PREFACE

This report proposes some questions to be discussed by specialists working on various aspects of speech communication. These questions concern the ultimate discrete components of language, their specific structure, their inventory in the languages of the world, their identification on the acoustical and perceptual levels and their articulatory prerequisites.

We regard the present list of distinctive features, and particularly their definitions on different levels, as a provisional sketch which is open to discussion and which requires experimental verification and further elaboration. The nature of these problems calls for coordinated research by linguists, psychologists, experts in the physiology of speech and hearing, physicists, communications and electronics engineers, mathematicians, students in symbolic logic and semiotics, and neurologists dealing with language disturbances, as well as the investigators of the poetic use of speech sounds.

The occasional remarks on auditory experience with respect to single distinctive features are meant merely as clues to future experiments in this domain. The articulatory data have deliberately been made brief and their only justification is a desire to outline the connection between the motor means and the acoustic effect; for a more complete treatment of articulatory movements see handbooks of general phonetics (1).

Since this study is addressed to workers in several fields, it was considered appropriate in places, to include certain data even though it might appear elementary to the specialist in any one domain. We have done our utmost to avoid the ambiguity and misunderstanding resulting from the unfortunate diversity of the terminology used in the different disciplines relating to communication.

The names of the distinctive features are meant to denote linguistic discriminations: in other words, the significant discriminations utilized in the code common to the members of a speech community. The stage of the speech event to which a given term is etymologically connected is much less important. Thus a term which alludes to the articulation may at times be used if the articulatory fact in question is common to all the manifestations of the given feature, e.g., the nasalization feature. Similarly, it is not important whether the term refers primarily to the physical or perceptual level, as long as the feature is definable on both levels. In cases where no generally accepted term was available, we have used names for certain distinctive features which may later be supplanted by more suitable ones. Nevertheless, a discussion of the features themselves seems to us more pertinent than an argument over their labels.

Wherever suitable English examples were available, they have been used. Unless otherwise indicated the specimens are from the stabilized and unified British Standard which has been exhaustively described under the label RP (Received Pronunciation) coined by Daniel Jones (2). When languages other than

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English are used, we have endeavored to make the examples as simple and as clear as possible.

The signs employed in transcribed examples are those of the International Phonetic Association (3) with a few modifications. A) The affricates are represented by single letters, the same as those used for the corresponding (homorganic) constrictives but with a superscript ^: sh - /ʃ/, ch - /ʧ/. B) When indicating the stress, the sign is placed immediately before the accented vowel. C) In accordance with the proposals of the Copenhagen Phonetic Conference (4) we render the syllabic and non-syllabic function of a phoneme by the subscripts $_{o}$ and $_{\frown}$ respectively, voicing by $_{,}$ and voicelessness by $_{v}$.

The examples quoted within diagonals present the phonemic ("broad") transcription which analyzes speech into phonemes. The examples quoted in square brackets give the phonetic ("narrow") transcription which is concerned with the variety of speech sounds emitted, without reference to their function in language. Examples given in conventional spelling form are underlined.

Many problems which are merely mentioned in passing will be discussed by us elsewhere. A more detailed treatment of the theoretical questions outlined in Chapter I and particularly of the relation between the sound shape and its functions in language will be given in a future publication (5), where also our analysis of the English phonemic pattern will be discussed more explicitly.

The mathematical treatment of the information carried by the distinctive features within a message and of their information capacity within a given language code is the subject of a special study being prepared in collaboration with Professor W. Hurewicz of the Department of Mathematics of M.I.T.

We are greatly indebted to Professor L. L. Beranek, Technical Director of the Acoustics Laboratory, M.I.T., and to Professor S. S. Stevens, Director of the Psychological Laboratories, Harvard University, for the many valuable suggestions which they made upon reading our manuscript. We are grateful to Dr. G. von Békésy, Senior Research Fellow in Psychophysics at Harvard University, for his illuminating comments on many of the problems involved. The inspired participation of Professor John Lotz in various stages of our discussions greatly contributed to their progress. We thank Professors W. Hurewicz, J. C. R. Licklider, and W. A. Rosenblith, M.I.T., for their stimulating remarks.

This publication could hardly have been completed without the help of Professor W. N. Locke, Head of the Department of Modern Languages, M.I.T., who contributed generously both time and advice.

We wish to acknowledge further the contributions of Mr. R. F. Schreitmueller, Dr. K. N. Stevens and other members of the staffs of the Acoustics Labora-

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tory and the Research Laboratory of Electronics, M.I.T., where a large part of this research has been carried on in connection with projects financed under grants from the U. S. Air Force and the Carnegie Foundation.

The research project in modern Russian at the Department of Slavic Languages and Literatures, Harvard University, generously supported by the Rockefeller Foundation, and especially the superb x-ray studies made as part of this research by Dr. A. S. MacMillan and Dr. George Kelemen at the Massachusetts Eye and Ear Infirmary, Harvard Medical School, clarified many crucial points.

For our spectrograms we used records kindly provided by Professor Marguerite Durand, Institut de Phonétique, Paris, for French; by Dr. F. S. Cooper, Associate Research Director of Haskins Laboratories, Professor John Lotz and Dr. A. Kuypers for Circassian; by Professor Clyde Kluckhohn, Harvard University, for Navaho; by Professor E. Westphal of the London School of Oriental and African Studies for Xhosa. Professor Osman Kemal Mawardi, M.I.T., Dr. Hari Keshab Sen, Harvard College Observatory, and Mr. Esat Turak, Harvard School of Design, graciously consented to serve as native speakers for spectrograms of Arabic, Bengali and Turkish. We owe thanks also to Mr. L. G. Jones of Northeastern University for spectrograms of English and for kindly communicating to us the results of his own experiments.

We want to express our particular gratitude to Avis M. Tetley, who has been both patient and efficient in seeing the manuscript through the press.

Criticisms and comments on any of the facts, concepts, terms, or interpretations presented in this report will be appreciated.

Cambridge, December 1951

Since the first edition of our Preliminaries is out of print and the demand for copies continues, we are publishing this second printing. The corrections and additions were made possible through the numerous valuable suggestions received from our correspondents. We are especially indebted to Professors C. H. Borgström (University of Oslo), K. Bouda (University of Erlangen), T. M. Camara (Rio de Janeiro), E. Fischer-Jørgensen (University of Copenhagen), R-M. S. Heffner (University of Wisconsin), W. Z. Leopold (Northwestern University), C. Lévi-Strauss (University of Paris), H. Penzl (University of Michigan), K. L. Pike (University of Michigan), T. H. Sebeok (Indiana University), K. Togeby (University of Copenhagen), W. F. Twaddell (Brown University) and H. Werner (Clark University). Mr. G. de Saussure

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(M.I.T.) kindly served as native speaker for our new French spectrograms and enabled us to confirm the phonemic definition of nasality proposed in the Cours de Linguistique of his grandfather. The Electronics Research Project of Northeastern University graciously permitted us to reproduce the instructive intervalgrams of the English stops executed there by Mr. Jacob Wiren. We thank Mr. E. D. Canonge, Summer Institute of Linguistics, Norman, Oklahoma, for the Comanche records and their phonemic transcription.

Cambridge, May 1952

The present reissue, which reproduces unchanged the text of the second printing, has been made necessary by the continuing demand for Preliminaries to Speech Analysis. We had hoped to publish a revised edition of the monograph at this time, but work on the revision has taken longer than originally expected. Some of the material that will be included in the revised edition may be found in the following articles and books:

1. Roman Jakobson and Morris Halle: Fundamentals of Language (The Hague, 1956); Germ. trans. by G. F. Meier Grundlagen der Sprache (Berlin, 1960)
2. Roman Jakobson and Morris Halle: "Phonology in Relation to Phonetics," in L. Kaiser ed., Manual of Phonetics, (Amsterdam, 1957) pp. 215-251
3. Morris Halle: "In Defence of the Number Two," Studies Presented to J. Whatmough (The Hague, 1957) pp. 65-72
4. Roman Jakobson: "Mufaxxama: The Emphatic Phonemes of Arabic," Studies Presented to J. Whatmough (The Hague, 1957) pp. 105-115
5. Morris Halle: "Questions of Linguistics," Il Nuovo Cimento, Suppl. to vol. 13, series X, pp. 494-517 (1959)
6. Morris Halle: The Sound Pattern of Russian (The Hague, 1959)
7. Gunnar Fant: Acoustic Theory of Speech Production (The Hague, 1960)
8. Roman Jakobson and Morris Halle: "Tenseness and Laxness"

Roman Jakobson, Harvard University
C. Gunnar M. Fant, Royal Institute of Technology, Stockholm
Morris Halle, Massachusetts Institute of Technology

Cambridge, September 1961

The text of the present printing remains unchanged except for the addition of the article "Tenseness and Laxness" on page 57.

Cambridge, August, 1963

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I THE CONCEPT OF THE DISTINCTIVE FEATURE

1.1 RESOLVING SPEECH INTO ULTIMATE UNITS.

In a typical test of the intelligibility of speech, an English speaking announcer pronounces isolated root words (bill, put, fig, etc.), and an English speaking listener endeavors to recognize them correctly. For the listener this situation is in one sense simpler than normal speech communication because the word samples with which he deals cannot be broken up into shorter meaningful entities and are not grouped into higher units. Thus the division of sentences into words and of words into their grammatical components does not concern this listener. Nor need he account for the interrelation of words within a sentence and of various grammatical components within a complex word (ex-port-s, im-port-ed, re-port-ing, mid-night).

In another sense, however, this test is more complicated than normal speech communication. Neither the context nor the situation aids the listener in the task of discrimination. If the word bill were to appear in the sequence one dollar bill or as a single word said to a waiter after a meal, the listener would be able to predict its appearance. In such a situation, the sounds which compose this word are redundant to a high degree, since they "could have been inferred a priori"(1). If, however, the word is deprived of any prompting context, either verbal or non-verbal, it can be recognized by the listener only through its sound-shape. Consequently, in this situation the speech sounds convey the maximum amount of information.

The question arises: how many significant units, i.e., units relevant for the discrimination of the samples, do the sound-shapes of the samples contain? Upon perceiving syllables such as bill and pull, the listener recognizes them as two different words distinguishable by their initial part /bi/ and /pu/ respectively. This distinctive fraction, however, may be decomposed in turn. The listener, and any member of the English speech community, has in his vocabulary words such as pill and bull. On the one hand, identical means are employed for distinguishing bill from pill and bull from pull. On the other hand, the distinction between bill and bull is the same as that between pill and pull. Thus to distinguish between bill and pull a double operation is necessary. The fraction /bi/ in bill proves capable of being split into two segments /b/ and /i/, the first exemplified by the pair bill - pill and the second by bill - bull.

Each of the two segments derived serves to distinguish the word bill from a whole series of vocables, all other things being equal.* For each of them a set of other segments can be substituted. This substitution of one segment by others is called commutation.

* Henceforth we shall use the more condensed Latin equivalent of this formula: ceteris paribus.

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