SOME USES OF PHONETIC DATA IN COMMUNICATION SYSTEMS

L. S. HARMS

1. INTRODUCTION

The view a scholar takes toward phonetic science influences what he takes from it and contributes to it. In the preface of the 1957 *Manual of Phonetics*, Louise Kaiser explains that "The book was intended to contain both a survey of the development of phonetics offered by present methods and an attempt to determine the place phonetics has among other sciences." In the first chapter of the 1968 *Manual*, Bertil Malmberg asserts, "There is only one way of defining phonetics without running into all kinds of difficulties and contradictions. That is to define it as a branch of linguistics...". But a science sometimes thrives on such difficulties and contradictions even though the individual scientist may from time to time weary of such an unwieldy state of affairs. As I see it, the place of phonetics is still an open question.

What is at stake is the degree to which phonetics becomes a closed branch of some field, or is open to incorporate new data and new technique, and to pursue its own course. The work of Jaffe and his colleagues provides a convenient illustration. In their examination of dyadic conversation, they found a substantial difference in the pause patterns in the monologue and the dialogue. The switching pause — when the communicator speaking becomes silent, and the other communicator in the dyad begins talking — turns out to be a critical matter. The details of the switching pause are amenable to study by the techniques of phonetics. The switching pause seems to be exactly on the line between a focused linguistic study of language and the more general study of communication systems. Clearly, phonetic science does now produce data of wide use in the study of communication systems. It will encounter, however, some instructive difficulties and contradictions if it evolves from the study of the monologue of the individual speaker to the dialogue of two communicators making speech sounds in a dyadic communication system.

2. HUMAN COMMUNICATION SYSTEMS

In recent years, there has evolved an attempt to unify diverse areas of science. This

attempt is called General Systems Theory. The theorist following this approach is directed toward finding similarities among branches of science, and most particularly, among the systems studied by different branches of science. Typically, the quest for useful similarities extends to systems which are larger than or smaller than a system of primary interest.

Within the study of communication systems, for instance, dyadic systems are smaller than small group systems of seven (plus or minus two) communicators, and larger than the single communicator viewed as a language user or a monologue producer.

The examination of the phonetic data generated in the individual, dyad and small group systems leads on to the discovery of both similarities and differences. There is nothing directly comparable to the switching pause, for instance, in the monologue. It could, in time, lead to a redefinition of the phoneme and an extension of notions of juncture and intonation.

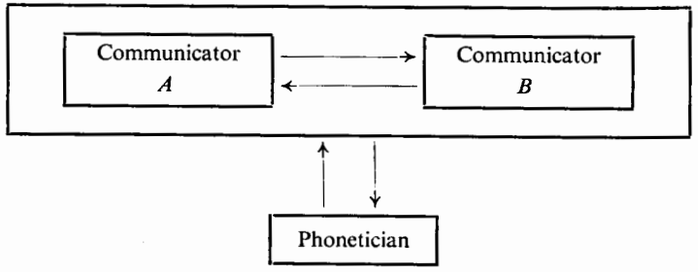

Fig. 1. Dyadic communication system.

Figure 1 models a simple dyadic system. In such a system, both Communicator *A* and Communicator *B* listen continuously. *A* and *B* alternate in speaking. The delayed auditory feedback studies demonstrate conclusively that *A* hears himself as he is talking. In free conversation, there is about 4 percent overlap or time when both *A* and *B* are talking.

In a dyadic communication system, there are six possible system states. These are:

(1) Communicator *A* holds the floor and there is joint silence;
(2) Communicator *A* holds the floor and vocalizes alone;
(3) Communicator *A* holds the floor and both vocalize;
(4) Communicator *B* holds the floor and there is joint silence;
(5) Communicator *B* holds the floor and vocalizes alone; and,
(6) Communicator *B* holds the floor and both vocalize.

Thus, it becomes possible to distinguish between a pause that *A* makes at the end of various units, and the pause that occurs when *A* ceases talking and *B* commences talking, and also the negative pause that occurs when both talk at the same time.

3. A LEARNING SYSTEM APPLICATION

A training approach has been developed on a dyadic model that makes extensive use of phonetic data. The system was designed to modify the dialect of the young college-age adult living in a multi-lingual community. Each student prepares a word list of vocabulary items in his major field of study. He produces sentences of ten words (plus or minus two words) using three words from his list.

The sequence of learning activities is shown in Figure 2. Notice that Communicator *A* produces a sentence. If he does not consider what he hears to be a good sentence, Communicator *B* asks *A* to reproduce it. Otherwise, *B* repeats the sentence in all its details. Evaluator *C* observes the sentence *A* produces and that *B* repeats. If he hears the same good sentence twice, he signals *A* to produce the next sentence. If he does not hear the same good sentence twice, he asks *A* to resay the sentence. This process continues, until ten good sentences in sequence are produced and repeated without the need for recycling, or until fifteen minutes elapse. When the ten-sentence criterion is reached, or fifteen minutes elapse, *A*, *B*, and the Evaluator shift roles. Different students are assembled during different learning sessions.

The first unit in the Learning System, as briefly described above, rests on a careful foundation of phonetic data. Other units in the Learning System build on the same general pattern of produce, repeat and evaluate. Students before work in the learning system are rated by judges as speaking a sub-standard English and they are rated after training by the same or similar judges as speaking a standard English.

4. A TEST PROCEDURE

A dyadic system approach to human speech communication leads on to novel developments in testing. Language-based tests of phonetic details employ a trained judge or rely on the analysis of phonetic detail of pronunciation. In both cases, the assessment depends on a standard external to the speaker-evaluator dyad operating as a communication system. The approach reported here relies on a direct measurement procedure.

The basic data-gathering operation is shown in Table 1.

TABLE 1

Communicator *A*	Communicator *B*
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0 ran	. 0 can
. 0 thin	0 tin
0	. 0 ...
.	.
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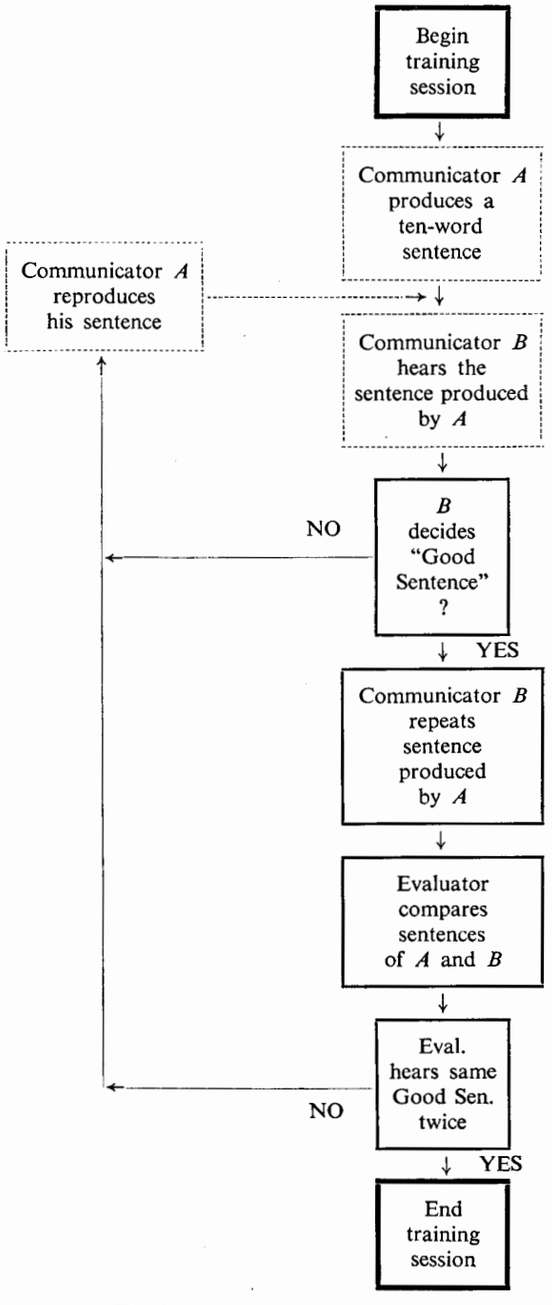

Fig. 2. Dyadic learning system.

The dot cues Communicator *A* to speak the word; *B* signals whether the word on his list is the same or different. If the words are the same, both *A* and *B* black in the mark-sense bubble. If the words are different, neither *A* nor *B* marks. Next, *B* speaks a word, and *A* signals. Both mark same; neither marks different. On any card, there are a possible twenty such exchanges. The time alloted for completion makes it unlikely that any AB dyad finishes all twenty test items.

Each communicator has eight 'phonetic data' cards. Each communicator forms a dyad with eight different communicators in the manner illustrated by Figure 3. All test instructions are presented on tape. The tape serves also to time the dyads. The test items are printed on mark-sense data cards. These cards can be hand scored, machine-punched or optically read onto computer tape. Computer programs have been prepared to score and to perform a variety of analyses on the data.

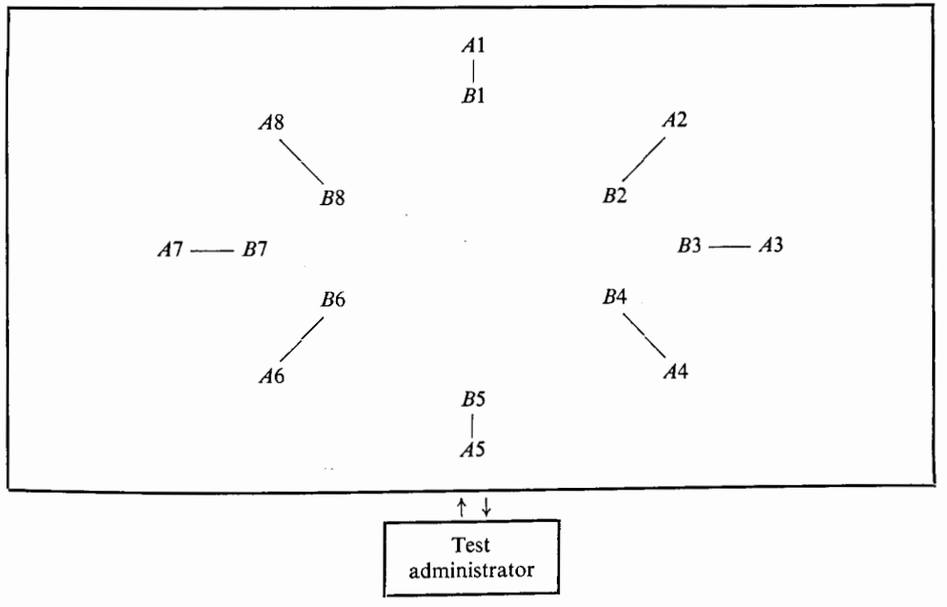

Fig. 3. Seating Chart for Hawaii Communication Test.

The 'phonetic data' operations described above form the first sub-test of the newly developed Hawaii Communication Test. In line with General Systems notions, the other subtests are built on this same model. The other four subtests include sentence processing, information transfer, affect and joint problem solving. The complete test takes about fifty minutes. The phonetic subtest, in particular, draws heavily on findings from phonetics, and it also promises to contribute data that will in the future have strong bearing on phoneme theory, and other topics of interest in a modern science of phonetics.

5. SUMMARY

The place of phonetics among the sciences depends on the use made of its findings, and the new findings and techniques integrated into the core of the field. Obviously, some approaches lead to difficulties and contradictions. But awkward and inconvenient problems can at times lead to a more powerful science. The utilization of the dyad as one basic unit for the study of speech sounds can expand the role of phonetics, increase its data, and sharpen its techniques.

Two extensions of phonetic science were reported. Both of these uses of phonetic data promise to return new data to phonetics. Further work along these lines is in progress and is being extended to the study of intercultural communication via satellite in the Pacific Basin.

Department of Speech Communication
University of Hawaii

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DISCUSSION

KINLOCH (Fredericton, N.B.)
In Figure 1, at the stage

Communicator *B* repeats sentence reproduced by *A*

does Communicator *B* consciously try to reproduce dialectal variations used by *A*?

HARMS
The evaluator often reports that this reproduction does appear to happen.