Language and Communication

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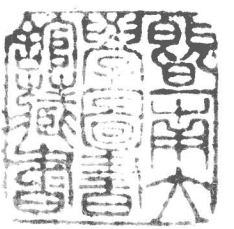

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From Chapter 1, "By Way of Introduction":

"The orientation of this book is strongly biased in two directions; it is scientific, and it is psychological. A scientific study of language, as opposed to a speculative discussion, begins with direct observations of communicating individuals and searches for the relation of these observations to the existing body of scientific knowledge. There exist many speculations of a literary or philosophical nature that are interesting and stimulate the imagination; unless these speculations lead to scientific observations and generalizations, they are not discussed here. Rejecting opinions in favor of facts helps to reduce this vast topic to manageable proportions. The psychological bias restricts the discussion to the effects of language on the behavior of the individual. Psychology is the science of behavior. Our present interest is not in language as one of the social graces, but as a kind of cooperative human behavior."

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PREFACE

This manuscript was begun in the summer of 1946, when the author first tried to select a text for an undergraduate course entitled The Psychology of Speech and Communication. No text could be found. The choice was between assigning six or seven different books or no book at all. This annoyance provided a stimulus. Now, five years and two mimeographed versions later, the response to this stimulus has been completed. The outcome is a book aimed at upper-class undergraduate or graduate courses in the psychology of communication.

Communication, if it is anything at all, is a social event. The spread of information through a group of people is one of the most important social events that can occur. When one tries to assemble the facts about this important social event, however, the data come from all fields of science. The diversity of sources has made the job an exacting one. One is never certain that something of vital importance is not hiding in an obscure transaction of a mathematical, philological, phonetic, sociological, anthropological, philosophical, or engineering society. The author does not want to suggest that he has either read all this literature or evaluated it correctly. This text is not an encyclopedia of linguistics. There are a lot of facts here, but certainly not all of them.

The purpose was to pull together in one book the more important approaches to the study of communicative behavior. In an introductory and necessarily superficial way the book tries to suggest the breadth of the spectrum of linguistic studies. These various approaches are discussed in terms that make sense to a modern psychologist.

The bias is behavioristic—not fanatically behavioristic, but certainly tainted by a preference. There does not seem to be a more scientific kind of bias, or, if there is, it turns out to be behaviorism after all. The careful reader will discover occasional subjective lapses. Undoubtedly in these instances, a scientific approach is possible, but the author was unable to find one or think of one. The argument nonetheless goes as far down the behavioristic path as one can clearly see the way. It is necessary to be explicit about this behavioristic bias, for there is much talk in the pages that follow about patterns and organizations. Psychological interest in patterning is traditionally subjective, but not necessarily so. Discussion of the patterning of symbols and the influences of context run through the manuscript like clotheslines on which the variegated laundry of language and communication is hung out to dry. It

is not pleasant to think that these clotheslines must be made from the sand of subjectivity.

It is a pleasant chore to recall help received from others. Professor C. T. Morgan deserves the reader's gratitude for his corrections of many obscurities and some downright mistakes. Professor S. S. Stevens' dogged persistence as an editor and critic made it possible to avoid some of the stylistic hazards an author can put in the reader's way. Doctor J. G. Beebe-Center has taken some of the arguments seriously enough to answer them with criticism and encouragement. Doctor D. A. Ramsdell has never tired of contending that language is even more complicated than this book pretends to find it. Doctor M. R. Rosenzweig gave valuable criticisms of the first draft, Doctor R. L. Solomon made numerous improvements in Chap. 9, and Professor B. F. Skinner was kind enough to read Chap. 8. Doctors F. C. Frick, E. B. Newman, and J. C. R. Licklider scuttled many of the author's thoughtless thoughts before they could become embarrassing in less congenial gatherings. Professor Roman Jakobson helped to reduce the number of linguistic blunders, and Doctor Yehoshua Bar-Hillel provided similar advice on several points of logic. The most valued critics, however, have been the undergraduates whose examination papers were faithful mirrors of their teacher's inadequacies. Against all these friendly critics is balanced the one person who was never critical, who typed four versions of the manuscript and mimeographed two, and who had persistent faith that the job was worth doing. Students and colleagues were helpful, but without the unwavering interest and industry of Katherine James Miller, the job would not have been done.

Some of the writing was done while the author held a position in the Psycho-Acoustic Laboratory. Good use was made of the laboratory's secretarial, drafting, and photographic facilities. Consequently, this book appears as PNR–100 from the Psycho-Acoustic Laboratory, Harvard University, under contract with the United States Navy, Office of Naval Research (Contract N5ori–76, Project NR142–201), and reproduction for any purpose of the United States government is permitted.

Acknowledgments

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1939, pp. 59, 61; Prentice-Hall, for the quotation in Chap. 12, from C. W. Morris, *Signs, Language and Behavior*, 1946, p. 214.

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GEORGE A. MILLER

CAMBRIDGE, MASS.
July, 1951

PREFACE TO REVISED EDITION

I have taken advantage of this re-issue of the book to make several minor corrections in the text. In general, however, I have not attempted to introduce new material or to soften the behavioristic bias that characterized the original text.

GEORGE A. MILLER

CAMBRIDGE, MASS.
January, 1963

FOREWORD TO THE TEACHER

Since few courses in language and communication are currently offered in departments of psychology, a few words of advice may prove helpful to psychologists who contemplate introducing such a course.

The first point concerns the order in which the subject matter is introduced. Some experimentation has led to the conclusion that there are two satisfactory orders. One is to begin with the molar, social phenomena of communication and then to proceed by more and more detailed analysis to the molecular facts of perception and phonetics. This order has the advantage of catching the student's interest initially and of keeping fairly good morale. The second possible order is exactly the reverse of the first and is the order adopted in this book. Proceeding from the detailed to the general, from the dull to the interesting, costs something in student enthusiasm. There are two reasons for paying the price. The first is that for most students language is a magical and subjective affair. It is not easy for the beginner to think scientifically, objectively, about language and communication. If a course of this sort is to have any permanent effect upon the student, it will probably be in the replacement of this magical attitude by a more scientific and reasonable one. The best way to introduce this kind of thinking is in terms of phonetics, perception, and statistics. Then when the more highly personalized functions of language are introduced, there is far less resistance to a continuation of this attitude.

The second reason for beginning at the molecular level is that we know better what we are talking about. The percentage of speculation is much lower for the discussion of phonetics than it is for the discussion of propaganda. As a consequence of this better factual support, it is possible to outline certain basic concepts about communication in a relatively compelling way. Once these concepts are established as valid in the regions where the evidence is well known, it is then much easier to generalize them for regions where the evidence is yet to be gathered. Thus the detailed study of the mechanical parts of communication can provide a firm foundation for the interpretation of more ambiguous subjects. The opposite approach, unfortunately, provides only the most ephemeral basis for the perceptual and phonetic studies and encourages students to waste too much time resisting ideas they cannot fully understand.

There is also a certain historical justification for beginning with phonetics and perception. Our knowledge of language and communication has grown in that order. Studies of the social aspects of communication are recent inno-

vations, whereas the perceptual processes have been of interest since the earliest psychological inquiries.

With a little effort the student can be helped over this initial barrier. Demonstrations are most valuable. Some demonstrations that have proved simple and instructive are: (1) recording breathing during speech and during quiet, (2) displaying speech waves on a cathode-ray oscilloscope, (3) administering some standard audiometric test, (4) constructing passages at different orders of approximation to English by having members of the class add successive words. Many other demonstrations are possible, depending upon the facilities available to the instructor. The effects of filtering, masking, or otherwise distorting phonographically recorded speech always provide an interesting period if the electronic gadgetry is at hand. In addition to demonstrations, the standard devices of motion pictures and slides are also useful.

In later sections of the course there are numerous verbal learning experiments that make interesting demonstrations. Few instructors will want to miss the chance of demonstrating the distortions of testimony or the natural growth of rumor, for these have considerable appeal to most students. If the projection lantern can be equipped with a reasonably good camera shutter, tachistoscopic demonstrations can be introduced.

With all the devices of visual education, however, there are still sections of the course that students will not understand until they have actually worked with the materials themselves. The simple distinction between types and tokens is usually difficult until the student has actually counted words in a passage and computed some simple type-token ratios. This is conveniently done in the form of a homework problem. Other assignments that have proved valuable are: (1) translating from phonetic notation into ordinary English, (2) computing the readability of three or four short passages, (3) outlining procedures for teaching certain specific words to a young child, (4) collecting rumors and the relevant data about them.

The book can be divided into two parts, the first including Chaps. 1 through 5, and the second including Chaps. 6 through 12. Courses for students with backgrounds in linguistics and in the engineering sciences should emphasize the first part. Courses for students in psychology and sociology should emphasize the second part. It is not advisable, however, to delete the first five chapters, for they develop several ideas about amount of information and redundancy that are used in the last seven chapters. In general, terms are defined explicitly the first time they are introduced, and not thereafter.

Most teachers will find that they are able to lecture far beyond the content of the text in several of the chapters, but few will be able to do so for every chapter. The discussion of the mathematical theory of information is apt to require work by teacher and student alike. This theory should be studied in the original form in the book by Shannon and Weaver, *The Mathematical Theory of Communication.* Chapters by Licklider and Miller in S. S. Stevens' *Hand-*

book of Experimental Psychology may also prove useful. Although this theory has many implications for psychology, it is relatively new and unfamiliar. In graduate seminars these references are suitable for student reports. A good background for lectures on acoustic phonetics can be obtained from the well-illustrated book by Potter, Kopp, and Green, *Visible Speech*, and Bloch and Trager, in their *Outline of Linguistic Analysis*, provide an excellent orientation toward physiological phonetics. On the perception of speech the final section of Fletcher, *Speech and Hearing*, though now somewhat out of date, is still the best thing available. Armed with these references, the lecturer need have little fear of misinforming his students on these relatively technical subjects.

The subject of language and communication is at least as broad as the subject of psychology itself. In many respects, therefore, a course in the psychology of communication resembles an introductory course in general psychology. The principal difference is that the examples are drawn from human verbal behavior. With this specialization and with somewhat more sophisticated students it is possible to go into more detail, but anyone who has offered a broad introductory course in psychology will have little difficulty preparing lectures on language and communication.

CONTENTS

Chapter 1

BY WAY OF INTRODUCTION

"When *I* use a word," Humpty Dumpty said in rather a scornful tone, "it means just what I choose it to mean—neither more nor less."

"The question is," said Alice, "whether you *can* make words mean so many different things."

"The question is," said Humpty Dumpty, "which is to be master—that's all."

—LEWIS CARROLL

The object of this book is to summarize for students of psychology the results of scientific studies of language and communication. These studies have been made by men of widely differing backgrounds and interests and for diverse and often unrelated purposes. Communication is so pervasively important in all walks of life that every branch of the social sciences is concerned with it, studies it, and adds to the general fund of knowledge about it. The beginning student is often overwhelmed by the variety of forms that the study of communication can assume and finds it quite difficult to reconcile one with another or to develop any well-rounded evaluation of the subject as a whole. He needs an introductory orientation to this heterogeneous field of knowledge. It is this need which the following pages are designed to satisfy.

The orientation of this book is strongly biased in two directions; it is *scientific*, and it is *psychological*. A scientific study of language, as opposed to a speculative discussion, begins with direct observations of communicating individuals and searches for the relation of these observations to the existing body of scientific knowledge. There exist many speculations of a literary or philosophical nature that are interesting and stimulate the imagination; unless these speculations lead to scientific observations and generalizations, they are not discussed here. Rejecting opinions in favor of facts helps to reduce this vast topic to manageable proportions. The psychological bias restricts the discussion to the effects of language on the behavior of the individual. Psychology is the science of behavior. Our present interest is not in language as one of the social graces, but as a kind of cooperative human behavior.

In some respects the scientific study of communication resembles the task of soaring off the ground with a tug at your own bootstraps. Science is, in one sense of the term, the set of symbols that scientists use to communicate their knowledge to other scientists. These symbols are published in journals and books and tables, and the symbols of one generation are studied by the

scientists of the next. A science of communication, like all other science, must consist of such a set of scientific symbols. The peculiar aspect of a science of communication is that its scientific symbols refer to other symbols. It uses language to talk about language, and it is somewhat puzzling that new symbols about old symbols could clarify the problem in any way.

The ordinary language of every day's sociabilities becomes the object discussed in another language of science. It is as if we used microscopes to study microscopes or yardsticks to study yardsticks. A similar dilemma confronted the pioneer psychologists who set out to understand the human mind. Their only weapon was the human mind itself, and they were forced to ask themselves, Can the mind comprehend itself? The student of language must ask himself a similar question. Can we advance our knowledge of the use of symbols by the use of symbols? Or, more bluntly, is a science of communication possible?

Such a bootstrap undertaking requires a new attitude toward language. To the student who begins the study of verbal behavior for the first time language is a personal, almost magical thing bound up inextricably with his private thoughts and feelings and ideas. Before he can begin a scientific study of speech and communication, he must learn to take a detached, *formal* attitude toward it. In the formal attitude the personal, meaningful aspects of verbal behavior are often ignored, and the symbols are seen as simple patterns of muscular twitches, or agitations of the air molecules, or patterns of squiggles on the page. The scientific study of language begins with this formal impersonal attitude toward these twitches, agitations, and squiggles.

The formal attitude toward communication is an important first step. A scientist can consider that his own verbal behavior is not under scientific scrutiny; he uses it to talk about the verbal behavior of other people. It is often easier to be objective about what other people are doing than about what we ourselves are doing. A scientist can forget that his friend across the room is saying something. He looks at the movements of the mouth and face as a kind of artistic dance. He listens to the melody rather than the words. He asks himself, Does the pitch glide up or down at the pauses, does every grouping of sounds follow the same pattern? Does the talker use more verbs than adjectives? Why does he select that particular pattern of symbols instead of some other? What does his speech reveal about him as a speaker? What is his effect upon the other listeners? After a little practice the scientist is able to look at verbal behavior as impersonally as he regards a falling stone or a whirring motor. Then he is ready to begin the formal, scientific study of verbal behavior.

Why Behavior?

An interesting theory of the origin of language in the human race holds that speech movements imitate gestures normally made with the arms and head. Suppose, for instance, a primitive man wanted to make a beckoning

gesture, but it was dark, or his hands were full, or his companion was not looking. In this crisis he got the idea of making a gesture with his tongue at the same time his throat made a noise. The friend interpreted the sound as phonation modified by a beckoning tongue movement and came running. Presumably.

Whether or not this theory is correct we shall probably never know. It does serve to illustrate a behavioral approach to the problem of communication. To think of speech as audible movement and comparable to movements of the arms and legs is to think of speech as vocal behavior. Viewed in this way, speech is not essentially different from acts of other types. Its apparent uniqueness rests upon its importance to man, the talking animal. Speech accomplishes the same sort of result that other behaviors could, only more expeditiously.

Many people who have not considered carefully the psychologist's problems have been puzzled that he is reluctant to use mentalistic terms like 'experience,' 'consciousness,' 'ideas,' etc., unless he can relate them to observable behavior. The reason is simple enough. Science is a public affair, but personal experiences are personal. To enter the domain of science, personal experiences must be made accessible, observable, public. Unless the personal experience is reflected by the person's behavior in some public way, it cannot be studied. If a psychologist wished to study your dreams, for example, you would have to convert them into vocal behavior. Then he could study your vocalizations. But he cannot study the dream itself.

One of the psychologist's great methodological difficulties is how he can make the events he wishes to study publicly observable, countable, measurable.

It is significant to note that the device most often used for conversion from private to public is verbal behavior. Thus speech is a crucial problem for psychology. None of his other activities gives the same sort of insight into another person as does his verbal behavior. Since men spend so many of their waking hours generating and responding to words, and since speech is such a typically human mode of adjustment, no general theory of psychology will be adequate if it does not take account of verbal behavior.

This is no simple task. The psychologist has usually found it easier to think clearly about nonverbal behavior, and he has accumulated information about knee jerks, stomach contractions, salivating dogs, etc., and has attempted to bring some order into this mass of behavioral observations. By assuming a formal attitude toward verbal behavior we hope to be able to treat it within the broad framework of the psychologist's generalizations.

How One Thing Signifies Another

Begin with some basic, perhaps self-evident, concepts. It is natural to distinguish an organism from its environment. We say the organism is

designed by evolution to convert food and water into tissues and work and to reproduce. To accomplish these functions in an ever-changing world, the state of the organism and the state of the environment must be able to mold and direct the organism's behavior. The necessary information is supplied by means of specialized cells called receptors and neurons. Because of these cells the central nervous system is affected indirectly by the changes going on in and around the organism.

Such statements are widely accepted and would not concern us here but for an implication they hold for the study of speech and language. Intermediate between the stimulating situation and the response to it is always the activity of receptor cells and sensory nerves. As far as the brain is concerned the activity of the sensory nerves stands for, or represents, the stimuli. The representation is adequate for most behavioral adaptations; it is nonetheless a highly schematic and inaccurate picture of the world. Thus physics tells us the thing we perceive to be a table is mostly open space and is held together by fields of force in a way entirely foreign to our general knowledge of tables.

It is common to begin a discussion of communication by pointing out that words are *signs* that conveniently replace the objects or ideas they represent. It would be misleading to imply, however, that this representative character of words distinguishes them sharply from all other stimuli to which we respond. The word 'chair' is clearly not the chair itself, but a symbol for the chair. Similarly, the light reflected from the object is not the chair itself. In either case the response is made to something that represents the chair. The something may be light rays reflected from the chair, or it may be sound waves arbitrarily associated with the chair. But it is not the chair.

In short, listeners respond to spoken words in the same way they respond to other energies that impinge upon their receptor organs.

As they affect the organism's behavior, stimuli do not present themselves in random, unorganized ways. We do not respond to the chair as if its right arm belonged to the table nearby and the seat were an especially thick portion of the carpet. The chair hangs together as a unit, separated from the table unit beside it and the carpet unit beneath it. It is an important psychological problem to discover the conditions under which stimuli are responded to as stable configurations. The problem is basic to verbal behavior; without such organization we could achieve no agreement as to the objects our words represent.

These remarks, which hold for stimuli in general, also apply to the verbal stimuli that affect us. Words do not present themselves in random, unorganized ways. Sentences hold together as units, and the component parts complement and modify one another according to their patterning. Words are not distinguished from other stimuli on the basis of configuration, for we impose organization on all the stimuli to which we respond.

Words cannot be distinguished from other stimuli on the basis of their repre-

sentative role or their organization into patterns. What, then, is the distinguishing mark of a verbal stimulus? One possible distinction is that words have an *arbitrary* significance. Words signify only what we have learned that they signify. The fact that we say 'chair' and not '*Stuhl*' is a matter of social coincidence. In contrast, the association between the light rays reflected from a chair and the chair itself is not arbitrary. Verbal signs that are organized into linguistic systems are usually called verbal *symbols*.

The arbitrary nature of a verbal stimulus is clear when we consider the role of learning. In general we learn to repeat those acts which are rewarded. If bumping into a chair is never rewarded, we soon stop behaving that way and start walking around it. In such cases the nature of the physical situation ensures that our responses develop in a certain way. Our response to the word 'chair,' however, develops differently. In order that we learn to respond correctly to the word 'chair,' *it is necessary for another organism to intervene and reward us each time we respond correctly.* Since the intervening organism can reward a range of possible responses, the choice of the sound pattern 'chair' is quite arbitrary.

The first encounter with a foreign language usually leaves the visitor surprised at the perversity of the foreigners. Why would anybody use an improbable name like '*Pferd*' for something that is clearly a horse? The arbitrariness of names is usually easier to accept, however, than the arbitrariness of grammatical structure. Why would anybody wait till the end of a sentence to give the verbs? It is hard to abandon the feeling that the unfamiliar is absurd and illogical. It is part of the formal attitude toward language to see that one name or one grammatical rule can be just as good as another. The important thing is that everyone agrees to the name or rule, whatever it is.

Once a society has adopted a set of symbols and rules for combining them, the conventions are no longer arbitrary. If everyone agrees to call a horse a horse, then we are no longer free to call horses by any symbol that occurs to us. Selecting new words arbitrarily isolates us from the rest of the language community. The arbitrary decision was made centuries ago, and many people abide by it. The point is that other decisions might have been made.

We have said that we must study behavior, that verbalization is a special and important kind of behavior, that behavior must be guided by stimulation, and that the association between stimulation and action may be quite arbitrary. A general introduction would not be complete, however, if it did not stress the importance of order, of pattern, in verbal behavior.

Speech sounds do not occur as isolated bits. They are interwoven in elaborate designs. It is instructive to imagine a language that makes no use of the pattern of its individual sounds. 'Ah' might stand for 'How do you do' and 'ee' for 'Please help me,' and so on. There would be very few things such a language could talk about, for men can make and distinguish less than 100