Coarticulation and Phonetic Competence

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syllables in + *breath groups* are caused by air pressure peaks. Independent data of Fromkin and Ohala (1968, Kyoto Speech Symp.) are consistent with these electromyographic observations. The Fromkin and Ohala data also show that the mean rate of change of f_0 with respect to air pressure is 12.5 Hz/cm H_2O. These data support the archetypal correlates of the *breath group* and the "motor theory" for the perception of intonation proposed in Lieberman (**1967**). They also support a phonetic theory in which implementation rules relate phonetic features to articulatory maneuvers.

2:45

I4. Pitch and Sentence Intonation. A. KUMAR AND K. OJAMAA, *University of Connecticut, Storrs, Connecticut 06268.*—Spectrograms of utterances consisting of various combinations of consonants and vowels were studied in order to determine what voice fundamental-frequency fluctuations are predictable from segmental structure. Questions and statements with different stress patterns were also recorded and studied. After corrections were made for predictable coarticulation effects, a characteristic f_0 contour was found to be associated with each sentence type. This relationship turned out to be a complex one; i.e., there is marked interaction between various stress patterns and sentence types. For example, the extent of terminal pitch rise in question sentences is affected by the relative positions of stress-bearing elements in the sentences. The observed effect can be explained by postulating differences in rates of lung volume change during the breath groups corresponding to different stress patterns. These findings seem to suggest that the perception of prominence and question intonation involves a special decoding device (be it innate or learned) that combines acoustic data with "knowledge" about articulation to derive the underlying linguistically relevant, phonemic intonation contour.

3:00

I5. Coarticulation Effects on Pitch. K. OJAMAA, D. ERICKSON, AND A. KUMAR, *University of Connecticut, Storrs, Connecticut 06268.*—The effects of vowels and consonants on the fundamental frequency of syllables were explored by examining spectrograms of consonant–vowel (C–V) and V–C utterances spoken in isolation. Comparisons of the differences in average fundamental frequencies for these syllables revealed relatively little evidence of consonantal influence on the average fundamental frequencies of adjacent vowels. However, by comparing the degree and amount of rise in fundamental frequency (i.e., pitch contours) in syllable initial and final positions, certain interesting phenomena were observed. In general, syllables that begin with voiceless consonants have a pitch contour characterized by a higher initial F_0 than their voiced counterparts and are followed by a sharper fall; syllables with voiceless consonants in final position have a characteristically sudden drop in the pitch contour. An explanation for these facts is offered in terms of changes in transglottal air-pressure drop as a result of variations in supraglottal vocal tract configuration as well as timing of laryngeal muscle gestures relative to consonant closure. It is felt that these predictable mechanical effects are among the variables that should be taken into account when analyzing the role of intonation in speech.

3:15

I6. Relation between Syntactic and Perceptual Units in Speech Processing. R. J. JARVELLA AND D. B. PISONI, *University of Michigan, Ann Arbor, Michigan 48104.*—A running memory-span technique was used to demonstrate effects on the processing of continuous speech that were related to its syntactic structure. Test pauses were introduced at and between sentence boundaries in auditorily presented narrative passages. Subjects were instructed to write down, maintaining correct word order, parts of the passages occurring just before the test pauses. Verbatim recall for sentences that were either interrupted or bounded by the pauses was nearly always perfect, while the great proportion of errors made occurred in sentences previously completed. The obtained results support a view of speech processing in which the unit of immediate comprehension corresponds to single sentence-sized linguistic segments; the psychological organization within this unit during comprehension is related isomorphically to its surface syntactic form. More generally, this research indicates the potential value of an approach to the analysis of speech and speech processess that considers more abstract linguistic levels than are overtly correlated with the acoustic signal itself.

3:30

I7. Coarticulation and Phonetic Competence. MARCEL A. A. TATHAM, *University of Essex, Colchester, Essex, England.*—This paper examines possible criteria for establishing competence/performance distinctions in phonetic theory. It is emphasized that for the competence aspect, rules should take a form compatible with those of the phonological component, and question of whether the coarticulation phenomenon can be handled adequately in the phonetic competence model is also discussed. Recent electromyographic data are referred to, and the problem of the relative roles of active and passive (voluntary and involuntary) programming of the muscles associated with articulation re-examined. It is argued that the area is by no means exhausted and that there are even yet questions to be asked.

3:45

I8. Prosodic Model for Orthographic-to-Phonetic Conversion of English. R. VANDERSLICE, *City University of New York, Flushing, New York 11367.*—The subset of prosodemic features that occur within sense groups (excluding grammatical pauses and shifts, which occur between sense groups) comprises *accentuation* and *intonation.* "Prosodemic" designates *grammar-expounding* as opposed to indexical features—a crucial distinction for reading machines in that text-sensitive assignment of indexical features is a cardinal requirement for fictive texts (including poetry), but can be omitted for straight factual prose, whose conversion to speech requires only that prosodemes (and, of course, segmentals) be appropriately assigned. Modeling accentual phenomena in terms of the binary features ACCENT and EMPHASIS eliminates degrees of "stress." The correct assignment of these features requires two kinds of information: syntactic (ultimately semantic) considerations govern which words in a sentence are accented (or emphasized); and orthoepic considerations determine which syllables in a word are weak and which strong—and, of the latter, which ones may receive the accents if the word is accented. Final disposition of accents and emphases is mediated by surface rules, contingent on the rate and style of speech, which produce, e.g., "rhythmic" recessions and suppressions of accents. Two intonational features—CADENCE, or postnuclear fall, and ENDGLIDE, or terminal rise—provide the four standard contours *falling, rising, fall–rise,* and *sustained.*

4:00

I9. Laterality Factors in the Recall of Sentences Varying in Semantic Constraint. R. J. JARVELLA, S. J. HERMAN, AND D. B. PISONI, *Program in Psycholinguistics, University of Michigan, Ann Arbor, Michigan 48104.*—The role of the