American Handbook of Psychiatry

Social Communication and the Information Sciences

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SOCIAL COMMUNICATION AND THE INFORMATION SCIENCES

Historical Note

Human communication involves all the procedures by which one mind may affect another. This includes not only speech but also the gestural and action behavior that people use to influence one another. But in spite of the central role that communication plays in our lives, the origins of language and speech are still somewhat obscure. The earliest remains of our material culture consist of crude articles of stone that date back close to a million years. Although we can surmise that people signaled to each other at this early stage, it is not until the appearance of Neanderthal man that signs of speech and communication become more convincing. Characteristic flint points, a bone industry, and burial grounds have been discovered that can be attributed to this middle Paleolithic period, which dates from about 150,000 to 75,000 B.C. These findings, together with evidence of the use of fire, betray the existence of simple social institutions that presuppose man's ability to communicate. However, the space on the floor of the Neanderthal jaw where the tongue muscles attach was very small, and we may conclude that these people probably could not talk too well. But speech and language with certainty are tied to the *Homo sapiens* group, which appeared during the fourth glaciation, within the last fifty thousand years. Engraved tools and cave

paintings remove all doubt about prehistoric man's ability to cope with complex symbolic systems [pp. 560-571].

The inferential evidence from which the evolution of communication has been reconstructed gives way to direct evidence with the appearance of the cuneiform writing of the Sumerians. These people, who lived in the Mesopotamian Valley from about 4000 B.C. on, together with the Babylonians and Assyrians have been credited with the development of the pictorial system of denotation. Thus, it was roughly 6000 years ago that man for the first time was able to store information and to codify his knowledge for posterity. Writing took a new direction between 2000 and 1500 B.C. when the Phoenicians and the Jews found ways to record the sounds people made when they spoke. The system of phonetic denotation was refined further in the next three millennia with the development of calligraphy, writing materials, and shorthand codes, and with the establishment of distance communication through the use of messengers and smoke signals. If in antiquity and well into the Middle Ages the art of writing was the prerogative of priests and scribes who herewith became the guardians of man's cumulative body of knowledge, the invention of the printing press—in China in the ninth century and in Europe in the fifteenth—broke this monopoly and laid the foundations for modern mass education. In the nineteenth century, technological innovations such as the telegraph, telephone, and radio enabled people to transmit messages almost instantaneously over long distances, and

in the twentieth century, finally, television added another dimension to long-range communication. At this point, the world entered the phase of technical mass communication.

The development of language, the invention of phonetic writing, and the introduction of communication machines profoundly influenced man's relationship to man. Whorf was perhaps the first to point out that the structure of language influences the perception of the world around us; and when we write down symbols and list them in dictionaries, we give more permanent shape to our fleeting perceptions. The act of codifying events is, of course, the basis of all cultural evolution—a fact that distinguishes human from animal communication. Thus, the invention of writing made it unnecessary for people to be within hailing distance of each other when they wished to communicate, and messages could be transmitted over greater distances and spans of time. The separation of man from his message is the innovation that made possible all later communication engineering.

If the first step in the evolution of communication was the development of spoken language and the second step the invention of pictorial writing, the third step was related to the development of digital and verbal codification systems. Early pictorial writing was based upon similarities between the original events and their symbolic representation; the introduction of phonetic denotation, however, required special instructions to explain which

symbols belonged to which sounds and which sounds stood for what events. Phonetic codification, arbitrary and free of analogies, lent itself to the development of abstract languages and numerical systems, and these, in turn, made possible the eventual construction of the digital computer.

The fourth step in the evolution of communication was the creation of communication machinery that could emit, receive, and evaluate messages without the presence of man. In the modern world, robots interact with each other or with human beings, and communication is no longer the sole prerogative of living organisms. Sometimes an undetected and usually anonymous entity, either man or machine, can be interposed between communicating people to record, select, amplify, delete, condense, rebroadcast, or otherwise tamper with the exchange of messages, often without the knowledge of the participants. The alliance of engineers who construct communication machines, operators who manage these machines, and advertisers who shape the content makes up the modern message manipulating industry [pp. 260-300].

The history of communication is significant for the psychiatrist because ontogeny seems to repeat phylogeny [pp. 300-317] Beginning with the first communicative sounds, the first movements, and the first picture book, the infant moves through all the steps that his ancestors took over thousands of years, until he reaches maturity. And much can happen to the individual

during his growth that will distort or stunt communication and be responsible for abnormal behavior. Also, language is the psychiatrist's main tool, which he employs when taking a history or engaging in any form of group therapy or psychotherapy. But it took almost a hundred years, after the establishment of psychiatry as a discipline, before the systematic study of communication was given recognition. Among the earliest contributions to the study of disturbed communication were those of the neuropathologists who described various abnormalities of the central nervous system and defects of the sensory and motor systems. Language and speech disturbances were focused upon by the psychophysiologists, while the classical psychopathologists described the disturbances of retention, recall, recognition, feeling, thinking, and judgment.' Freud and the psychoanalysts focused upon the message exchange between doctor and patient and pointed out the importance of early human growth and development. At the time of the Great Depression, a concern with the social aspects of human behavior signaled the beginning of the theory of interpersonal and group relations. After World War II the rapid advances made by the communication engineers gave rise to the information sciences. The amalgamation of these various movements and disciplines is the subject of this chapter.

Social Communication

Communication links discontinuous parts of the living world to one

another. Its principal function is to facilitate sexual propagation, in that any species characterized by at least two genders must possess means of communication in order to reproduce. Communication is made possible by three basic properties of living matter found at all levels of organization, ranging from the single cell to complex societies. In organisms we call these properties perception, decision making, and expression; and in machines we refer to input, information processing, and output. These functions, of course, constitute the foundation upon which human relations and man-machine interaction rest. The term "social communication" as used in this context refers to the live exchange of messages mediated by vocal sounds, written signs, gestures, or movements without modification by machines.

The basic networks of social communication are one to one, one to many, many to one, and many to many. One-to-one communication occurs between two people such as husband and wife, mother and infant, teacher and pupil, doctor and patient, and lawyer and client. It is characterized by instant feedback, a large number of nonverbal components, and a subject matter that frequently bears directly upon feelings and personal experiences.

One-to-many communication occurs in the lecture hall, in church, at political meetings, in military situations, or whenever one person addresses others in writing. The system is asymmetrical; the content is mostly impersonal, hortatory, or informational; the duration of the presentation is

brief; and feedback, if it occurs at all, is usually delayed. In the modern world, this manner of communication is identified mostly with mass communication [pp. 348-381] and [pp. 535-551].

Many-to-one communication occurs when spectators boo or cheer a player or an official, when constituents write their congressman, when people congratulate the guest of honor, or when people vote at an election. The system is asymmetrical and of short duration; the subject matter is limited; the content is situation-oriented; and feedback is delayed. Public opinion polls exemplify this type of network [pp. 40-60].

Many-to-many communication occurs when one group meets another—in battle, on the playing field, and during demonstrations and migrations. Communication may be physical through action, the system short-lived, and the content closely tied to competition and survival. Feedback is often instantaneous [pp. 247-261].

From these few examples it becomes evident that the arrangement of the network determines to a large extent the effectiveness of communication [pp. 70-115]. In industry, government, and the military this aspect of communication is referred to as organization. It determines the assignment of tasks in social networks whereby the original functions of the organism—perception, decision making, and expression—are now distributed among

many people. Control of communication through organization assures that the messages of numerous people get properly directed and coordinated.

The assessment of a social network of communication is based upon the answers obtained to a number of pertinent questions that may be asked by the investigator [21-46].

WHO (status, role, identity)

SAID WHAT (content or referential property of symbols)

TO WHOM (status, role, identity)

WHEN (chronological, biological, elapsed time)

WHERE (context , situation, location)

HOW (language: oral, written, gestural; metalanguage: instructions, interpretative devices)

WITH WHAT EFFECT (feedback, result)

The questions WHO and TO WHOM can be answered by studying the social characteristics of the participants and the manner in which a communique is coded, phrased, and timed. The whole style frequently

identifies the sender as well as the receiver. The WHAT refers to the events that the signs and symbols represent. Proper usage presupposes conformity to the prevailing customs as laid down in dictionaries or legends. Unfortunately for the scientist, people observe, in addition to the dictionary usage, a multitude of informal and private conventions. Husbands and wives, parents and children, industrial crews, members of clubs, and sports teams develop private vocabularies. Thus, a message can be comprehended in many ways, depending upon the interpretation. The WHEN refers to various aspects of time and timing. Clues usually indicate the chronological date, the point in the evolution of a given situation, and the position of this message in a series of messages. The WHERE deals with the social context in which communication takes place.

The label of the situation should furnish the participants with enough information to identify the rules indicating who can talk to whom, about what, for how long, where, and in what manner. Usually, there is an indication of the consequences or penalties for violation of the rules. The HOW refers to the language system in which a message is phrased and the manner of its transmission. If the message is expressed in English, it may be spoken, written, or transmitted by semaphore signals, jungle drums, or a sign language such as those of the Indians and the deaf and dumb. The EFFECT can be evaluated by studying the changes that a message produces in the psychological sphere (attitudes, opinions, beliefs) in social matters (laws,

elected officials, procedures) or in the physical world.

Three sets of determinants influence social communication. The biological determinants control the organs of communication' involving the sensory and motor systems, and the central and autonomic nervous systems. Disorders of the human communication organs may interfere with perception, thinking, feeling, speech, and action. The psychological determinants—that is, the knowledge and experience a person has acquired —influence sophistication in cognition and the ability to make decisions, to express self, and to initiate and carry out action. Neurotic processes and intrapsychic conflicts may interfere with the successful exercise of these functions of communication. The social determinants are embodied in culture, language, nonverbal symbolic systems, collective assumptions, and value orientations to which an individual is exposed. A specialist in communication, therefore, has to acquire knowledge of anatomy, physiology, psychology, psychopathology, anthropology, and sociology. From medicine to psychiatry and from the social to the information sciences ranges the field of relevance.

Social communication shapes a person's body of knowledge; his opinions, attitudes, and beliefs; his ideas about the world and about himself; his sense of identity; his role in society; his skill in relating to others; and his ability to cope with personal problems.

But the most important aspect of social communication is the potential for gratification that it provides. The release of tension that occurs after a successful message exchange contrasts with the unresolved tension experienced with failure to communicate. Only through communication with others can man tackle complex tasks. Communication thus becomes the tool with which the individual transcends himself, implements cooperation with others, and satisfies his need for belonging.

The Information Sciences

The origin of the information sciences can be traced back to 1948 when C. E. Shannon published his now famous mathematical theory of communication in which he defined information quantitatively and described criteria for the evaluation of communication systems. Although information theory at first held great promise for psychology and biology, it later turned out to be something of a disappointment. For one thing, the quality of information is more important in human affairs than the quantity. For another, information theory can only be applied to a network that is characterized by discrete channels and a uniform coding system. But the human organism has multiple coding systems: one type is characterized by nervous impulses;' another by chemical stimuli traveling in the vascular system; and a third by structural arrangements of DNA in the nucleus of the cell. Living organs are open systems and some of the body codes are still

unknown, some of the channels are not discrete, and the sources of input are multiple. But, in spite of these limitations in applicability, information theory has greatly fertilized the thinking in the life sciences.

Also in 1948, Wiener published his book on cybernetics, which he called *Cybernetics or Control and Communication in the Animal and the Machine.132* This theory of feedback and servomechanisms embodies the idea that information about the effects of an action can be signaled back to its source, enabling the information control center to plan the next step. Cybernetics has had a significant impact upon the behavioral sciences because it is applicable to machines, organs, organizations, and societies.

A third theory of communication that is most relevant for the field of engineering is the theory of smoothing, filtering, detection, and prediction of the value of signals in the presence of noise. Unfortunately, in social situations the distinction between signal and noise or between intentional and unintentional messages is not applicable. In social communication the human observer utilizes all the information he can extract from the message itself, from the situational context, and from the physical environment. Unintentional signals and incidental perceptions may have just as much informative value as those contained in the message, and, therefore, these sources cannot be classified as noise.

A fourth group of theories concerned with automata and computers, including hardware design and programming, has perhaps exerted the greatest influence on our time. Through the renaissance, mechanical devices served to increase the capacity of our motor system. In the baroque period, the scope of our sense organs was extended and engines began to replace muscular energy. Finally, in the twentieth century with the advent of the computer, the capacity of our central functions has been enlarged. The computer can react selectively to suitable inputs and can combine input with information derived from the memory, thus simulating decision making. Because of the similarity between a computer program and a series of logical statements, theorems now can be tested by feeding data into a computer and checking whether the results turn out as expected. Today, then, we start with a verbal or mathematical theory, construct an external model, and test operationally the correctness of our assumptions.

We owe to the late Warren McCulloch and the Macy Foundation the introduction of principles of cybernetics into neurophysiology, psychiatry, and the behavioral sciences. But the most extraordinary impact of information theory occurred in the field of genetics. Starting with the assumption that cells, tissues, organs, and organisms must be integrated by some information-bearing signal system, the geneticists were able to show that information is coded inside the cells in terms of various arrangements of nucleic acids. Finally, the idea that organisms and life are steered by some

mysterious central function such as the soul has been replaced by the notion that organisms are held together by an internal communication system and are linked to the environment by an external communication system. Intactness and functioning of these systems are as vital to survival as respiration, nutrition, or temperature control.

Today, most scientific institutions have access to a computer center. The hardware of a computer consists of input and output devices, arithmetic and control circuits, and a memory; the software consists of a program of instructions according to which the information is processed. The computer works on the binary principle, which means that the information is represented by binary symbols, is stored in binary memory elements, and is processed by binary switching elements. Although computers are more than a million times faster than the human brain, their elements are arranged in series so that the component parts have to be in working order if the computer is to function properly. The brain, in contrast, has about a thousand times as many nerve cells as the computer has memory elements, occupies considerably less space, and works on a multiple input systems that can process different kinds of information simultaneously. At any one time, the computer can attend to one task accurately and fast; the brain, in contrast, can pursue several tasks simultaneously but with less accuracy. Loss of cells does not appreciably influence the functioning of the brain as a whole—a feature that is most useful in case of injury or disease.

Modern computer operations of significance to health fall into the following areas:

1. Information Storage, Retrieval, Collection, and Dissemination. The tremendous capacity for storage of information has given the computer the role of an auxiliary memory. All person has to remember are the retrieval words in order to have access to what he is searching for; and libraries of the future may be of a kind in which a dialing system will flash the desired page onto a video screen.

2. Information Processing, Computation, and Statistical Analysis. The rapidity of operation of the computer has made it possible to carry out thousands of statistical operations in a minimum of time. The computer is used for description and tabulation of data and for carrying out standard statistical analyses, including multivariate, regression, time series, and variance analyses.

3. Simulation of Human Functions and Scientific Model Construction. In addition to its role as man's auxiliary brain for storage, retrieval, and processing of information, the computer also has assumed an entirely new function—that of a participant in interaction. A computer now is able to replace certain decision-making functions of man, and when linked to effector machines the decisions can be implemented. Among the simulated processes of significance to the physician are conversations, history taking, and diagnosis, whereby the professional may be replaced by the computer. A program that simulates a patient enables a student to practice

interviewing; or a whole message exchange simulating the conversation between two people may be simulated by two computers.

4. Instructional Programs. By making marks with a magnetic pencil, by typing answers on the input typewriter, or by operating dials, students can respond to questions flashed onto a video screen. If the answer is correct, the program proceeds; if it is wrong, re-exposure to previously studied material occurs. The whole instructional program usually is stored in the computer itself, although the student may be referred to material that is available elsewhere.

5. Social System Simulation. Computer models of industrial, military, medical, or commercial organizations furnish headquarters with a small-scale model of the whole enterprise. This enables scientists not only to proceed with an analysis of the system but to build in certain automatic warning devices that trigger remedial measures in case certain critical stages should be reached. Monitoring is significant not only for the operation of ships, airplanes, and space capsules but for the human heart and brain as well.

6. Computers in the Field of Mental Health. Computers are used for recording information pertaining to psychiatric patients;' for the evaluation of social disability; for multiphasic screening of the general health of patients; for clinical decision-making processes involving global judgments; and for the simulation of certain diseases.

System Analysis and Operations Research

Traditional scientific methodology requires isolation of phenomena, dissection into smaller particles or functions, and a neglect of the specific social context and the identity of the participants. Because science is concerned with mass effects, its methodology may result in a loss of the particulars of the phenomenon under study. To compensate for these shortcomings, behavioral scientists began to consider phenomena in another and novel way. Instead of analyzing structures and reducing processes and particles to their constituent components, they studied the development and transformation of processes in a larger context. This approach, known by the name of operations research, aims at obtaining an overall view of larger systems in order to integrate the physical, economic, and social aspects of the enterprise. Operations research is dedicated to the task of steering whole systems and preventing the fragmentation inherent in the functional division of labor. Its procedures consist of formulating the problem, constructing a model to represent the system, feeding data into the model and testing it, experimenting with solutions to the problem, and implementing on a large scale the solutions discovered with the help of the model.

Operations research found its most fruitful application in industry, where tasks such as allocation of funds, space, time, and resources, inventory accumulation, replacement of obsolete parts, scheduling, and hiring and firing

of personnel occur daily. As advances in decision theory were made and the science of system analysis was developed, computer models of whole systems were able to furnish executives with a quantitative method for decision making, comparing time, cost, value, and effectiveness. The theories that facilitated the integration of part functions into a whole became known as general systems theories.

The term "system" as used in this context refers to a cluster of components or units engaged in mutual interaction. To cope with an organization that has people in one subsystem, products in another, and machines in a third, terms had to be invented that were common to all three. The task thus consisted of translating analogies, homologies, and transactional processes characteristic of cell, organ, organism, group, and society into terms applicable to all of these entities. While the physicists possess many satisfactory equations to denote the transformation of one kind of energy into another, behavioral scientists do not have schemes that allow them to relate, for example, sensory data to biochemical changes. In the past, value theory came closest to being a general systems theory suitable for interdisciplinary research. It proceeds under the assumption that a value or price can be assigned to all objects, persons, and processes—a device that introduces a unitary scale. Communication theory, a scheme more recently applied to different types of data, concerns itself with the messages that connect the discontinuous parts of an organization. Both value and

communication theory are general systems theories that have been particularly significant for the behavioral sciences because the findings of anthropologists, psychologists, sociologists, and psychiatrists thus can be unified. That this task is of major interest to the field can be seen from the number of relevant publications on the subject.

With the help of a general systems theory a scientist can construct a scientific model. But before using a model for purposes of prediction, the scientist has to go through several steps, any one of which may become a source of errors and can influence the data obtained. The first step consists of making measurements or observations; the second step involves the encoding of data so that they are acceptable to the particular model in use; the third step consists of processing the data; and the fourth step consists of checking the results obtained. If the scientist makes relevant observations, possesses a workable model, and processes the data appropriately, the results obtained with the model should coincide with the data pertaining to the original events. Among the schemes developed by operations research, decision models are the most relevant for psychiatry because they simulate human judgment. In its simplest form, a decision is composed of five basic elements. These are: strategies or plans constructed on the basis of controllable features or variables; states of nature made up of non-controllable events; outcomes that consist of the results observed when a specific strategy is employed and a particular state of nature exists;

predictions of the probabilities that a given state of nature will occur; and, finally, the assessment of risk in which strategy and outcome are selected with regard to the degree of uncertainty that people are willing to tolerate.

A suitable model for the study of social communication requires three types of observations. First, the characteristics of the communicating entity have to be specified; second, the characteristics of the processes connecting the entities and the properties of the overall field have to be enunciated; and, third, the characteristics of the observer who is part of the field and is influenced by the transaction have to be recorded. In schematic form, this approach [pp. 450-465] would appear as shown in Table 39-1.

Table 39-1. Evaluation of a Behavioral Situation

COMMUNICATING ENTITY	CONNECTING PROCESSES	OBSERVER
1. Input functions (perception)	1. Combination of functions of several small entities to form a larger entity	1. Scientific observation or measurement of ongoing signal exchange
2. Central processes		
Data scanning (recognition)	2. Organization of networks	2. Encoding of exchange into terms acceptable to the scientific model
Data processing (thinking)	3. Languages and codes	3. Assessment of outcome or effects produced
Data storage (memory)	4. Content: referential property attributed to signals	4. Management and organization: intervention with the connecting processes

3. Output functions (expression and action)	5. Meta-communicative processes: instructions and interpretative devices	5. Treatment or repair: intervention with the entities themselves
	6. Feedback: reincorporation of information at the source	

The task of observing all the changes that occur at any one moment is somewhat overwhelming. To simplify matters, the scientist can proceed in several different ways: (1) he can assign the role of observer to one of the participants, thereby losing in objectivity but gaining information concerning the subtleties of the exchange; (2) he can obtain additional observers or monitoring devices to keep track of events and feed their reports into a central station that will collate the data. This condensation, however, introduces new errors and loses information; (3) he can compare a subject's behavior with the predictable and programmed behavior of a machine that is put in his place, and denote the significant differences, thus gaining information on the uniqueness of the subject's behavior. Whatever method the scientist uses will maximize one kind of information and minimize another. Therefore, a decision has to be made as to what events are the most relevant. This decision can be arrived at by correlating the outcome or effect produced by the whole system with its component parts or processes. Each outcome usually is matched to a given internal and external constellation.

Mind and Body, Word and Action

The mind-body dichotomy has been with us for over 2500 years, with the result that until recently the human body was considered in the light of biological and physical laws while the symbolic processes were evaluated in the light of theological, psychological, and social conventions. But behavior can be understood only if both the biophysical and the symbolic processes are encompassed in one overall system. The theoretical basis for a unification of physical and psychological data was established with the advent of cybernetics and the concept of feedback. In brief, this is the way it works: human action occurs in a physical field and produces a physical impact; but, at the same time, the identical action always occurs in a social field, and also has a symbolic function with an informative impact [pp. 450-465]. When the physical and symbolic effects are perceived by the participants, this newly acquired information may lead to a correction of the old body of information. Hence, information can be said to control action and action to change information. With this theoretical innovation, the mind-body parallelism became obsolete.

Of old, the mind component of the dichotomy was closely identified with verbal behavior and pertinent contributions are found under headings such as language, psycholinguistics, semiotics, signifies, semantics,- or speech [pp. 264-287]. The body component, in contrast, was identified with anatomy, physiology, and movement. With the advent of cybernetics, the mind became identified with information and the body with action. Every human being

experiences the discrepancy between information and action in daily life. If action turns out to match preconceived ideas, then the organism experiences tension reduction; but if information and action do not coincide, the discrepancy gives rise to tension that serves to redirect action or to adjust the information to fit the action. The principle of differential perception is applicable to other communicative processes—that is, to the discrepancy between verbal and nonverbal messages, overt content and covert instruction, or different versions of a message repeated over time. In his theory of cognitive dissonance, Festinger states that non-fitting relations among cognitions produce dissonance—an experience that motivates the person to reduce the inconsistency and strive toward consonance.

Amazingly, action per se has received much less attention than verbal behavior. The legal fraternity has been concerned for millennia with the assessment of action in terms of the law. The military [pp. 509-534] are the specialists who have been concerned with control of people through action. Finally, the clergy, who since the beginning of history held the monopoly on writing, controlled the assumptions that people were allowed to make about action. These were laid down in the Ten Commandments of Moses, the turning of the cheek at the time of Christ, and the notion of charity in the Middle Ages. More recently, the scientific assessment of bodily action has produced technical treatises on walking, dancing, writing, posture, and specialized movements of the extremities. The relative sparsity of

publications on action is in part due to the unsatisfactory models available for the representation of action [pp. 393-412]. Interaction between two persons and in small groups has received more consideration, but the field is still in its infancy.

A special case of the relationship of information to action is seen in the connection of verbal with nonverbal communication in that silent action signals may take the place of vocal sounds and thus facilitate redundancy.

For example, if a person's attention is momentarily diverted, a verbal passage may not be heard unless it is repeated. Redundancy can be produced without boredom by repeating the message nonverbally and by appealing to different sense modalities instead of reiterating the same verbal message over again. The field of nonverbal communication, covering such subjects as the nature of nonverbal codes, the impact of movement upon perception, and the influence of culture and situations, has been explored by Ruesch and Kees, Birdwhistell, Bosmajian, Critchley, Ekman and Friesen, W. La Barre [pp. 456-490] and Hall.

The perception of both action and verbal behavior has become the specialty of the field of cognition. This field is concerned with the whole representational process, beginning with the original events and pursuing the process to the representation in the brain. Cognition, hence, is concerned with

information processing in the widest sense of the word, involving sensation, perception, imagery, retention, recall, problem solving, and thinking. In a technical sense, cognition is concerned with pattern recognition, visual memory, iconic storage, echoic memory, and related problems. The psychologist's concern with perception and cognition corresponds to the psychiatrist's preoccupation with disturbed perception and the unconscious [pp. 130-159]. If the German and French schools of psychiatry attempted to relate aberrations of perception and cognition to nosological entities, the psychoanalysts tried to relate repressed unconscious impulses to neuroses and the overwhelming of the conscious by the unconscious to psychoses. Alexander finally attempted to connect psychosomatic diseases to the organism's physiological response to specific emotional stimuli. In explaining the failure to relate perception, cognition, or awareness to disease, one has to remember that psychological phenomena on the whole do not abide by the rules of deterministic mathematics, but fit more appropriately into the rules of probabilistic mathematics. Today we know that no diagnostic entity is characterized by unique ways of perception, decision making, or expression. The failure to establish a deterministic relationship between personality or symptomatology and disease should not obscure the fact that, statistically speaking, one disturbance may be associated with a given disease more frequently than another.

The communicative behavior of psychosomatic patients may illustrate

the point [pp. 614-634]. Without attributing any causal connection to such a description, we can say that many psychosomatic patients appear somewhat infantile: their perception of external events often is inaccurate or incomplete in that their concern with psychological problems of the self and with proprioceptive stimuli arising in the organism displaces in importance the exteroceptive impression of other events. Also, any exteroceptive information received from the chemical and mechanical end organs is unduly weighted and the usual maturational shift to a preference for the more complex wave receivers—vision and hearing—is delayed. Bodily signs and signals are relied upon more than words or numbers, and often the impact of actions of the self upon others is not correctly observed. Reliance upon proximity receivers and insufficient mastery of the higher symbolic processes often result in an incomplete or arbitrary delineation of physical, psychological, and social boundaries, and these patients believe that the physical or mental state of other people is identical with their own and that messages are to be understood as if they were traveling within one and the same neuronal network. Often a symbiotic relationship with one other person develops whereby the patient abdicates decision making and confines himself to perception or action. Lacking the ability to make independent decisions, these patients frequently utter value judgments that express their normative and conformist orientation, indicating their dependence upon the protective actions of others, which, in the process of maturation, was not sufficiently

replaced by reliance upon informational exchange.

Frequently, in the course of a relationship, the psychosomatic patient will use body language mediated by the autonomic nervous system; and since physicians and nurses are experts at interpreting vascular, glandular, and pain manifestations of people, these patients find within the medical establishment a kind of understanding that tends to prolong existing disease or invalidism. Some patients who have matured beyond the stage of body language may use nonverbal actions to convey messages. Such action language is prevalent in many patients found on the orthopedic wards of the hospital and in the juvenile courts. Both the patient who chooses body language and the patient who prefers action language are unable to find emotional satisfaction in verbal exchanges with other people.

Disturbed Communication

In his book on disturbed communication, Ruesch points out that no message can be considered abnormal in isolation from its social context. Communication is a process that connects person to person, and a message may be declared deviant only if it fails to fulfill its task. Disturbed communication thus is defined by the effect it produces rather than by its structure; and evaluation as to whether a message exchange is successful or a failure is accomplished by considering people and messages in their social

field. The connecting processes may fail for quantitative reasons in that they may not match the capacities of the communicating entities, or they may fail for qualitative reasons in that they are not matched to the input characteristics of an entity. A ditty may help in remembering these characteristics:

T00 much, too little; too early, too late; At the wrong place, is the disturbed message's fate.

Overload and Underload. In animal or machine, every communication network has a given capacity. When the load exceeds this capacity, the machinery or the organism breaks down; when the load is too small, the machinery or the organism may deteriorate for lack of use. Overload [pp. 201-224] is a known source of disorganization. To protect himself from the fatigue resulting from excessive input, the individual learns to disregard certain classes of stimuli; but in the process he may also disregard vital information. Underload in the form of sensory deprivation may lead in mild cases to retarded development and in severe cases to some general disorganization of behavior and hallucinatory syndromes. Excessive output, as in overwork, results in fatigue; whereas output below par leads to poor physical fitness, decline in intellectual functioning, and possibly premature aging. Because the homeostasis of the organism requires that input be quantitatively matched somewhat to output, changes in one function always affect the other

functions, and imbalance between input and output results in frustration, overt anxiety, and, eventually, disorganization of behavior.

Erroneous Timing. Ill-timed messages, similar to quantitatively deviant messages, have to be delivered with greater intensity and have to be repeated more often than well-timed ones. In addition, a message has to be properly separated from those preceding and following; otherwise their confluence may distort the meaning. Also, in person-to-person communication the response of the second person has to follow the statement of the first in proper time if it is to be correctly understood.

Difficulties of Perception, Evaluation, Expression, and Action. Input of the organism is identified with perception, and disturbances may range from sensory defects to selective inattention. In the area of central functions, processing of information involves scanning, encoding, decoding, storage, and decision making; disturbances may involve thinking, feeling, memory, and judgment. The output of the organism is identified with muscular movement that results in verbal productions or silent action, and here the disturbances may range from inhibition and exaggeration of verbal output to difficulties in initiating, sustaining, or completing action. All of these disturbances are central to the daily endeavors of the psychiatrist and are well described in the treatises of classical psychopathology.

Language and Speech Difficulties. Some of the difficulties of communication are related to disturbances of language and speech. Among these are aphasia, agnosia, and apraxia; stuttering, stammering, and lisping; and disturbances of the voice apparatus proper. On a higher level or organization we find deficient mastery of digital codification, which is the basis of reading and writing difficulties, and of analogic codification, which underlies difficulties in pattern recognition. Deficiency in the integration of the digital with the analogic forms of codification prevents people from rapidly switching from analytic details to larger pattern appreciation—a process that is essential for proper intellectual functioning [pp. 727-738].

Disturbed Metacommunication. The term "metacommunication" refers to auxiliary and covert messages that go along with the overt communication to instruct the receiver in how he ought to interpret a statement. Metalanguage is far more subtle than language itself, and it varies with the situation, with time, and with the composition of the group. In schools of creative expression and acting, students are trained to enact a passage first as a comedy, then as a tragedy, and finally as a reportage. These variations are based upon a shift in role assumption that is expressed in nonverbal ways. A child learns these modulations when he has consistent contact with parents and peers in different contexts and situations. The patient who lacked such experiences does not learn these modifications of interpretation and when he expresses himself, he may tenaciously cling to one and the same nonverbal

form of expression in spite of changes in content or context.

Message Discrepant with Situation. The context of a situation governs the sets from which words or gestures are chosen. Without knowledge of the particular set from which a word or symbol derives, the receiver does not know what alternatives have been considered. After all, the economy of communication depends upon a shared knowledge of sets. For example, if the sender selects the eleventh out of a set of seventeen symbols, the receiver is aware that the other sixteen have been rejected.

Distortions in Feedback, Correction, and Reply. Some people are unable to utilize printed information; others are unable to listen to or heed the spoken word. Then there are people who are unable to learn from trial and error. Also, there are those who have difficulty in combining information held by self with information held by others, thus being handicapped in correcting information. Sometimes, people may get confused when information from various sources is juxtaposed and a decision has to be made as to which version is the correct one. The ability to juxtapose information, to condense and combine it, is in part an emotional function. An intense experience of either pleasure or frustration in connection with a given type of information tends to stabilize it. Because of the emotional component, such information tends to become immune to change, and intrapsychic processes may become redundant. In contrast, an experience of emotional neutrality associated with

a given body of information tends to elicit boredom. The remedy for boredom, of course, is activity and change.

Devious Reply. An appropriate response amplifies, attenuates, or corrects the information contained in the initial message, while inappropriate responses may exert a disorganizing effect. In reacting to a statement, we may distinguish between understanding, acknowledgment, and agreement. In understanding, we place an observation into a model in our own head and determine its relationships to other events. In acknowledging, we simply indicate receipt of the message without referring to our understanding of the content. In agreeing, we not only understand and acknowledge but also respond to the content. To be acknowledged is pleasant; to be understood and acknowledged gives us a feeling of self-respect; and to reach an agreement paves the way for action. Numerous disturbances are characterized by devious acknowledgment. For example, inappropriate responses are frequently given by mentally deranged persons whereby acknowledgment may be inadequate, exaggerated, or omitted. Often the reply simply introduces a new topic, as in the case of the tangential reply [pp.354-364] that constitutes a response to a peripheral aspect of the initial message with complete disregard for the intent of the sender. Because it is the appropriate reply to one's intent that produces a feeling of satisfaction, the lack of this kind of recognition is discouraging. Satisfaction is the motor that drives people toward successful communication, and devious replies lead to a

serious disruption of communication and human relations.

Threatening Content. A message may be disturbing if it contains threats to one's personal safety, to existing human relations, or to action in progress, while discovery that messages are not truthful and do not correspond to reality makes people suspicious. Conversely, awareness of facts that destroy magic thinking interferes with the faith and hope that are necessary for living. Messages that trigger obligatory responses also exert a coercive effect, regardless of whether they elicit obsessive, compulsive, or phobic behavior.

Inadequate Information. A person may not have the information necessary to carry out a task or hold a position; he may be inept at processing information; he may not have tested his information in action; or he may have an emotional aversion for the task at hand. The assessment of these disturbances is geared to a comparison of the patient's functioning, not with a universal standard or norm but with the demands of the situation. If a person's information is not matched to the exigencies of the situation, he will fail. A more subtle constraint may be exerted by an individual's value system, which may oppose the acquisition of information or its relevant use in action.

Deficient Programming. Every person has to learn to apportion time, space, energy, and money to various tasks. The difficulties some people encounter are related to the discontinuity of their pursuits. Life is cyclical and

most tasks have to be abandoned and taken up again in the next hour, the next day, or the next week, with time in between to rest or eat. Programming of one hour or one day seldom represents a major difficulty because circumstances dictate what must be done. Also, when people work, the institution or organization delivers schedules and takes over the burden of apportioning resources. But if a person has to program his own life over a period of years, difficulties may arise in the setting and implementing of priorities and in behaving in a consistent manner.

Coincidence of Several Disturbances. Simultaneity of several traumatic events may increase frustration to a degree that exceeds an individual's tolerance, while proper spacing of traumatic events may contribute to gradual adaptation. In learning, the motto that applies is "One thing at a time." When too many events that require adaptation occur simultaneously, the individual may become confused as to the priorities involved. If the situation can be talked over with another person, the frustration is easier to bear than if communicative exchange is not available.

Disturbances of Communication in Various Mental Conditions. The peculiarities in the ways of communication of patients suffering from psychoses and neuroses have been elaborated by many authors. Among the sources are:

Schizophrenia: Artiss; Bateson, Jackson, Haley et al.; Bleuler; Boatman and Szurek; Domarus; Fromm-Reichmann; Jackson; Laing; Lidz; Ruesch [pages 635-661] ; Scheflen; Sullivan; Watzlawick, Beavin, and Jackson; Wynne and Singer.

Manic and Depressive Conditions: Fromm-Reichmann; Grinker, Miller, Sabshin et al.; Lewis; Ruesch.

Psychoneuroses and Personality Disorders: Freud; Meerloo; Ruesch; Shands.

Disorders of the Central Nervous System: Brain; Rioch and Weinstein.

Sensory Defects: Department of Health, Education, and Welfare; Zahl; Blau (Chapter 9).

Language and Speech Disorders: Barbara; Mysak; Oliver [pp. 264-287].

Therapeutic Communication

Therapeutic communication can occur anywhere: at home, at work, on the playground, or on the ward. It is not tied to any hour of the week, nor is it bound to props such as a chair, a couch, or a darkened room. Therapeutic communication may be undertaken by persons who do not know that they act as therapists; and those who benefit may be unaware that they have been

helped. Therapeutic communication is not a method invented by doctors to combat illness; instead, it involves the utilization of a universal function of man to support those in need, to dispel anxiety, to correct information, and to initiate action. At times this process is called psychotherapy; at other times, education; then again, tutoring. Some call it counseling, others guidance, and a few simply friendship. The only difference between planned therapy and ordinary communication is found in the participants' goals. The person designated as patient seeks help; the person designated as therapist uses his skills for the benefit of the other without seeking power or personal gain, his only material reward being the fee that he is paid.

Therapeutic communication makes use of contributions that derive from many different disciplines. To understand the nature of networks and codes, and the principles of feedback, the therapist borrows from cybernetics; to understand verbal communication, he turns to philology and linguistics; to appraise what goes on inside the individual, he utilizes the psychoanalytic scheme; to assess pathology, he draws heavily from clinical psychiatry; to appraise the cultural and social milieu, he adopts approaches from the social sciences; and in order to simulate the interaction between patient and therapist, he employs the computer. In his attitude, the doctor shows respect for the other person's individuality; and he encourages the patient to express himself, always indicating his readiness to listen, watch, understand, and respond. In his work, the doctor focuses upon the patient's difficulties in

separating fact from fantasy, his ineptness in human relations, and all those processes which prevent him from further growth and development.

The therapist's power to steer the therapeutic process in the desired direction derives from the leverage inherent in his special knowledge, the institutional resources at his disposal, and his reputation as a physician. Because of the attribution of healing powers, his words acquire a persuasiveness and his actions a magic quality. This initial advantage is reinforced in the therapeutic session by the therapist's operations, which are aimed at providing the patient with a satisfactory communicative exchange. This experience in turn becomes the motivation for the patient to seek more of the same, and it induces him to work toward mastery of communication.

Over time, when exposed to therapeutic communication, the patient will learn a variety of its subtleties. Perception and cognition are invariably sharpened; the distinction between proprioception, involving sensations and feelings, and exteroception, pertaining to people and situations, becomes clear; and discrimination between fact and fantasy is mastered. On the output side, the patient learns to express feelings and thoughts, to choose appropriate words and gestures, and to share what goes on inside with another person. As far as the central processes are concerned, recall and reconstruction of past events, the bridging of amnestic gaps, the acquisition of new information, and the proper integration of the new body of knowledge

with the old pave the way for the mastery of decision making. Acceptance of the unavoidable; allocation of time, space, energy, and money to various tasks; and planning of future action are worked through with examples from the patient's life. Mastery of decision making eventually will lead to consistent choice of those perceptions, actions, opportunities, and people that fit into the patient's life style and to a rejection of those features that are inappropriate. In applying to life situations what has been learned in the therapeutic session about perception, information processing, decision making, and expression, the patient is likely to gain further experience with conversation, discussion, negotiation, confrontation, and cooperation in two-person or group settings.

The indications for emphasizing one aspect of communication over another depend upon the patient's condition, the therapist's personality, and the specific circumstances that govern a situation. Whether therapeutic communication is carried out individually or in groups, in a combination of both, or in the framework of family therapy will have to be decided for each case. If the patient's condition is related to the experience of anxiety in the face of unalterable somatic, physical, or social circumstances, communication may help him to clarify contradictory issues, lend him emotional support, and induce him to accept the unalterable. If the patient's condition is related to inner conflicts evidenced by guilt, shame, fear, anger, or depression, communication can help him to relive past experiences, to gain insight into the present circumstances, and to adopt a behavior that is favorable to the

gradual reduction of internal conflicts. The working through of resistances against unconscious conflict here is the method of choice. If the patient has an infantile personality, utilizes naive ways of communication, or lacks knowledge of people and situations, contact with an experienced therapist may help him to grow. Through guidance and informal education, the patient may learn to achieve maturity. If his condition is related to misunderstandings, disagreement, or social conflicts, communication with the other people may help him to correct erroneous information, to respond appropriately to the situation, and to eliminate disagreements as they arise.

Details of the role of communication in various therapeutic procedures are embedded in a vast literature. Freud was the first to call attention to the phenomenon of transference, and subsequently the communicative exchanges between analyst and patient have become a central focus of psychoanalysis. Ruesch gives an overview of the field of therapeutic communication; Shands and Meerloo [pp. 130-159] focus upon the contributions of psychiatry to communication;

Walton describes communication from the standpoint of peacemaking; and Haley focuses upon a variety of therapeutic paradoxes. Lennard and Bernstein, in analyzing the patterns of human interaction, emphasize situational context and roles of the participants. Feldman analyzes the mannerisms of speech and gesture; Ekman and Friesen as well as Mahl

describe various types of nonverbal behavior in therapy. Finally, it is well to remember that the special kind of communication that exists between professionals and their patients is subsumed in hundreds of articles concerned with the doctor-patient relationship.

Conclusions

Social communication is a term that refers to the exchange of messages mediated by vocal sounds, written signs, gestures, or movements without modification by third parties or machines. Social communication between human beings is characterized by goal seeking, goal changing, and corrective behavior, and the creation or maintenance of steady states at a fairly high level of orderliness; part functions are always functions of the system as a whole, and the chains of causation are at least circular, if not more complex. A communication system is delineated by the network in which signals travel. It is made up of participating entities consisting of biological, social, or machine units that are characterized by input, central, and output functions.

Communication is mediated by signals, signs, and symbols. A signal is an impulse in transit. A sign, by force of its own structure or because of attention paid to it, possesses for a participant problem-solving properties. A symbol is an extra-organismic device that has been agreed upon to refer, in a condensed way, to actions or events that have occurred elsewhere. A statement, which is

made up of a series of signals, constitutes a purposive expression on the part of a person or group with the intent of conveying information. A statement becomes a message when it has been perceived and interpreted by another person. When two or more individuals can agree on the topic to which an exchange refers, a message can be said to have content.

All observations pertaining to the study of social communication are made by a human observer stationed in the network. The character of these observations is determined by the observer s position in the system, his time and space scales, his methods and instruments of observation, his theoretical models and a priori assumptions, and, finally, his purpose in carrying out his study.

The technical process of embodying information in some concrete way is referred to as codification. Inside the organism, events are codified by means of nervous and humoral impulses; outside the organism, objects and events are codified in terms of two- or three-dimensional marks or objects. Analogic codification makes use of similarities between coded signal and original event. Digital codification, in contrast, is based upon arbitrary and discrete representation of events, whereby the digital elements—words or numbers—are connected to the events for which they stand by means of a legend. A special code suitable for human interaction is language, which is composed of a plurality of signs or symbols whose significance must be

known to a number of participants; also, language must be reproducible by human beings and should retain its approximate significance under different conditions.

When signals travel through space and pass certain boundaries, they are likely to be recoded in order to be acceptable to the new network. Sensory end organs thus are stations of signal transformation. Phylogenetically old are the chemical and mechanical end organs that serve as proximity receivers. Phylogenetically younger are the visual and auditory end organs that serve as distance receivers. Once signals have been perceived and are properly recoded they become available for information processing. The incoming signals are scanned against information stored in the memory; the new information is combined with the old, and becomes the basis for eventual decision making. The decision is made accessible to others through speech, writing, or action, and this output is perceived not only by others but by the communicator himself, hence guiding his next step in the process of communication.

Any statement is made up of two parts: the principal content, which refers to some other event, and the secondary instructions, which refers to the message itself. Instructions are embedded in the rules that govern a situation, in the roles assumed by the participants, and in the language used. They indicate who can talk to whom, when, where, for how long, in what

manner, and on which subject.

Feedback refers to the incorporation of information about the effects of an action at the original source. Control thus is not localized in any particular area of the network but is dependent upon an ongoing circular relay of messages that in effect steers the behavior of organisms and organizations and regulates the performance of machines. The correction of any performance is dependent upon the observation of the impact achieved and the reaction of others. Successful communication can be conceived of as the establishment of concordant information; unsuccessful communication as the establishment of discordant information between participants. The pleasure that individuals derive from well-functioning communication constitutes the driving force that induces them to seek human relations. Frustrating communication, in contrast, manifests itself either by symptom formation or by withdrawal from ill-functioning social networks.

Disturbances of communication can be caused by:

1. Disease, trauma, or malformation of the organs of communication, in which case perception, evaluation, and expression may be affected.

2. Insufficient mastery of nonverbal or verbal language, in which case the sign processes may suffer.

3. Inadequate or erroneous information about self and others, in

which case inappropriate action may be the result.

4. Insufficient mastery of meta-communicative devices, with the result that an individual's actions may be misinterpreted.

5. Inability to correct information because of inadequate skills in the utilization of feedback, in which case knowledge will be erroneous.

6. Lack of feedback from another person or group, whereby the social entities do not join in an ongoing exchange, with resulting isolation.

7. Participation in a nonfunctional network in which the organization prevents people from communicating effectively, leading to separation or the formation of new networks.

Therapeutic communication differs from ordinary communication in that the intention of one or more of the participants is clearly directed at bringing about a beneficial change in the system. To this end, the therapist steers communication in such a way that the patient not only learns in the therapeutic hour but also is exposed to situations and exchanges that provide for diversified experiences. This may be accomplished by including in the communications other members of the family or friends, or by introducing the patient to specially created new groups or existing organizations. Once the patient has experienced the pleasure of successful communication, he is likely to perfect the art on his own. If the processes of communication, and

particularly feedback, function properly, an individual can be relied upon to steer his own actions and those of other people in a meaningful way. Successful communication is the road to mental health.

Bibliography

Ackoff, R. L. and M. W. Sasieni. *Fundamentals of Operations Research.* New York: Wiley, 1968.

Alexander, F. *Psychosomatic Medicine.* New York: Norton, 1950.

Arieti, S. "The Structural and Psychodynamic Role of Cognition in the Human Psyche," in S. Arieti, ed., *The World Biennial of Psychiatry and Psychotherapy,* Vol. 1, pp. 3-33. New York: Basic Books, 1971.

Artiss, K. L., ed. *The Symptom as Communication in Schizophrenia.* New York: Grune & Stratton, 1959.

Austin, C. L. *MEDLARS ig63~ig6y, National Library of Medicine,* Pub. no. 1823. Bethesda: U.S. Public Health Service, 1968.

Barbara, D. A., ed. *New Directions in Stuttering: Theory and Practice.* Springfield, Ill.: Charles C. Thomas, 1965.

Barber, T. X. et al., eds. *Biofeedback and Self-Control, ig70.* Chicago: Aldine-Atherton, 1971.

Bateson, G., D. D. Jackson, J. Haley et al. "Toward a Theory of Schizophrenia," *Behav. Sci.,* 1 (1956), 251-264.

Beadle, G. W. "The Language of the Gene," in *The Languages of Science,* pp. 57-84. New York: Basic Books, 1963.

Beckhard, R. *Organization Development: Strategies and Models.* Reading, Mass.: Addison-Wesley, ig6g.

Beer, S. *Cybernetics and Management.* New York: Wiley, 1959; Science Editions, 1964.

Bertalanffy, L. von. *Robots, Men and Minds.* New York: Braziller, 1967.

Birdwhistell, R. L. *Kinesics and Context: Essays on Body Motion Communication.* Philadelphia: University of Pennsylvania Press, 1970.

Bleuler, E. *Dementia Praecox, or the Group of Schizophrenias.* New York: International Universities Press, 1950.

Boatman, M. J. and S. A. Szurek. "A Clinical Study of Childhood Schizophrenia," in D. Jackson, ed., *The Etiology of Schizophrenia,* pp. 389-440. New York: Basic Books, 1960.

Bosmajian, H. A. *The Rhetoric of Nonverbal Communication.* Glenview, 111.: Scott, Foresman, 1971.

Bowlby, J. *Attachment and Loss.* Vol. 1: *Attachment.* New York: Basic Books, 1969.

Brain, W. R. *Speech Disorders.* Washington: Butterworths, 1961.

Broadbent, D. E. *Perception and Communication.* Oxford: Pergamon, 1958.

----. *Decision and Stress.* New York: Academic, 1971.

Buckley, W., ed. *Modern Systems Research for the Behavioral Scientist.* Chicago: Aldine, 1968.

Callaway, E. 3rd. "Schizophrenia and Interference: An Analogy with a Malfunctioning Computer," *Arch. Gen. Psychiatry,* 22 (1970), 193-208.

Charcot, J.-M. *Leçons sur les maladies du système nerveux.* Paris: A. Delahaye & E. Lecrosnier, 1884.

Cherry, C. *On Human Communication,* 2nd ed. Cambridge: MIT Press, 1966.

Chomsky, N. *Syntactic Structures.* New York: Humanities Press, 1957.

Churchman, C. W. *The Systems Approach.* New York: Delacorte, 1968.

Coleman, J. S. *Introduction to Mathematical Sociology.* New York: Free Press, 1964.

Collen, M. F. "Automated Multiphasic Screening and Occupational Data," *Arch. Environ. Health,* 15 (1967), 280-284.

Coulson, J. E., ed. *Programmed Learning and Computer-Based Instruction.* New York: Wiley, 1962.

Critchley, M. *The Language of Gesture.* London: Arnold, 1939.

Dance, F. E. X., ed. *Human Communication Theory—Original Essays.* New York: Holt, Rinehart & Winston, 1967.

Davitz, J. R., ed. *The Communication of Emotional Meaning.* New York: McGraw-Hill, 1964.

Department of Health, Education, and Welfare. Vocational Rehabilitation Administration. *Research on Behavioral Aspects of Deafness.* Washington: U.S. Govt. Print. Off., 1966.

Dixon, W. J., ed. *BMD: Biomedical Computer Programs.* Publications in Automatic Computation, no. 2. Berkeley: University of California, 1970.

Domarus, E. von "The Specific Laws of Logic in Schizophrenia," in J. S. Kasanin, ed., *Language and Thought in Schizophrenia,* pp. 104-114. Berkeley: University of California Press, 1944.

Edwards, W. and A. Tversky, eds. *Decision Making.* Baltimore: Penguin, 1967.

Ekman, P. and W. V. Friesen. "Nonverbal Leakage and Clues to Deception," *Psychiatry,* 32 (1969), 88—106.

----. "The Repertoire of Nonverbal Behavior: Categories, Origins, Usage, and Coding," *Semiotica,* 1 (1969), 49-98.

Emmert, P. and W. D. Brooks. *Methods of Research in Communication.* Boston: Houghton, 1970.

Faris, R. E. L., ed. *Handbook of Modern Sociology.* Chicago: Rand McNally, 1964.

Feldman, S. S. *Mannerisms of Speech and Gestures in Everyday Life.* New York: International Universities Press, 1959.

Fenichel, O. *The Psychoanalytic Theory of Neurosis.* New York: Norton, 1945.

Festinger, L. A *Theory of Cognitive Dissonance.* Evanston, lll.: Row, Peterson, 1957-

Foerster, H. von, ed. *Cybernetics: Circular Causal and Feedback Mechanisms in Biological and Social Systems.* Trans. 6th-10th Conf. New York: Josiah Macy, Jr. Foundation, 1950-1955.

Frank, J. D. *Persuasion and Healing.* New York: Schocken, 1963.

Franke, J. *Ausdruck und Konvention.* Gottingen: Verlag fur Psychologie—C. J. Hogrefe, 1967.

Freud, S. (1938) *An Outline of Psychoanalysis,* in J. Strachey, ed. *Standard Edition,* Vol. 23, pp. 144-207. London: Hogarth, 1955.

Fromm-Reichmann, F. *Psychoanalysis and Psychotherapy.* D. M. Bullard, ed. Chicago: University of Chicago Press, 1959.

Gerard, R. W. and J. W. Duyff, eds. *Symposium on Information Processing in the Nervous System, Leiden, 1962.* Amsterdam: Excerpta Medica Foundation, 1964.

Goffman, E. *Behavior in Public Places.* Glencoe, Ill.: Free Press, 1963.

Gorden, R. L. *Interviewing: Strategy, Techniques and Tactics.* Homewood, Ill.: Dorsey, 1969.

Gray, W., F. J. Duhl, and N. D. Rizzo, eds. *General Systems Theory and Psychiatry.* Boston: Little, Brown, 1969.

Greenwood, W. T. *Management and Organizational Behavior Theories: An Interdisciplinary Approach.* Cincinnati: South-Western Pub., 1965.

Grinker, R. R., ed. *Toward a Unified Theory of Human Behavior,* 2nd ed. New York: Basic Books, 1967.

Grinker, R. R., J. Miller, M. Sabshin et al. *The Phenomena of Depressions.* New York: Hoeber, 1961.

Haley, J. *Strategies of Psychotherapy.* New York: Grune & Stratton, 1963.

Hall, E. T. *The Silent Language.* New York: Doubleday, 1959.

----. *The Hidden Dimension.* New York: Doubleday, 1966.

Hayakawa, S. I. *Language in Thought and Action.* New York: Harcourt Brace, 1949.

Hogben, L. *From Cave Painting to Comic Strip—A Kaleidoscope of Human Communication.* New York: Chanticleer, 1949.

Horney, K. *The Neurotic Personality of Our Time.* New York: Norton, 1937.

Horrobin, D. F. *The Communication Systems of the Body.* New York: Basic Books, 1964.

Jackson, D. D., ed. *Human Communication.* Vol. 1: *Communication, Family, and Marriage.* Vol. 2: *Therapy, Communication, and Change.* Palo Alto: Science and Behavior Books, 1968.

Johnson, H. A. "Information Theory in Biology after Eighteen Years," *Science,* 168 (1970), 1545-1550-

Kent, A. and O. E. Taulbee, eds. *Electronic Information Handling.* Washington: Spartan Books, 1965.

Knapp, P. H., ed. *Expression of Emotion in Man.* New York: International Universities Press, 1963.

Korzybski, A. (1933) *Science and Sanity,* 4th ed. Lakeville, Conn.: International Non-Aristotelian Library, 1958.

Kraepelin, E. (1904) *Lectures on Clinical Psychiatry.* T. Johnstone, ed. New York: Hafner, 1968.

Laing, B. D. "Mystification, Confusion, and Conflict," in I. Boszormenyi-Nagy and J. L. Framo, eds. *Intensive Family Therapy: Theoretical and Practical Aspects,* pp. 343-363. New York: Harper & Row, 1965.

Leibovic, K. N., ed. *Symposium on Information Processing in the Nervous System, Buffalo, 1968.* New York: Springer, 1969.

Lennard, H. L. and A. Bernstein. *Patterns in Human Interaction.* San Francisco: Jossey-Bass, 1969.

Lenneberg, E. H. *Biological Foundations of Language.* New York: Wiley, 1967.

Lewis, A. *Inquiries in Psychiatry: Clinical and Social Investigations.* New York: Science House, 1967.

Licklider, J. C. R. *Libraries of the Future.* Cambridge: MIT Press, 1965.

Lidz, T. *The Family and Human Adaptation.* New York: International Universities Press, 1963.

Litterer, J. A. *Organizations: Structure and Behavior.* New York: Wiley, 1963.

McCulloch, W. S. *Embodiments of Mind.* Cambridge: MIT Press, 1965.

McLuhan, H. M. *Understanding Media.* New York: McGraw-Hill, 1964.

----. *The Gutenberg Galaxy.* New York: New Am. Library, 1969.

Mahl, G. F. "Some Clinical Observations on Nonverbal Behavior in Interviews," *J. Nerv. Ment. Dis.,* 144 (1967), 492-505.

Matson, F. W. and A. Montagu, eds. *The Human Dialogue.* New York: Free Press, 1967.

Meerloo, J. A. M. *Unobtrusive Communication: Essays in Psycholinguistics.* Assen, The Netherlands: Van Gorcum, 1964.

Messner, J. *Social Ethics,* 3rd rev. ed. St. Louis, Mo.: Herder, 1965.

Miller, G. A. *Language and Communication.* New York: McGraw-Hill, 1951.

----. *Psychology of Communication: Seven Essays.* New York: Basic Books, 1967.

Miller, J. G. "Living Systems: Basic Concepts; Living Systems: Structure and Process; Living

Systems: Cross-Level Hypotheses," *Behav. Sci.*, 10 (1965), 193-237; 337-379; 380-411.

Morris, C. W. *Signification and Significance: A Study of the Relations of Signs and Values.* Cambridge: MIT Press, 1964.

Mysak, E. D. *Speech Pathology and Feedback Theory.* Springfield: Charles C. Thomas, 1966.

Neisser, U. *Cognitive Psychology.* New York: Appleton-Century-Crofts, 1966.

New York State, Department of Mental Hygiene. *An Overview: the Multi-State Information System.* Albany and Orangeburg: DMH and Information Sciences Division, Research Foundation for Mental Hygiene, Inc., Rockland State Hosp., 1970.

Ostwald, P. *Soundmaking.* Springfield, Ill.: Charles C. Thomas, 1963.

Pei, M. *The Story of Language,* rev. ed. Philadelphia: Lippincott, 1965.

Pierce, J. R. *Symbols, Signals, and Noise.* New York: Harper Torchbooks, 1965.

Reitman, W. R. *Cognition and Thought.* New York: Wiley, 1965.

Révész, G. *The Origins and Prehistory of Language.* London: Longmans, Green, 1956.

Rioch, D. and E. Weinstein, eds. *Disorders of Communication.* Proc. Assoc. Res. Nerv. Ment. Dis., Vol. 42. Baltimore: Williams & Wilkins, 1964.

Ruesch, J. *Disturbed Communication.* New York: Norton, 1957.

----. *Therapeutic Communication.* New York: Norton, 1961.

----. "The Assessment of Social Disability," *Arch. Gen. Psychiatry,* 21 (1969), 655-664.

----. *Semiotic Approaches to Human Relations.* The Hague: Mouton, 1972.

Ruesch, J. and G. Bateson. *Communication: The Social Matrix of Psychiatry,* 2nd ed. New York:

Norton, 1968.

Ruesch, J. and W. Kees. *Nonverbal Communication.* Berkeley: University of California Press, 1956.

Saporta, S. ed. *Psycholinguistics: A Book of Readings.* New York: Holt, Rinehart and Winston, 1961.

Scheflen, A. E. *Psychotherapy of Schizophrenia: Direct Analysis.* Springfield, Ill.: Charles C. Thomas, 1961.

Schuetz, A. "Common-Sense and Scientific Interpretation of Human Action," *Philos. Phenom, Res.,* 14 (1953), 1-38.

Scientific American. *Information.* San Francisco: Freeman, 1966.

Sebeok, T. A., ed. *Animal Communication—Techniques of Study and Results of Research.* Bloomington: Indiana University Press, 1968.

Sebeok, T. A., A. S. Hayes, and M. C. Bateson, eds. *Approaches to Semiotics.* The Hague: Mouton, 1964.

Shands, H. C. *Thinking and Psychotherapy: An Inquiry into the Processes of Communication.* Cambridge: Harvard University Press, 1960.

----. *Semiotic Approaches to Psychiatry.* The Hague: Mouton, 1970.

Shannon, C. and W. Weaver. *The Mathematical Theory of Communication.* Urbana: University of Illinois Press, 1949.

Skinner, B. F. *Verbal Behavior.* New York: Appleton, 1957.

Smith, A. G., ed. *Communication and Culture.* New York: Holt, Rinehart & Winston, 1966.

Snider, J. G. and C. E. Osgood, eds. *Semantic Differential Techniques.* Chicago: Aldine, 1969.

Solomon, P., P. E. Kubzansky, P. H. Leiderman et al., eds. *Sensory Deprivation: A Symposium Held at Harvard Medical School.* Cambridge: Harvard University Press, 1961.

Spitz, R. A. *No and Yes.* New York: International Universities Press, 1957.

Spitzer, R. and J. Endicott. "Diagno II: Further Developments in a Computer Program for Psychiatric Diagnosis," *Am. J. Psychiatry,* 125, *Suppl.* (1969), 12-21.

Starkweather, J., M. Kamp, and A. Monto. "Psychiatric Interview Simulation by Computer," *Methods Inf. Med.,* 6 (1967), 15-23.

Starr, M. K. *Production Management—Systems and Synthesis.* Englewood Cliffs, N.J.: Prentice-Hall, 1964.

Steinbuch, K. *Automat und Mensch: Über menschliche und machinelle Intelligenz.* Berlin: Springer, 1961.

Stroebel, C. F. and B. C. Glueck, Jr. "Computer Derived Global Judgments in Psychiatry," *Am. J. Psychiatry,* 126 (1970) 1057-1066.

Strotz, C. R., A. J. Malerstein, and J. A. Starkweather. "Automated Psychiatric Patient Record System," *Arch. Gen. Psychiatry,* 21 (1969), 311-319.

Sullivan, H. S. *The Interpersonal Theory of Psychiatry.* New York: Norton, 1953.

Thass-Thienemann, T. *Symbolic Behavior.* New York: Washington Square Press, 1968.

Thayer, L., ed. *Communication: Theory and Research.* Springfield, Ill.: Charles C. Thomas, 1967.

----. *Communication: Concepts and Perspectives.* Washington: Spartan Books, 1967.

Waggoner, R. W. and D. J. Carek, eds. *Communication in Clinical Practice,* Vol. 1, no. 1, Int. Psychiatry Clin. Boston: Little, Brown, 1964.

Walton, R. E. *Interpersonal Peacemaking: Confrontations and Third Party Consultations.* Reading, Mass.: Addison-Wesley, 1969.

Watson, D. O., Jr. *Talk with Your Hands.* Winneconne, Wis.: D. O. Watson, Jr., 1964.

Watzlawick, P., J. Beavin, and D. D. Jackson. *Pragmatics of Human Communication: A Study of Interactional Patterns, Pathologies, and Paradoxes.* New York: Norton, 1967.

Whorf, B. L. *Language, Thought, and Reality.* J. B. Carroll, ed. New York: Wiley, 1956.

Wiener, N. *Cybernetics, or Control and Communication in the Animal and the Machine.* New York: Wiley, 1948.

----. *The Human Use of Human Beings—Cybernetics and Society.* Boston: Houghton, 1950.

Wundt, W. *Völkerpsychologie,* 4 vols. Leipzig: Wilhelm Engelmann, 1905.

Wynne, L. C. and M. T. Singer. "Thought Disorder and Family Relations of Schizophrenics: 1. A Research Strategy," *Arch. Gen. Psychiatry,* 9 (1963), 191-198.

Zahl, P. A., ed. (1950) *Blindness: Modern Approaches to the Unseen Environment,* reprinted with rev. bibliography. New York: Hafner, 1963.

Zubek, J. P., ed. *Sensory Deprivation: Fifteen Years of Research.* New York: Appleton-Century-Crofts, 1969.