final lax /e/, later elided, in forms like clothe.[6] In a longer discussion of the problem of derived forms, Chambers 1971 rejects the extension of intervocalic voicing to the ϕ-subclass, arguing that instead there is a special voicing rule that applies to deverbal nouns. If Chambers' analysis is correct, the ϕ-subclass has no bearing on the inflectional endings.

Thus far, we have seen the presentation of the vowel analysis by Luelsdorff and Zwicky, followed by counterarguments and reanalyses by Lightner, Shibatani, Delack, Hoard, and Sloat. In return, some

support for the vowel analysis has been advanced recently by Guile 1972 and Miner 1972; the latter work has been responded to by Cohen and Utschig 1973. I now review this material briefly.

Guile's defense of the vowel analysis arises from his hypothesizing that vowel epenthesis rules always break up some 'non-obstruent' clusters (consonant clusters containing at least one non-obstruent consonant) and that vowel syncope rules creating consonant clusters always create some nonobstruent clusters. He cites rules in English (the fast speech rule also discussed in Zwicky 1972 under the name Slur), Georgian, and Old Norse to support the syncope hypothesis, and concludes his article by remarking that in the case of the English inflectional endings

> a putative rule of vowel epenthesis would have introduced a vowel breaking up exclusively obstruent clusters. But this runs counter to the independently motivated principle of universal grammar which defines what a possible rule of vowel epenthesis is. Hence, the facts of English must be accounted for by a rule of vowel syncope. (468).

However, the two universal hypotheses need careful validation. There is a possible counterexample to the syncope hypothesis in Japanese (see Ohso's 1973:13 discussion of a fast speech deletion of high vowels in the environment [-vcd]__{[-vcd], #}--an extension of a devoicing rule), and an epenthesis rule restricted to obstruent clusters would not be phonetically implausible, though I have no good examples.

Miner carefully reviews most of the literature and presents two new arguments for the vowel analysis: (a) that given the Unordered Rule Hypothesis (Koutsoudas, Sanders, and Noll 1971, and other items cited by Miner), the underlying forms /ɨz/ and /ɨd/ lead to the simplest grammar (sec. 3), and (b) that the phonology of forms in -edly and -edness supports the choice of /ɨd/ rather than /d/ (sec. 5). With respect to (b), Miner notes that contrasts like resígnedly versus detérminedly indicate that the realization of -ed (before -ly or -ness) as [ɨd] or [d] is correlated with ultimate or penultimate stress on the root, respectively. He then argues that an insertion rule for Pst = /d/ and resignedly is much more complex than a deletion rule for Pst = /ɨd/ and determinedly. Nevertheless, even his deletion rule is scarcely simple:

$$(5)\quad \text{ɨ} \rightarrow \emptyset \;/\; \langle\text{-stress}\rangle\; C_0 \left[\left\{\begin{matrix}+\text{son}\\ -\text{cor}\\ +\text{dist}\\ \alpha\text{stri}\end{matrix}\right\}\right] \#\_\_ \left[\begin{matrix}-\text{son}\\ +\text{cor}\\ -\text{dist}\\ -\alpha\text{stri}\end{matrix}\right] \# \langle+\text{seg}\rangle_1 \#$$

Cohen and Utschig begin their discussion (sec. 2.1) of the inflectional endings by arguing against /s/ and /t/ as the underlying forms for S and T. They maintain first of all that the voicing assimilation rule required in this analysis, namely

(6) [-son] → [+vcd] / [+vcd] # __ #

is implausible (a) because it claims that /s/ and /t/ voice by virtue of the voicing of preceding sonorants, even though English permits both voiced and voiceless obstruents after sonorants, and (b) because it claims that /s/ and /t/ voice by virtue of the voicing of preceding stem-final vowels, a 'specious generalization'. They continue with a version of Lightner's argument against voiceless underlying forms--that either the vowel in /ɨz/ and /ɨd/ must be inserted as part of the stem, or else /s/ and /t/ must be made to assimilate in voicing to the epenthetic vowel as well as to stem-final vowels. The first criticism, however, is not very strong, since assimilation in voicing to any preceding sonorant (including vowels) is not unparalleled; a classical Sanskrit (regressive) analogue is well known: 'In external combination...an initial sonant of whatever class, even a vowel or semivowel or nasal, requires the conversion of a final surd to sonant' (Whitney 1960:sec. 157c).

Cohen and Utschig then give four objections to the /əz/ and /əd/ analysis of S and T. Three have to do with the form of the syncope rule required by Miner, the fourth with Miner's argument based on the Unordered Rule Hypothesis (URH). The syncope rule in question (adopted from Sloat and Hoard 1971) is a subpart of (5):

(7) ə → Ø / $\left[\left\{\begin{matrix}+\text{son}\\-\text{cor}\\+\text{dist}\\\alpha\text{stri}\end{matrix}\right\}\right]$ #__ $\left[\begin{matrix}-\text{son}\\+\text{cor}\\-\text{dist}\\-\alpha\text{stri}\end{matrix}\right]$ #

Cohen and Utschig's objections are as follows: (a) the rule (7) is ad hoc and implausible, a result of the fact that the contents of the curly braces in (7) don't constitute a natural class; (b) rule (7) doesn't collapse with another syncope rule presented by them, namely a deletion in the final syllable of titan, metal, atom, angel, minister (cf. titanic, metallic, atomic, angelic, ministerial); and (c) the combination of alpha variables and curly brackets in (7) is uninterpretable according to the conventions of Chomsky and Halle 1968. The first and third objections don't take into account the fact that the formulation of rule (7) is transparently an attempt to avoid stating a negative environment,[7] as in

(8) ə → Ø / - $\left[\begin{matrix}-\text{son}\\+\text{cor}\\-\text{dist}\\\alpha\text{stri}\end{matrix}\right]$ #__ $\left[\begin{matrix}-\text{son}\\+\text{cor}\\-\text{dist}\\\alpha\text{stri}\end{matrix}\right]$ #

or, better,

(9) ə → Ø / # __ [-son] # except / $\left[\begin{matrix}+\text{cor}\\-\text{dist}\\\alpha\text{stri}\end{matrix}\right]$ #__ $\left[\begin{matrix}+\text{cor}\\-\text{dist}\\\alpha\text{stri}\end{matrix}\right]$ #

or even:

(10) [ ] # ə [-son] #
1 2 3 4 5 unless 1 and 4 are [+cor, -dist, αstri]
↓
ϕ

Cohen and Utschig's second objection is not necessarily weighty, since a language might have several distinct syncope (or epenthesis) rules. Moreover, their syncope rule for titan et al. is not very plausible phonetically (it deletes ə between C and [$^{+cons}_{+son}$]#); neither is Miner's syncope rule, of course, but Miner's rule refers to word-internal # and is therefore clearly a morphophonemic rather than phonological (or 'allophonic') rule. A phonetically plausible alternative analysis of the titan cases would be to derive the final syllabic resonant (R̩) from a full vowel plus resonant (VR) via vowel reduction (əR), vowel assimilation (R̩R), and monophthongization (R̩); see the discussion of 'pseudo-syncope' in Semiloff-Zelasko 1973.

The remaining Cohen-Utschig objection to Miner's analysis concerns the URH. They point out (sec. 2.2) that Miner's syncope rule and an English flapping rule should (under the URH) apply simultaneously, to yield *[bæDz] from /bæt#əz/ bats. However, it is possible to maintain, with King 1973:567f., that languages have both phonological rules and ('low-level') phonetic rules and that all of the former precede all of the latter.[8] If the inflectional syncope rule is a phonological rule and flapping is a phonetic rule, then there is no ordering problem. Still another way to account for the interaction between flapping and the inflectional syncope rule would be to use the fact that flapping is optional for many speakers, while the inflectional syncope rule is obligatory for all speakers. Then, by a principle of applicational precedence due to Ringen 1972, in forms to which both rules would be applicable the obligatory rule (syncope) applies first; after this the optional rule may apply if its conditions are still satisfied. In the case at hand the optional rule (flapping) would no longer be applicable, for syncope would have removed the conditions for its application.

Cohen and Utschig then confront a potential conflict between the URH and the vowelless analysis of the English inflectional endings: if /č‿č#z/ underlies churches, then both epenthesis and devoicing ought to apply simultaneously, giving *[č‿čəs]. In this case they appeal to a distinction between (phonological) epenthesis and (phonetic) devoicing; devoicing, they claim (following Harms 1973), is not only phonetic but also universal, hence not really a 'rule' of English at all but rather a physiological process. Miner 1972:fn. 3 disputes this treatment of devoicing, pointing out that the physiological requirements would be equally satisfied by the voicing of a stem-final voiceless obstruent or by the insertion of a vowel[9] as by the devoicing of a suffixal voiced obstruent. Devoicing might nevertheless be treated as a phonetic, rather than phonological, rule of English (like flapping in the discussion above).

This concludes the list of items concerned with selecting an underlying form for some or all of the inflectional endings in English. None of the writers surveyed here gives an argument for a particular vowel in the endings, though the vowels favored by supporters of the /Vz/ and /Vd/ analyses are i (Lightner 1970, Sloat and Hoard 1973b) and ɨ (Luelsdorff, Lightner 1968, Miner). Supporters of the /z/ and /d/ analyses write epenthesis rules that insert 'neutral' vowels, ɨ or ə.

One remaining problem area is the GenPl. As it is put in Dr. Latham's English Language (cited by Bombaugh 1961:256), 'In the plural number, however, [the genitive] is rare; so rare, indeed, that whenever the plural ends in s (as it always does) there is no genitive'. Kruisinga 1932:sec. 829 echoes this conclusion:

> The genitive suffix is never added to nouns with a plural suffix, no matter whether this is final or not. Thus the plurals fathers, fathers-in-law, and such groups as the queens of England never take a genitive suffix, although the groups father-in-law or queen of England do...We can state this in another way: English has no genitive plural. The explanation of the apparent exceptions men's, women's, children's has already been given...It may be added here that the plurals lice, mice, and geese, though formally isolated from the noun-stems, do not take a genitive suffix either.

That is, regular nouns have the GenPl identical to the Pl (although Delack 1971:fn. 7 reports forcing items like Joneses' [j̆ównzəzəz] from informants), a fact that could be given a generative account in several ways--for instance, by a rule simplifying the sequence of morphemes S + S, by a rule simplifying the clusters sz, zz, s̆z, etc. (see footnote 9), or by a condition preventing segmentalization of the Gen suffix in regular Pl forms (recall the discussion in section A above). Kruisinga, however, maintains that Gen and Pl don't occur together even in irregular forms; of the umlaut plurals men, geese, teeth, feet, lice, mice, and women, he says, 'These plurals with vowel-change must be looked upon as suppletive, rather than inflectional, forms. All of them that denote persons: men, women, and children, are so completely isolated from the corresponding singular that they can take a sibilantic suffix to serve as a genitive: men's, women's, children's' (sec. 761). I do not understand this claim. Moreover, as pointed out in Zwicky 1969:419, there are other acceptable irregular GenPls: oxen's, addenda's, both sheep's, seraphim's, etc. Apparently all zero-Pl and those irregular-Pl nouns with Pls ending in sonorants have GenPl forms, while the few irregular Pls ending in obstruents (feet, teeth, mice, geese, lice) do not (*feet's, *teeth's, etc.).

Kruisinga's account also rules out phrases like *the queens of England's because these would be cases of a Gen suffix added to nouns with a (nonfinal) Pl suffix. However, the occurrence or nonoccurrence of the Pl suffix is irrelevant, as can be seen from cases with umlaut or zero Pls: The man I mentioned's golf score is usually quite low

vs. *The men I mentioned's golf scores are usually quite low, Any sheep from Calgary's wool is beautiful, *All sheep from Calgary's wool is beautiful. Apparently, the GenPl is unacceptable whenever the NP in question doesn't end in its head N, as in the examples already cited and in A passer-by's arms were hurt in the accident vs. *Two passers-by's arms were hurt in the accident. That is, plurality is associated with the head word of an NP, genitivity with the final word of an NP, and to be acceptable, GenPl NPs must have Gen and Pl associated with the same word (whether or not Gen and Pl are realized as suffixes). The implications of these facts about GenPl NPs for the morphological description of English need further study.

Footnotes

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1. I do not consider analyses in which there is no attempt to fix on a single underlying form (or to argue that several distinct underlying forms are needed), as when Bloch 1947 simply lists the automatic alternants of the Prs suffix (Prs is represented as /z/, but as Bloch says in sec. 3.2 of the paper, this is merely 'to simplify the listing'). Nor do I consider analyses in which two or more distinct underlying forms are set up for the regular alternants of the Pst and PstP suffixes because of internal Psts like dwelt and put, in which the t-d-id alternations are nonautomatic--analyses like those of Bloch and of Juillard and Macris 1962:ch. 2, which set up three morphemes for Pst (one for the alternants d and id, one for t in both regular and internal Psts, and one for Ø in both internal and irregular Psts) and four for PstP (the three above plus one for the alternants n and in).

2. This is not quite true, since (as Silva and Zwicky 1973: sec. 2.2) point out, certain idioms with a markedly casual style require auxiliary reduction: You're telling mé!, So's your old man! How's your ass?

3. On the other hand, it has sometimes been argued that facts that might seem to motivate rules with opposite effects do not really do so, as when Eliasson 1972 maintains that Swedish alternations between unstressed e and Ø don't motivate both a syncope and an epenthesis rule, but only several syncope rules.

4. Compare the discussion by Mulder 1968:196, where the failure of automatic alternation is taken to motivate distinct phonological forms for the regular English Pl:

> ...the English forms 'eggs' /egS/ and 'sacks' /sakS/ are straightforward cases of neutralization of opposition between /s/ and /z/, because such forms as /...gs/ and /...kz/ are structurally not possible.
>
> However, in the English forms 'sins' /sinz/, 'ells' /elz/, and 'plays' /pleiz/, matters are different, because such forms as 'since' /sins/, 'else' /els/, and 'place'

/pleis/ can also occur. The expression of the plural morpheme in English apparently has three regular forms: /S/, /z/, and /iz/. Because /S/ represents both /s/ and /z/, however, /S/ and /z/ are not allomorphs in respect to each other. In fact, therefore, the English plural morpheme has only two regular phonological forms, i.e. /S/ or /z/ on the one hand and /iz/ on the other. The prediction of /z/ and /iz/ belongs to the domain of morphophonology; the prediction of /S/ belongs to phonology proper.

In respect of /iz/, though /s/ cannot follow a phoneme of the hissing and hushing order, there is, however, no phonological rule which prohibits /s/ from following /i/. Therefore, also /iz/ is a phonologically determined variant of a certain morpheme, i.e. it is a case of semi-phonological determination.

5. Miner 1972:26-8 notes a difficulty with assuming that the internal formations result from a change of boundary from # to +: sometimes it is the stem, sometimes the suffix, that is responsible for this change. Such a manipulation of boundaries goes beyond a proposal put forth by Stanley 1973:202-6, according to which only affixes could trigger the demotion of boundaries.

6. It is also possible, of course, that some forms require one treatment, some the other.

7. Negative environment statements in phonology have been proposed by Zwicky 1970b and Sampson 1973, among others. Zwicky 1970b notes that negative environment statements and curly brackets can be traded for one another in many cases, while Zwicky 1970c observes that curly brackets and paired alpha variables can be traded for one another in certain cases. Consequently, the issues at hand in this bibliography are tied to the curly brackets problem; see the discussion in McCawley 1971.

8. For King, this assumption eliminates a large number of putative historical changes in which rules would be added within the phonological component of a language.

9. Or by simplification of the final cluster, as evidenced in English in forms like long [lɔŋ] < /lɔng/, Black English and general casual [kowl] cold, and perhaps (as pointed out to me by G. K. Pullum) the Chinese/Dutch/Irish/Swiss as opposed to the Indians/Israelis/Greeks/Yugoslavs.

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Bibliography VI

A Critical Bibliography on the Tense/Lax Distinction in Vowels

Patricia Donegan Miller

A. Introductory remarks

References to a vowel distinction known variously as tense/lax, open/close, or narrow/wide have appeared in the literature of phonetics and phonology for at least a hundred years. Phonologists point out that the sound patterns of many languages indicate the existence of such a distinction; but phoneticians, thus far, through a variety of experimental approaches, have been unable to discover a consistent and particularized articulatory correlate of the distinction, although there does seem to be a rough acoustic correlate (a kind of 'centralization vs. peripheralization' with respect to the acoustical vowel diagram).

The following annotated bibliography is intended to note the major references to and descriptions of this distinction, and thus to document the search for its phonetic correlates. A variety of approaches to the distinction have been taken, and I will group the references around these major themes. I will use the terms tense and lax to refer to the phonological distinction, but I intend them as labels, without assuming particular physical correlates.

B. The literature

The original distinction referred to the shape of the vocal tract and was further defined in terms of articulatory effort.

Melville Bell (1867) refers to the distinction primary vs. wide with tense vowels being primary, and lax ones wide. Wide refers to the greater width of the pharyngeal cross-section for lax as opposed to tense vowels.

Sweet (1906) bases his narrow vs. wide distinction on the shape of the tongue and the resulting passage: narrow (tense) vowels have "a feeling of tenseness in that part of the tongue where the sound is formed, the surface of the tongue being made more convex than in its natural 'wide' shape, in which it is relaxed and flattened. This convexity...narrows the passage--whence the name." Sweet distinguishes the narrow/wide opposition from vowel height, maintaining that one can raise [ɛ] to [ɪ] without producing an intermediate [e].

Sievers (1901) calls the distinction gespannt (tense) vs. ungespannt (lax), and ascribes it to the tension of the tongue musculature and vocal bands. Sievers preferred his terminology to Sweet's or Bell's because his direct reference to tenseness would avoid confusion of this distinction with the height distinction.

Stumpf (1926) describes vowels in terms of the vocalic triangle. Since [i] is lowered and retracted when laxed, and [u] is lowered and advanced when laxed, he described the distinction which we call tense/lax in terms of a shift toward the middle of the vowel triangle. This seems to parallel Bell's notion of the tense vowels as primary.

Daniel Jones (1964) expresses doubts that differences in muscular tension correspond to the real facts of the tense/lax distinction. He regards tense/lax as a distinction applicable only to high vowels, [e/ɛ] being a distinction of height. He notes that lax [ɪ] is lowered and retracted from the close position of [i], and that lax [ʊ] is lowered and advanced as compared with [u], and he is apparently unwilling to make any further declaration on tenseness vs. laxness. However, he does observe that the tense/lax difference may be felt by placing the fingers on the throat and noting the different muscular tensions for the tense/lax pairs.

Raphael (1971) describes an electromyographic experiment to test the tense/lax hypothesis vis a vis the traditional vowel triangle. When genioglossus activity was measured for front vowels, the order of decreasing activity was [i, e, ɪ, ɛ], with [ɪ] and [e] transposed from their usual triangle positions with respect to height. Tongue height, however, may be based on more than just genioglossus activity. Jaw opening for [e] and [ɛ] is greater than for [i] and [ɪ], so the tongue bunching activity may be counterbalanced; and tongue backing may be involved in the production of [ɪ] and [ɛ], although the data acquired on the superior constrictor (an indicator of tongue backing) were not wholly consistent in this experiment. Raphael concludes that although his data do not strongly affirm the picture presented by the vowel triangle, they do allow for the possibility of such a view.

Meyer (1910) and others have concerned themselves with the possibility that the distinction is related to degree of air flow: tense vowels are associated with lower air flow than lax ones.

When Meyer measured air flow for tense and lax vowels, he found that there is a stronger approximation of the vocal cords and a correspondingly smaller air flow for tense vowels than for the corresponding lax ones.

Heffner (1950) points out that an acoustic and perceptual distinction of the tense/lax variety does seem to exist, but notes that 'there is nothing in the acoustic data that permits us to class [ɪ] with [i], or [ɛ] with [e], or to group any of the rest together'. He also points out that the distinction 'is not due merely to a difference in the elevation of the tongue.' He prefers to attribute the distinction to a difference in 'laryngeal positions and air pressures', noting Meyer's findings as to the 'breath consumption' of the various vowels. (pp. 96-98).

An attempt to verify Meyer's (1910) conclusions about the stronger vocal cord approximation and consequently smaller air flow of tense vowels is reported by Schumacher (1966). Tubes passed through the nose to the pharynx and esophagus were connected to manometers which measured supra-glottal and sub-glottal air pressure respectively. Mean air flow was measured by means of a flow meter. Mean air flow

was 1 1/3 times higher for lax vowels than for tense ones (both in closed syllables); sub-glottal pressure was the same. Tense vowels were 'characterized by a higher supraglottal air pressure', Schuhmacher observes, but it is difficult to see what the manometer connected to the pharynx was actually measuring in his experiment. (pp. 85-86). The air flow results support Meyer (1910), however.

Stetson (1951) suggested that tense/lax was related to syllable articulation and the manner in which the vowel is arrested. A syllable, for Stetson, 'is constituted by a ballistic movement of the intercostal muscles' (p. 33). He maintains that the lax vowels are arrested by a consonantal movement alone, while tense vowels are arrested by both the consonantal movement and a contraction of the arresting chest muscles (external intercostals). This explanation is dependent on the chest pulse theory of the syllable, however, which phoneticians no longer consider tenable.

A number of phoneticians have associated the distinction with length and with acoustic distance from a neutral vowel; in addition some retain a definition in terms of articulatory effort.

Jakobson Fant and Halle (1952) maintain that tense phonemes, in contra-distinction to lax ones, display a longer sound interval. They do not cite measurements to support this notion, and their attempt to distinguish tenseness from length (on the basis that the former is an inherent, 'protensity' feature and the latter a prosodic feature defined with reference to the syllabic chain) is not particularly successful. They maintain that tenseness differs from diffuseness because diffuse vowels are intrinsically shorter than compact ones, but that 'tense vowels have a longer duration than the corresponding lax ones'. [But since lax vowels are less diffuse than their tense counterparts, one would expect a canceling effect.]

Jakobson, Fant and Halle also state that, associated with their longer duration, tense vowels are articulated 'with greater distinctness and pressure' and with greater deviation from the neutral position (an open [æ] (p. 18)); and they note that this parallels the acoustic fact that the sum of the deviations of the formants of a tense vowel (from the neutral vowel [æ]) is always greater than that of the corresponding lax vowel.

In their 1964 paper, 'Tenseness and Laxness', Jakobson and Halle remark on Stumpf's (1926) and Jones' (1964) observations that laxness involves a shift toward the middle of the vocalic triangle. They reiterate their position that tenseness involves a greater deviation from the neutral position of the tract (very open [æ]), and they again relate this to the longer duration of tense segments and to their heightened sub-glottal pressure. [Note, however, that Schuhmacher (1966) found no difference in sub-glottal pressure.] This article is a modest expansion of the material in Jakobson et al. (1952).

The 'shift toward the middle of the vocalic triangle' is tested by H. P. Jørgensen (1966) in terms of the acoustical vowel diagram. Jørgensen measured formants of German vowels in German words spoken

by four speakers. He notes that the lax vowels were all lower than the corresponding tense ones (for one speaker, even lax /a/ had a higher F_1), and that the lax vowels were more centralized, i.e.--F_2 was characteristically higher for lax back vowels than for their tense counterparts, and F_2 was characteristically lower for lax front vowels than for their tense counterparts. F_1 and F_2 values were very close for tense and lax /a/. Jørgensen maintains, however, that the apparent acoustic centralization of non-low vowels does not necessarily reflect an articulatory centralization.

Requiring that phonetic features represent physical scales describing independently characterizable aspects of the speech event, Chomsky and Halle (1968) describe tense/lax in articulatory terms rather than acoustic ones. They refer again to the greater muscular effort, greater duration of the 'appropriate configuration', and greater deviation from neutral or rest position (which is now assumed to be that of [ɛ]) which characterize tense vowels (pp. 324-5). In Chapter 9, they claim that the unmarked value for tenseness is [+tense].

A number of linguists have attempted to associate tense/lax with tongue root advancement/retraction.

Ladefoged (1964) points out that many West African languages have a kind of vowel harmony based on something like tense/lax, where the vowels in any given word are either all from the tense set of vowels or all from the lax set. The articulatory correlates of the distinction seem to be hard to pin down, but by cineradiology the author finds that, in Igbo, 'in each case the body of the tongue is more retracted for the vowels of set 2. So it appears that there <u>is</u> a physiological parameter that distinguishes between these two sets of vowels, despite the fact that it is difficult to specify a unique auditory property that characterizes one or the other set.' (pp. 39-40). He refers to Sweet's mention of convexity or 'bunching up' of the tongue for 'narrow' vowels, and he suggests a redefinition of tense-lax or a return to Sweet's 'narrow-wide'.

Stewart (1967) describes the vowel harmony systems of dialects of Twi and Fante. In attempting to characterize the 'raised/unraised' contrast of their harmony systems, he notes that the 'raised' vowels are produced with the upper surface of the tongue raised and the lower surface of the chin lowered, and he suggests that the important factor must be a pushing forward of the root of the tongue. He notes that Ladefoged's (1964) cineradiology data for Igbo support this hypothesis. He maintains that the wide pharynx associated with raised vowels would account for their 'breathy' quality, and that advancing would also account for their greater susceptibility to palatalization (as opposed to their unraised counterparts. Stewart claims that raised/unraised (i.e. advanced/unadvanced) must be distinguished from tense/lax (in the Jakobson-Halle sense) for several reasons:

1. Unadvanced African back vowels show no shift toward the middle of the vocalic triangle,

2. Advanced and unadvanced vowels do not appear to have the length difference that Jakobson and Halle claimed to exist between

tense and lax vowels, and

3. Phonological evidence from the harmony systems studied indicates that unadvanced may be the unmarked member of the opposition, while lax is the marked member of tense/lax, and unadvanced is supposed to correspond to lax.

He remarks that 'the implications for their lax/tense distinction are serious if its supposed role in vowel harmony in African languages is the only evidence of its autonomy.' (p. 202), and he suggests that (1) if the African and European distinctions are to be identified, tongue root position is vital and length and tension are not (although he presents no experimental evidence against these correlates), and (2) that if such identification is possible, there is a strong case for viewing unadvanced or lax as the unmarked member.

In light of Halle and Stevens' (1969) suggested revision of vowel features, this article takes on a good bit of importance. It shows the origins of their suggestion, but it also makes apparent the premature nature of their claims regarding the marked and unmarked members of the opposition.

Chomsky and Halle (1968) also introduce an extra feature to account for the African vowel harmony systems: this is the feature covered/non-covered. Based on Ladefoged's X-ray tracings, they determine that 'covered sounds are produced with a pharynx in which the walls are narrowed and tensed and the larynx raised; uncovered sounds are produced without a special narrowing and tensing of the pharynx.' They associate a dull or breathy quality with 'covered' vowels. Chomsky and Halle here make no attempt to identify this distinction with tense/lax.

In an attempt to integrate tense/lax and covered/non-covered (±advanced tongue root), Halle and Stevens (1969) re-examine Bell's decisive role in the tense-lax distinction. Noting that the two classes of Igbo vowels are distinguished by movements of the tongue root, they suggest that (based on cineradiographs) English tense/lax pairs are similarly distinguished--that tense vowels have a wider cavity in the vicinity of the hyoid bone and lower pharynx. They note that the acoustic consequences of such a distinction are theoretically predictable: a lowering of F_1 with advancing, a raising of F_2 for front vowels with advancing, and a lowering of F_2 for back vowels with advancing. For non-low vowels at least, these predictions fit the acoustic differences (between tense and lax vowels) that actually occur. They would fit Ladefoged's African data, except that his data show no downward F_2 shift for back vowels with advancing. Halle and Stevens suggest that unmarked high vowels are [+Advanced Root], and unmarked low vowels are [-Advanced Root]; for mid vowels, they don't know yet. They note that in many languages advancing is concomitant with height.

It is suggested that a flattened-out sound wave form is responsible for the dull or breathy character of vowels with advancing, and the authors speculate on the reasons for this effect, but they draw no firm conclusions.

Continuing the approach taken by Halle and Stevens, Perkell (1971) proposes two revisions, based on physiology, of the features specifying vowels. His 'suggested revisions' are the replacement of [±Tense] by [±Advanced Tongue Root] and the replacement of [±Low]

by [±Constricted Pharynx] (the latter an unpublished suggestion of Halle and Stevens). Using superimposed tracings of lateral cineradiographs of two speakers, Perkell attempts to provide 'a crude physiological framework corresponding to the features' (p. 128). That is, he attempts to associate each feature with the activity of a particular muscle group.

In [+High] vowels, the tongue body and mandible are higher (than for [-High]), and the posterior third of the genioglossus and the styloglossi are responsible. The sternohyoid and sternothyroid lower the hyoid bone and larynx during [+High] vowels. For [+Back] vowels, the styloglossi and hyoglossi pull the tongue body back. One speaker also used the pharyngeal constrictors for this. It is suggested that tongue root advancing is due to the contraction of a small segment of the genioglossus at the tongue root. The contour of the posterior half of the tongue dorsum, the epiglottis, and the hyoid bone are farther back for [+Constricted Pharynx] vowels, probably due to contraction of the middle and lower pharyngeal constrictors and the hyoglossi.

Perkell points out that considerable muscular interaction is involved in achieving 'the phonetic and acoustic goals'; and he suggests that the physiological configurations correlated with the new features support these two suggested revisions.

Lindau, Jacobson and Ladefoged (1972) observe that the suggestion of the feature [±Advanced Tongue Root] involves two claims: that it distinguishes vowels in some way other than the features high and low distinguish them; and that the tense/lax distinction in English and German is identifiable with the distinction which governs African vowel harmony sets. In order to determine whether advancing is independent of the tongue height mechanisms, Lindau et al. traced cineradiographs or X-rays of four African speakers, one German, and six English speakers. Their measurements showed that advancing was clearly used to separate the tense/lax sets of Twi and Dho-Luo, and that high vowels were partly differentiated by advancing in Igbo, but that in Ateso the vowel sets differed by height, not by a separate mechanism of advancing. In German, too, the difference in advancing between tense and lax vowels was non-significant; tongue height was attained by lifting and advancing, so advancing was not a separate mechanism for the German speaker. For English, it seems that 'there is a substantial variability in the mechanisms used to distinguish between vowels. Tongue height is attained by different combinations of jaw opening, lifting, and advanced tongue root for different speakers.' (p. 87). It is suggested that a vowel target may be a particular configuration in an acoustic space where the relations between formants play a crucial role.

The authors also note that the variation among English speakers (their use of different articulatory mechanisms to produce perceptually similar vowels) shows the need for caution in viewing the productions of a single speaker as characteristic of the language.

In 'An auditory motor theory of speech perception', which appeared simultaneously with Lindau et al. (1972), Ladefoged, Declerk, Lindau, and Papcun (1972) discuss the results of studies of

cinefluorograms of six speakers of American English; they note that various speakers use various combinations of mechanisms to produce what is perceptually the same sound. Regarding the tense/lax distinction, their speakers 2, 3, and 6 use advanced tongue root to produce tense vowels, but the other speakers vary considerably.

Ladefoged et al. suggest that speakers use acoustic rather than articulatory targets for vowels, noting Lindblom and Sundberg's (1971) observations that speakers can produce a given vowel with a variety of jaw openings--with no apparent need for modification governed by auditory feedback. F_1 could be correlated with vowel height, and F_2 may be correlated with the traditional front-back dimension, according to Ladefoged et al. Lip rounding, which is a fairly straightforward articulatory feature, has 'no uniform auditory or acoustic correlates', and may be organized by speakers in articulatory terms, even though vowel height and frontness are based on acoustic correlates.

The variety of approaches shown here is adequate testimony to the difficulty of finding precise phonetic correlates for this frequently-mentioned phonological distinction. In spite of the difficulty, however, the phonetician is not free to conclude that the distinction does not exist; such a conclusion would leave unexplained the phonological facts which argue for such a distinction.

C. Comments from a phonologist

A look at the phonological effects of tenseness and laxness may help clarify the sorts of phonetic correlates to be expected. In studying diachronic, synchronic, and developmental phonological substitutions, I have observed that vowels are distinguished from other vowels not only by height but also by color (Miller, forthcoming). Color includes principally palatality (tongue-fronting), and labiality (lip-rounding, lip-narrowing).

The distinction between chromatic vowels (those marked by one or more color) and achromatics (vowels without color, like [ɨ ɯ ʌ ɤ ɑ]) is revealed in context-free phonological processes such as raising, which applies to chromatic vowels and not to achromatic vowels, or lowering, which applies to achromatic vowels if it applies to chromatic ones. Presumably, raising is a phonological means of optimizing color--by providing a closer articulation which makes increased palatality or labiality possible. Achromatic vowels, which are free of the close articulations associated with palatality and labiality, are especially susceptible to lowering, which seems to be a phonological means of optimizing sonority (in the traditional sense). A similar hierarchy of susceptibility appears in bleaching, the loss of palatality and/or labiality: the susceptibility of a vowel to bleaching is an inverse function of its height, and thus apparently of its degree of palatality or labiality.

The way these substitutions respond to color or degree of color is exactly paralleled by the way they respond to tenseness. If lax vowels are raised, the corresponding tense vowels are raised. Conversely, if tense vowels are lowered or bleached, the corresponding

lax vowels are lowered or bleached. This strongly suggests that tenseness is a relatively greater degree of color--palatality or labiality or (in front rounded vowels) both.

These facts suggest that achromatic (nonpalatal, nonlabial) vowels could not participate in a tense/lax distinction. There is some phonological evidence for this conclusion: languages that give up a long/short distinction typically recode it, in the chromatic vowels, as a tense/lax distinction. But unless one or both of the pair [ɑ:/ɑ] is 'colored' (changed to [æ] or [ɔ]), these achromatic vowels merge. A well-known example is Romance (Labov et al., 1972).

In some languages, the length distinction is not lost, but tense/lax is superimposed on long/short. This appears to be the case in Modern German; here, as Jørgensen's (1966) study shows, the non-low, chromatic vowels show a quality distinction for tense/lax pairs, but the two achromatics display nearly identical formant values, suggesting that the so-called tense/lax distinction for this pair may really be long/short instead.

The phonological distinction 'intense/non-intense color' corresponds to and summarizes many of the various kinds of physical correlates associated with tense/lax.

A number of authors (Jakobson, Fant and Halle (1952), Jakobson and Halle (1964), Jørgensen (1966), Ladefoged et al. (1972)) point out the lower F_1 value and the more extreme F_2 values of tense vowels as opposed to the corresponding lax ones: this amounts to the acoustic centralization of lax vowels and peripherality of tense ones. Correspondingly, even though the articulatory correlates of tenseness remain rather ill-defined, there is general agreement that the articulatory gesture is somehow more extreme for the tense member of a tense-lax pair. Raphael determined that geniglossus activity is greater for the tense vowels [i, e] than for the lax [ɪ,ɛ]; and Meyer (1910) and Schuhmacher (1966) note a lower airflow in tense vowels which suggests a more constricted oral articulation.

Jakobson, Fant and Halle (1952) maintain that length is one of the physical correlates of tenseness, but none of the studies surveyed have pursued their claim. The above-mentioned tendency for length to be recoded as tenseness or for tenseness to be superimposed on length is evidence that tenseness is phonologically related to length, but this tendency could be accounted for by pointing out that the greater duration of long vowels apparently allows time for the more extreme articulations associated with tenseness. If Jakobson et al. are correct in claiming that tense vowels are inherently longer than the corresponding lax vowels, one might expect to find languages whose tense vowels become phonologically long, or are treated as long by a phonological process. That is, a process might class all tense vowels together with (tense and lax) long vowels--e.g. [i, i:, ɪ:] would undergo or condition the process but [ɪ] would not--but I do not know of any clear cases of such a situation.

The precise relationship of tenseness to tongue-root advancement is not clear, but judging from the work of Ladefoged et al. (1972) and Lindau et al. (1972), it does not look as if they can be regarded

as the same feature, on either articulatory or acoustic grounds. In any event I know of no phonological evidence that the two features are the same--e.g. there do not seem to be any languages where vowel harmony is based on a tense-lax distinction of the 'European' variety; and, as far as I know, there is no relation between the advanced-tongue-root distinction and length in African vowel harmony languages which display an advancing distinction. For speakers of languages like German or English who advance the tongue-root in producing a tense/lax distinction, advancing may serve as a color-amplifying gesture (for palatal vowels) which occurs in conjunction with tongue lifting. The relation of advancement to tenseness in back or round vowels is not well-established, although Perkell found that advancing bore some relation to the [u/ʊ] distinction for two speakers; in general, the articulatory correlates of tenseness have been less thoroughly studied for non-palatal vowels.

In suggesting that the phonological distinction tense/lax can be described as intensity/nonintensity of color, I do not mean to imply that no more precise physical description can be or ought to be found. On the contrary, the explanation of the phonological substitutions which are sensitive to this distinction depends on the discovery of its physical correlates. The investigation of these physical correlates, however, can be aided by attention to the kinds of substitutions which the distinction conditions.

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