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ABSTRACT

The methodological soundness of a number of communicational models is tested for relevance to communicative disorders. Existing models lack isomorphism in relating environment to language structure. A new model, useful in classification of communicative disorders, is proposed, tested, and found to encompass (1) an indication that language is a tool for human adjustment, (2) an accounting for the variables that work together in the process of symbolizing, (3) feedback, (4) an explanation for disordered communication, (5) a provision for all the receptive-Expressive and central processes, and (6) a means of harmonizing interdisciplinary research in communication. (CH)

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The Need for a Model of Communication

Countless dry holes have been encountered in our probings into the nature of Communication. The productivity of scholars, teachers, and clinicians in the Communication areas has long been restricted by too narrow assumptions about this process. Only occasionally have researchers into segments of these behaviors struck the strata of power which fuel these intangible and complex phenomena. Even then it appears there was often a lack of awareness of the related and often identical work of scholars in other disciplines. While researchers in a variety of areas were discussing such things as "symptoms" and "predisposing factors" in speech disorders, they were oblivious to the formidable language barriers they themselves were erecting to seal off their own communication about Communication. The segments of the communication process, in short, cannot be understood without consideration of these phenomena in their whole functioning. Required for such comprehension is a very broad perspective indeed, stretching into the total functioning of man in his environments.

As a complex organization, the individual person himself may perhaps serve as a model for the communication systems of human groups and institutions. It seems impossible to define the exact boundaries between the environment within the human body and the environments outside as they communicate. Exactly where is the separation between the blood circulation and the atmosphere during inhalation and exhalation? Exactly where are the separations between input of food and the energy which is released in the blood stream? Exactly where and how does man respond to the radiations, electromagnetic-gravitational fields, temperatures, and all of the other phenomena in nature which impinge on him and which he is in lesser degree at the same time generating? This relating, this interaction, within and among his enterprises are illustrations only of what is meant by Communication in the broader sense.

Perhaps most all of us hold some sort of model in our thinking in respect to the manner in which communication functions since we must have some sort of norm with sufficient points of reference to guide our efforts. To work without at least a general model leaves our efforts to diagnose most communicative disorders without consistent criteria. Intelligibility and audibility have long been insufficient for the criteria in the array of difficulties as we encounter. We need, in fact, scores of check points which are only partially accessible through the standardized tests. Further,

many of the tests have not been correlated with any model of communication, and we do not know how relevant they are. We accumulate much data on a subject, but we are often uncertain as to its interpretation. An example of this is in the lack of correlation between hearing acuity and listening. Normal hearing does not necessarily insure the listening upon which the response of speech is dependent.

Criteria for Model Building

The requirements for a suitable model of the communication process seem almost impossible to diagram. All attempts we have observed, including our own, grossly oversimplify, have only half validity, and most tend to be dehumanizing by making man an analogue of a machine. We can attempt, however, to outline some of the criteria in light of the relating functions as they appear to us. First, the model must clearly indicate language as an instrument of human adjustment to an apparently chaotic world, but one in which there is nevertheless much order and structure if the communicator can recognize it. Second, an adequate model of the communication process must incorporate the chief variables which must work together in the complicated neuro-muscular coordinations which go on in speech and symbolizing. Third, the model should account for the homeostatic and feedback phenomena, the balancing and regulating through the brain and nervous system for coherent speech. Fourth, most important for us, the model must be able to provide at least a general explanation for the gamut of

speech and communication disorders and pathologies, from articulatory difficulties, to stuttering, to the dysphasias, and other involvements of the nervous system. Fifth, if it is valid, the model will provide for all of the modalities of reception and all of the means of expression in the common central process. Sixth, the model must be capable of encompassing and harmonizing research data concerning communication from the diverse inter-disciplinary sources from which we encounter them. As research advances, the model should be capable of correction and extension accordingly as theories and philosophies become validated. This is important if research data from abnormal communication are to have meaning. An example of this may be seen in the area of stuttering, in which there are many "theories," with but a few having any rigorous research basis whatsoever.

The model will need to be four dimensional since it will need to coincide with both the growth and deterioration of the whole communication capacity from conception and birth through childhood to maturity and senility. If the model is to deal with the existences of this process as our subject lives, it must be able to follow him into his human interpersonal networks of his organizations and institutions. Finally, the model must have the flexibility necessary to allow the formulation of criteria of what is 'normal' in these behaviors in relationships to man's various cultures.

Ideally, there should not be a diversity of models. If the model has correspondence to the neuro-semantic-linguistic phenomena which comprise Communication, one model should suffice for the human species. The present great diversity of models may result in part from the different objectives and terminologies of the specialized professions working for the improvement of communication. The differing viewpoints the specialists maintain may be corrected when we know as much, for instance, about Communication as physicians know about what is called smallpox, a deviation from their model of health.

A Cybernetic Model of Communication

There are many factors not possible to diagram into such models as Figures 1 and 2 (and for that matter, in any others we have scrutinized.) Chief among these is the arousal of messages from the memory storages which the reception of messages from outside the person activates simultaneously. These inner messages, the basis for the making of inferences about the environment, are triggered directly in proportion to the similarities the subject perceives of a present situation to situations previously experienced.

Among whatever sense modalities come into play in the reception-perception stages and the language or behavior outputs the activity goes back and forth, an interplay, a circularity between the environment and the responses or outputs to it. The cyberneticists describe this interplay in terms of Positive and Negative Feedback, and Feedforward.[1]

Figure 1. Interplay in Language-Thought Relationships in One Person

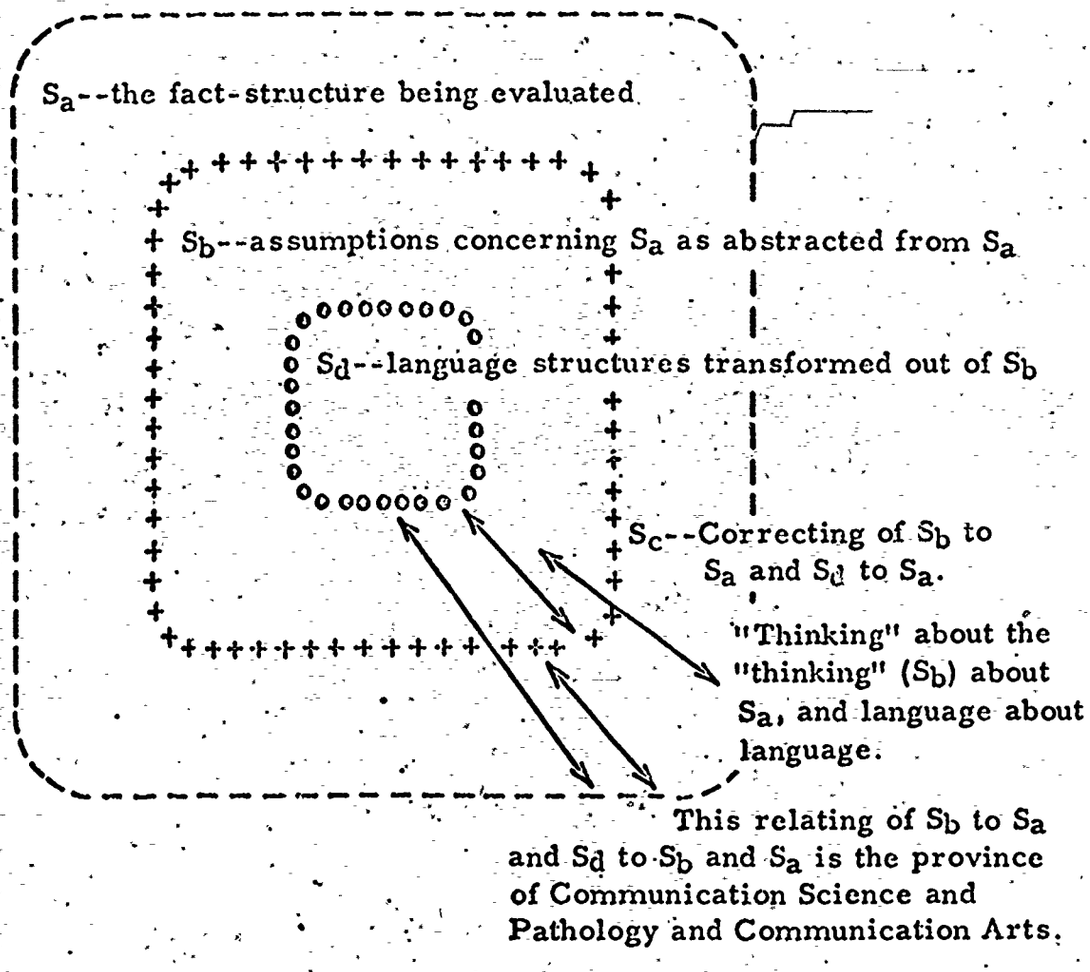
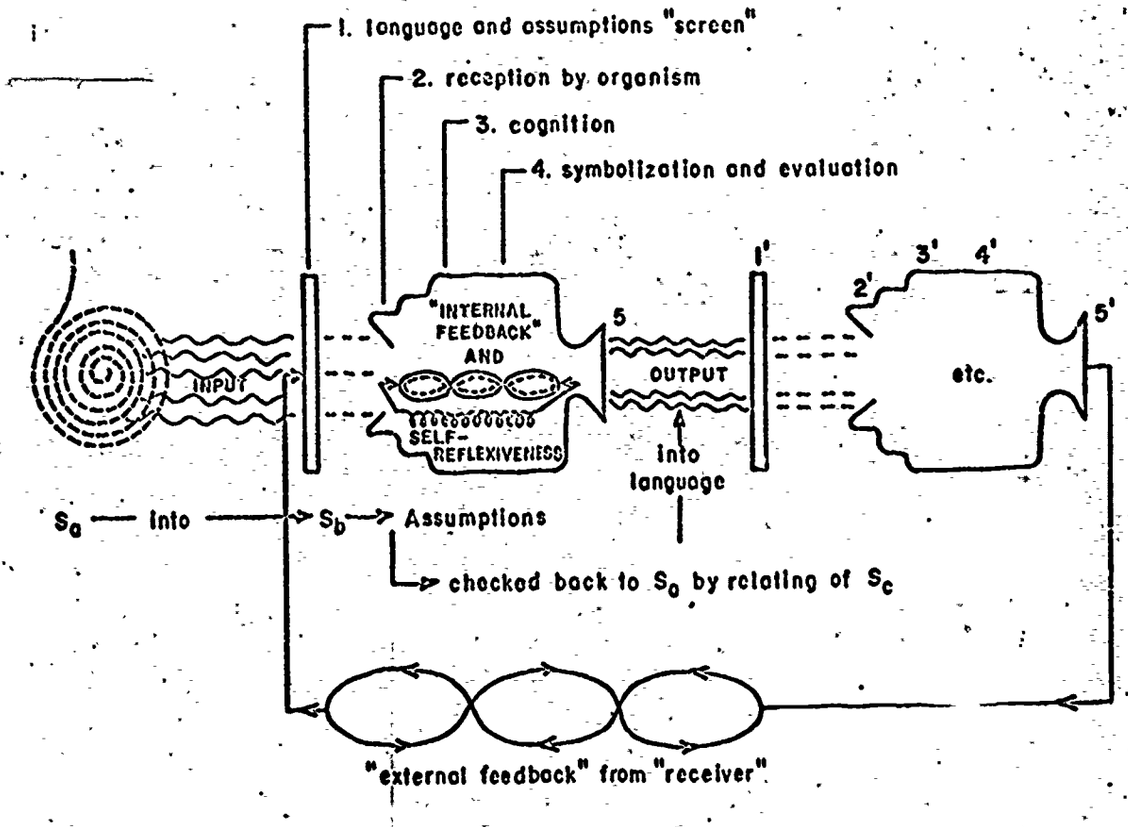


Figure 1 is an attempt to represent the interplay and circularity between an environment and the ensuing speech back into the environment. At the highest order of abstraction, c (communication) may be described as a series of isomorphic transformations from S_a into S_d. When the different orders of abstractions (transformation to transformation) are kept in correspondence with S_a the conditions for adequacy, mental health, and creativity remain favorable. Communication pathology is concerned with the array of physical, semantic, psychological breakdowns and disorders in this whole relating-functioning.

The principles of relating as diagrammed in Figure 1 are further exemplified in Figure 2, a modification of a diagram by Wendell Johnson (1953, 1958). Both combined would be the model we have in mind but it seems impossible to put both in a single diagram.

Figure 2. A Fact-Structure Transforming Isomorphically into Language



(modified from Johnson 1953 and 1958)

Positive Feedback is the response perceived to a message which in turn triggers further ideas. Positive Feedback induces and continues spontaneity. In a closed system such as prejudice it often feeds upon itself until energy is exhausted. Examples of this are in the building up of emotional outbursts, of impulsiveness and over-verbalization. Positive Feedback is the great reinforcer. This freedom, to the extent it runs wild, is the enemy of relevancy and coherence. But it is also the ally of creativity. The "running wild" suggests the possibilities, the alternatives, the vague, and unformed ideas which we must have for breakthroughs into our problems and into their solutions. As implied by Sondel (1964), Positive Feedback powers how much the person will say, how much he will write, how long he will persist.

Feedforward denotes the direction in which the thinking, language, and action goes and determines the decisions we make on what we are going to explore and think about next, in what we are going to talk about next, in what we are going to do next, and in the way in which we are going to think, speak, and do. It powers the development of our subjects of discourse; it powers the thoroughness in the treatment of the sub-topics of our themes.

Feedback becomes negative when the response perceived to a message results in the slowing down, inhibition, or stopping of further messages. Negative Feedback brings the forward-going phenomena into size, shape,

and form. It is the great mechanism of critical thinking whereby inference making and semantic jumps of Positive Feedback are curbed to bring language and the underlying assumptions into an isomorphism with the structures of existence. Herein communication contributes to mental health. It makes for relevance and coherence. It brings wild inferences into a better correspondence to 'reality' to improve predicting and foresight.

At this time we can sketch in only a few connections of this "model" (which in itself is a sketch) to the multitudinous defects, disorders, and disturbances in the structural process of Communication. We suggest that, when sufficient data from the laboratories are in, about all the problems with which speech and language pathologists are concerned will find their place in what has been outlined.

The sensory modalities open only small cracks into the environments which they reflect. In the very limited spectrum to which the five senses can respond there is a mixing of these signals with the signals from within the organs and musculatures of the whole body. The messages from the inner senses more or less compete and are often confused with the traffic from outside.

When the necessary isomorphism (similarity in structure) to 'reality' is not maintained, when intensionality shuts out the extensional,[2] we call the psychiatrist. But this closed inner activity occurs in varying degrees in the province to which speech and language pathologists limit themselves. We have observed no ingrained communicative disorder in which there was not the tendency to misevaluate its nature and importance by the subject. Often enormous concern about the language disorder shuts off the necessary primary attention upon what the subject is talking about. Frequently there is a reversal of attention into what the speaker thinks the other persons in the situation think about his thinking and about his speech.[3]

In this area of self-reflexiveness (the subject's reactions to his own reactions) we observe the subject generating his own misevaluations with the accompaniments of anxiety, fear, of language seems to be attached to the language disorders. These complexities in the interpersonal transactions cannot be developed here.

Relevance to 'reality,' and creativity, mount as extension (the perceiving of relations and operations in the fact-phenomena) deepens simultaneously with increased intension (inner activity in generating inferences, predictions, and alternatives). Relevancy to the goal comes through Feedforward which combined with energy from Positive Feedback resists opposing forces to

move forward. The movement toward a goal (to say or do what is desired) becomes strategic when Positive Feedback is brought under control by Negative Feedback. This is the semantic device for the slowing down or stopping of action which is not relevant, or in the 'right order,' or at the right time, or the right behavior.

Timing of feedback has been dramatically demonstrated in research on delayed feedback (Smith, 1962). This occurs at the less conscious levels of homeostasis. It is equally important at the conscious levels of interpersonal communication. Too suden response indicates the undelayed and impulsive response which does not adequately engage experience. Too late response interferes with symbolic formulating and inhibits evaluating. It does this in a group perhaps in as many strange ways as it does in the person. For both the person and the group, the inhibiting and critical functions of the cortex are too much in ascendancy.

When Positive Feedback and Feedforward are both fully engaged there is strength and persistence in continuing to speak whether or not it is appropriate. Perhaps there is similar strength and persistence is not speaking also. This may become the habitual oververbalization and/or underverbalization discussed by Johnson (1946). The principles seem applicable to the person who cannot think of anything to say, who cannot stand up to opposition, where no semantic reactions are evoked, whose

ability to ask questions is paralyzed, or where persons are perceived as stronger personalities and with whom the subject is not comfortable. For both over and underverbalization there is a lack in checking to the extensional, the perceiving of relationships in the fact-phenomena, and awareness that the receiver and sender are abstracting.

The models which follow are but a few of the many which might be discussed appropriately in the present context and available from a variety of academic disciplines. The reader is encouraged to seek out others from learning theory, psycholinguistics, and other related fields to evaluate for their pertinence.

Used as a norm or model from which to study communication disorders, the Fairbanks (1954) model (Fig. 3) could illustrate points of breakdown of communication within the organism and in its interrelationships with the external environment, as in dysphasia. Regardless of the type or extent of the involvement, the disruptions occuring in the communication of the dysphasic can be viewed here as disturbances in the sensor or effector units of the model. A weakness of this model is the omission of the content of the signal being received in the input section and the amount of 'noise' and language distortion residing in the assumptions already present prior to its reception. In other words, the interpersonal aspects of the communication disorder are omitted to show the intrapersonal dimensions through the servo-mechanism concept. The chief question we raise is whether this

Figure 3. The Fairbanks Model

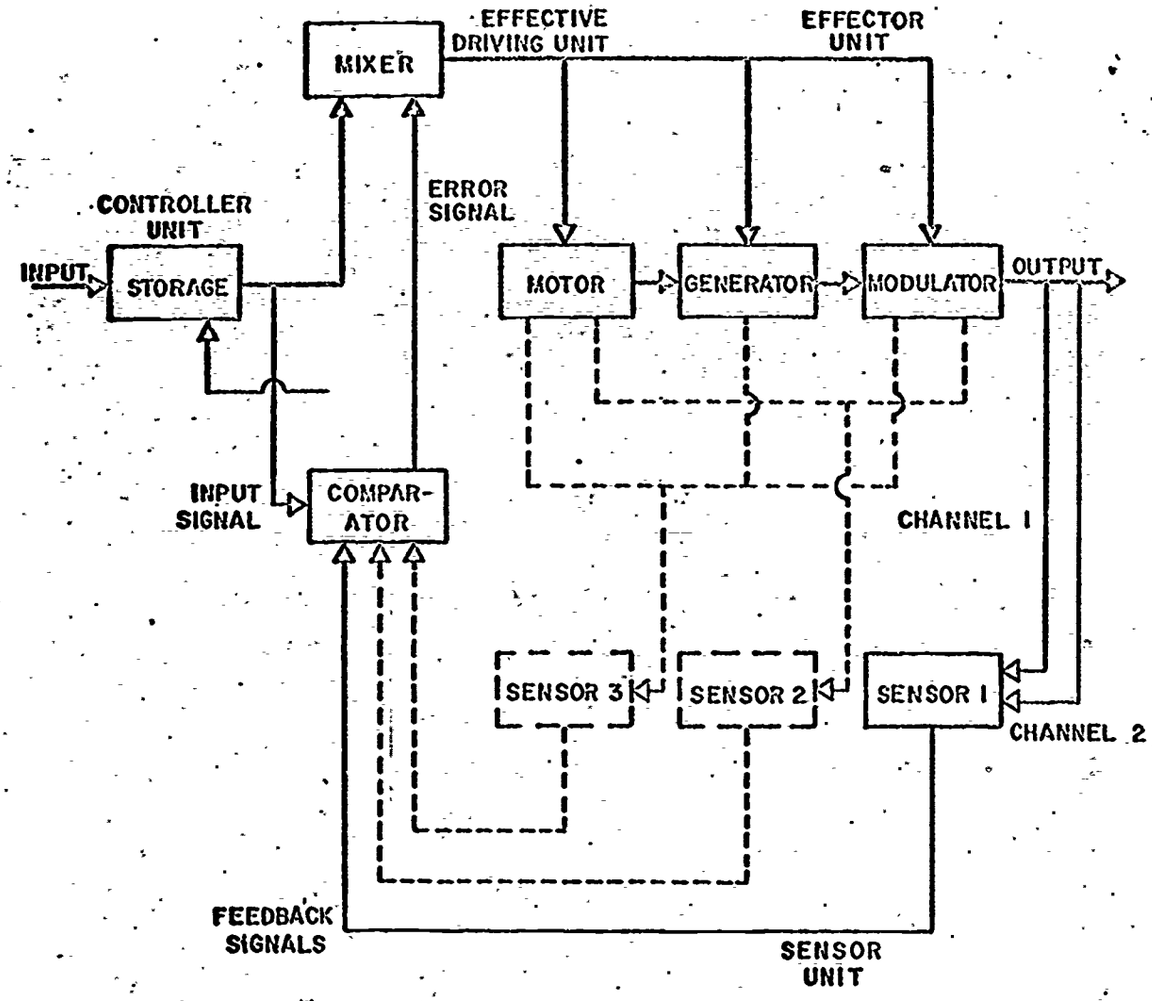
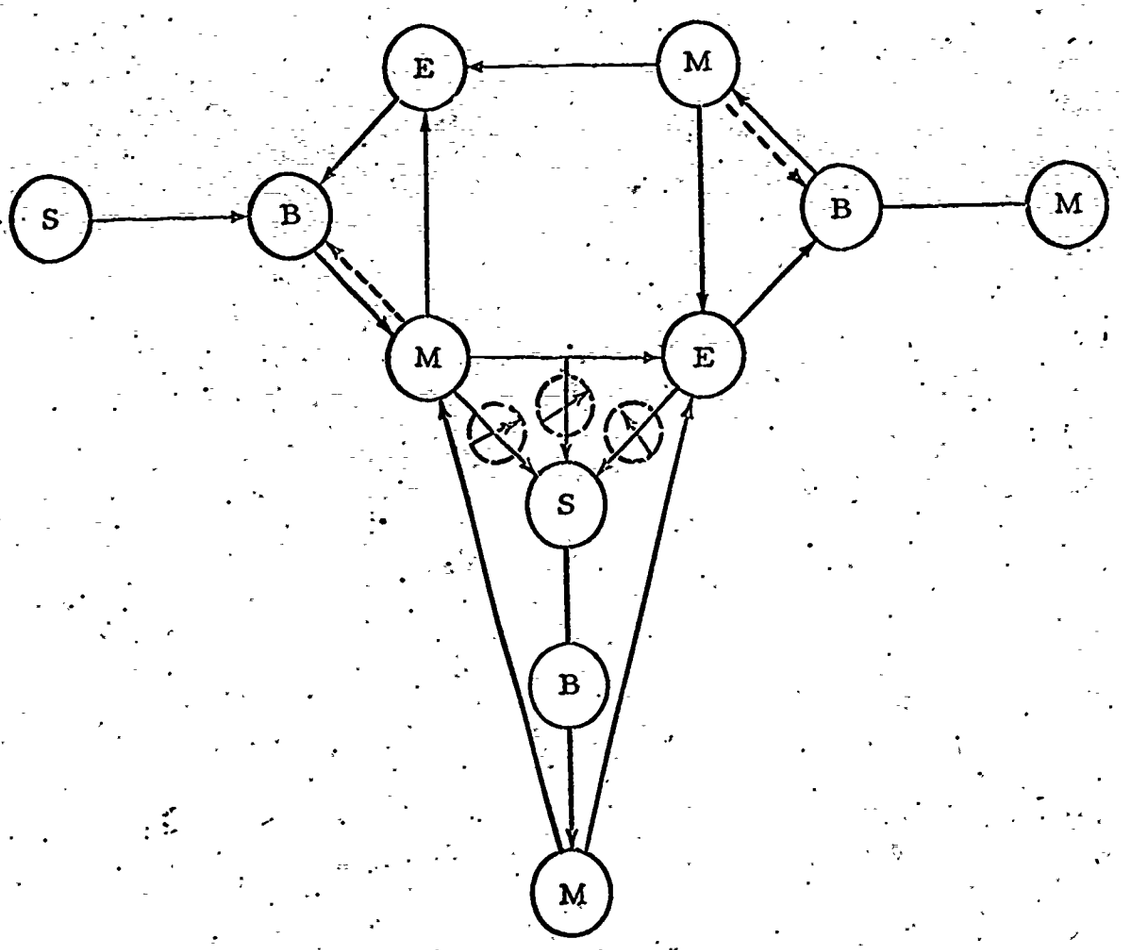


Figure 4. The Peterson Model



A schematic representation of a simple communications link, with the speaker in the upper left and the listener in the upper right: S--generalized sensory system, B--brain, E--ear, M--Motor mechanism of speech. The three circles in the lower portion of the diagram represent an experimenter: S--generalized sensory system, B--brain, M--generalized motor system. The dashed circles and arrows represent measuring instruments.

model is not exclusively concerned with signals as such? If the content of a message is made up of signals, what is the guidance procedure to keep content isomorphic to 'reality'?

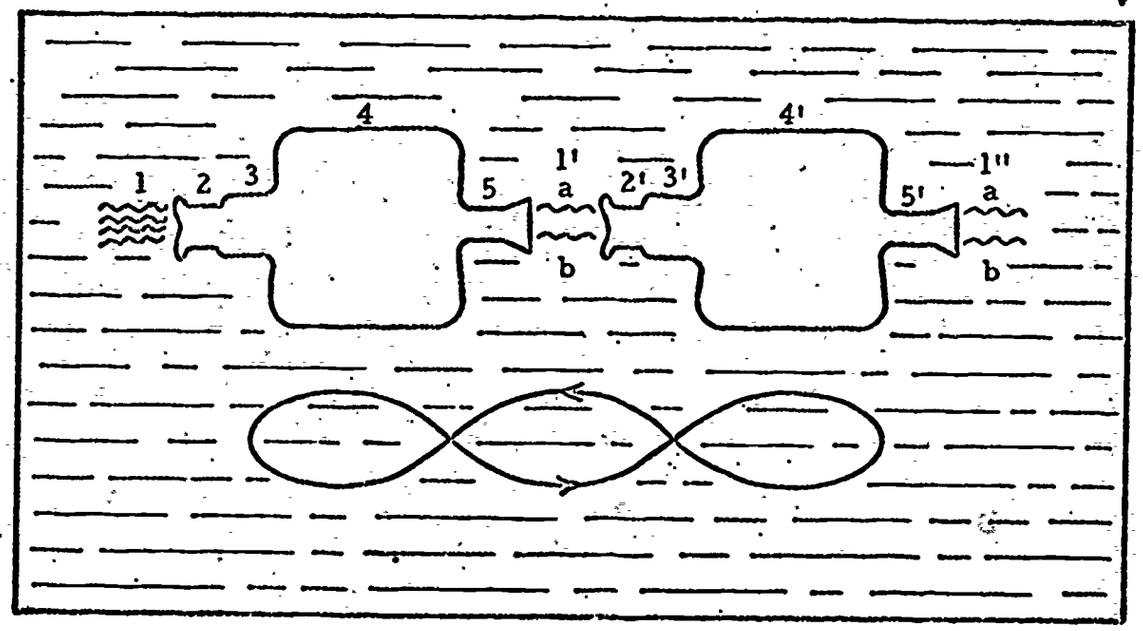
The model by Peterson (1958), Figure 4, is concerned with a more specific dimension of communication, from the research point of view with the experimenter and his instrumentation built into the model. As such, it does not account for the effects of the experimenter's presence upon the communication between speaker and listener. Since this model was designed to show a specific set of relationships in a laboratory setting, it is of limited usefulness in relating to communication disorders per se. As with Figure 3, we ask what is built into this model to keep the messages relevant and in correspondence with the fact-phenomena?

Not diagrammed here are the 'information theory' models such as that of Cherry (1961) who depicts communication as a 'one-way' process, although he does account for the 'noise' factors which may interfere between transmission and reception. Wiener (1954) notes three levels of communication problems that may be seen to bear directly on disordered communication in the clinic. In the first level, technical problems in the accuracy of transference are, of course, obvious in the case of the patient with a hearing loss. Most aphasics are shown to have problems in interpretation of meaning by the receiver compared with that intended by the sender. The

third level, effectiveness with which the meaning is conveyed leads to desired conduct, is perhaps more applicable to other clinical problems, such as parent counseling. The factor of noise noted by Cherry (1961) has particular relevance, since we can define noise as any disruption or unwanted signal which may interfere with the desired signal. In this respect, reception interference is of primary concern and while 'noise' is generally considered to be external to the organism, physical injuries to the organism which distort the message, or interfere with its normal perception, might also be considered 'noise'. Hearing losses of varying degree are one obvious class of example here, as would be dysphasia. Since dysphasia is rarely this simple, however, our model here is lacking in representing the total picture and an added dimension, perhaps in interpretation-regulation of the 'noisy' signal, is needed. Distinguished at another order, 'noise' enters from the orientation dragged in by the assumptions inherent in the receiver's use of language.

Figure 5, a communication model developed by Johnson (1956), is one of the few which attempts to relate the communication interaction between the speaker and the listener in a dynamic fashion against a background of the linguistic environment. As was noted in many of the previous models, this model does not account for the existence of noise elements in this relationship. This model is one of the few, however, which denotes stages of perception, integration, and internal and external feedback within and between the communicators. A clear application of the Johnson model to

Figure 5. The Johnson Model

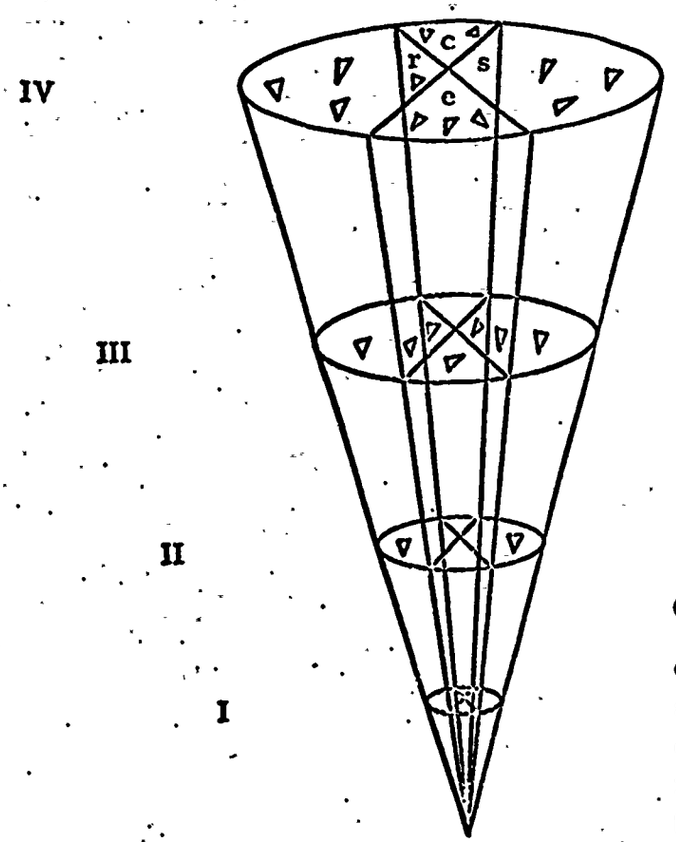


Key: Stage 1, event, or source of stimulation external to the sensory end organs of the speaker; Stage 2, sensory stimulation: Stage 3, pre-verbal neurophysiological state; Stage 4, transformation of pre-verbal state into symbolic forms; Stage 5, verbal formulations in "final draft" for overt expression; Stage 1', transformation of verbal formulations into (a) air waves and (b) light waves, which serve as sources of stimulation for the listener (who may be either the speaker himself or another person); Stages 2' through 1" correspond, in the listener, to Stages 2 through 1'. The arrowed loops represent the functional interrelationships of the stages in the process as a whole.

communication disorders is the problem of stuttering, wherein the evaluation aspects of the disorder are of primary importance. This model accounts for the speaker's (stutterer's) reception of the signal, its integration and, perhaps more importantly, its evaluation prior to his own verbal response. The feedback, on an internal level, of the stutterer's speech is accounted for as is the reception of this signal by the listener; in addition, the stutterer's evaluation of the listener's evaluation is also accounted for by the 'external' feedback loop. The element of 'noise' or distortion in the stutterer's evaluation of his speech is accounted for as well. A concern for the maintainence of isomorphism is apparent in the use of the 1', 2', 3', 4', 5', to represent keeping of a correspondence in the messages between two speakers.

Most of the models discussed to this point indicate or imply the relationship between one speaker and one listener. The model proposed by Reusch and Bateson (1951), Figure 6, is more 'socially' oriented and describes communication through a series of levels, each one encompassing more persons. The most basic level is intrapersonal, progressing through the communicator and one other person to the group level and, ultimately, to the cultural level. Any communication disorder which has as its base a cultural evaluation may be described through this model, which is to say the entire field of communication disorders. The process of communication

Figure 6. The Reusch-Bateson Model



Code:

e: evaluation
s: sending
c: channel
r: receiving
▷: one person

is secondary in this model and the relationships existing in a social matrix are given primary consideration.

Again, the problem of stuttering would appear to be amenable to observation through this model. At the most basic level, the stutterer's own 'social' evaluation of his speech is essentially intrapersonal. As the matrix becomes more complex, by moving from one level to another, so does the communication problem. As is indicated by research, the difficulties in speech production become greater as the social sphere increases. Since stuttering is one of the few speech disorders viewed from a cultural influence point of view it seems particularly appropriate in this model scheme. At the ultimate (cultural) level the concept of deviance must exist among sufficient members of the society as represented on that level for the problem to be self-evaluated as deviant by the individual, the lowest level represented on the model. One deficiency of this model for our purposes is that it lacks the relational aspects covered in some detail in previous models and as a result tends to over-simplify the complexity of the interrelationships, particularly on the cultural level. While we may learn much from the models thus far available from electronics, from psychology, or sociology, or psychiatry, or cultural anthropology, or management science, we have thus far seen none which appear adequate for our purposes. In our opinion, they are too limited and they do not describe the chief variable at the heart of interpersonal communication: namely, the maintenance of a

sufficient isomorphism in the relating of environment to thought to language structure.

Our conclusions, after viewing communicative disorders in the framework presented here, are that present methods of categorizing are, by and large, symptom-oriented, non-descriptive, and unscientific. This, in turn, has led us to the following orientation of classification which we feel is more functionally and relationally oriented.

Under this structure, communicative disorders may be viewed as falling in one or more of the following categories:

1. Trauma or lesion, structural defect, or developmental anomaly.
2. Deficiencies of isomorphism and evaluation.
3. Interferences in coordination, feedback, and regulatory phenomena.

It is probable that most communicative disorders would fall into more than one of these divisions. While an aphasic may be assumed to be aphasic as a result of cerebral trauma, for example, the effects of his disorientation soon lead to secondary problems which put him into the other two categories as well. Because of the reactions of the individual and those around him, it is unlikely that many persons would remain

exclusively in the first category; the recognition of a problem would seem likely to introduce an overlay of semantic disorders on the physical problem.

This orientation leads the speech clinician away from the procedure of diagnostic labeling that is non-descriptive and 'symptom' oriented. The time is long since past, we feel, that the diagnostic and evaluation procedures based upon similarities only and so-called 'symptoms' only have had any justification in our field.

If speech pathology and audiology are ever to grow to the point where we can claim for them distinction as a discipline it seems, to us, that its practitioners must first recognize that all knowledge undergoes continual change and that similar and proportional change is necessary in the clinic and in the laboratory. The assumptions underlying all we do in the field are under constant bombardment from without; the development of sufficient models of communication which we ourselves build, be it by virtue of scrutinizing our own daily activities in a new light or by the ways described here, may be one way in which we can incorporate the rigor and flexibility within not only to withstand this bombardment but to add growth and maturity to the field at the same time.

It seems to us ironic that a field concerned with deficiencies in that most

human activity, communication, is also one which appears to view the recipients of its services in a dehumanizing way---through the models we use and the way we label (rather than describe) the problems with which we work.

Summary

The need for studying communication as a process which knows no disciplinary bounds has been recognized by many scholars of the process. Models of the communication process have been devised in order to make the task of communicating about Communication easier.

A totally suitable model should encompass the following: 1) an indication that language is a tool for human adjustment; 2) an accounting for of the variables that work together in the process of symbolizing; 3) feedback; 4) an explanation for disordered communication; 5) a provision for all the receptive-expressive and central processes involved; and 6) a means of encompassing and harmonizing interdisciplinary research in communication.

A number of communication models are presented, and their relevance when applied to communicative disorders discussed. The major criticism of the existing models is the lack of isomorphism in relating environment to language structure.

A new orientation toward classification of communicative disorders, based on the discussion of communication models, is presented.

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1. 'Feedback' and 'Isomorphism' are brought into the communication model in Speech: Science-Art by E. Murray, G. Phillips, and D. Truby, Bobbs-Merrill, Indianapolis, 1969.

2. 'Intensional' and 'extensional' orientations, along with the others cited below, are formulations from Alfred Korzybski's applied epistemology

of general semantics (Science and Sanity, various editions, International Non-Aristotelian Library, Lancaster, Pa.) which provides a methodology for correcting our assumptions and the processes whereby they are built. The formulations are designed to enable us to know about our knowings, to have cognition of our cognitions. These second order semantic behaviors are uniquely humanizing.

Other of these formulations, basic to the theme of this paper, include: Consciousness of Abstracting; Non-identity; Self-reflexiveness; Multi-ordinality; and Extensional Devi[illegible].

3. This process, by which information (or lack of it) dehumanizes is particularly apparent in the problem of stuttering. Here the stutterer, by his evaluation of a label applied to his very human dysfluency, reacts, first, to his speech as being abnormal since it is not 'perfect'. The resultant stress on perfection in turn creates more anxiety and stress, the speech gets progressively worse, creating further anxiety, etc. The stutterer, then, essentially helps to create and maintain his own disorder.