COMMUNICATION AND SCIENCE

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Contents

Preface

I. A General Theory of Communication 1
- The Origin of Ideas 25
- Motivation Theory: An Example 38
- Cognitive Processes 43
- What is Communication? 46

II. Science and Communication 50
- Science as Public Understanding 53
- Classical Science 60
- Modern Science and Relativity 74
- Relativity and Transformation 75
- Scientific Method 80
- Observation 82
- Objectivity 85
- Precision 90
- Theory 93
- Testing Theories 95
- Experiments 102
- Science as a Collective Adventure 107
- Summary 109

III The Communication of Culture 111
Technologies 146
Neural Networks 147
Summary 151

IV Variations in Communication Theory and Research 154

V Human Intuition and Scientific Understanding 165

VI Categorical Methods: Logic and Scaling 183
Scaling 206

VII Comparative Methods: Measurement 213
Measurement 223

VIII Principles of Communication Science 240

Preface

The field of communication, as its partner disciplines in the social sciences, has been confronted with a sizeable array of alternative approaches to the study of people in society. So many different approaches have been advocated, in fact, that it is not clear how many there are or just what boundaries might exist among them. In addition to the classical approaches such as the philosophical, rhetorical, journalistic, artistic and scientific models, there are newer contenders such as ethenomethodological, hermeneutic, critical, rules, laws, statistical, constructivist, deconstructivist, and yet other approaches. Each

of these may, with more or less legitimacy, lay claim to a special insight which makes its particular kind of understanding unique and valuable.

However exciting this intellectual richness may be for the professional, to the beginning student, the field may often seem less a field of scholarship than a field of battle. Introductory textbooks often vacillate between combatative arguments for a specific approach, and hopelessly eclectic compilations of insights from a myriad of viewpoints. This is not so much a failing of the authors as it is an inevitable consequence of there being too many approaches to cover deeply in a single elementary book.

This book is by no means meant to solve this problem, but it does intend to provide a principled introduction to one of the major approaches to communication studies -- the scientific approach -- in a small enough format to serve as a supplement to a more general introduction to the full range of alternative approaches.

Communication and Science is not a technical book or a book of methods, but rather a book about what the scientific method is and how it interacts with the study of communication. There is no shortage of introductory books on research methods and statistics, and of course there is a deep professional literature from the philosophers of science. This book, on the other hand, is an introduction to the scientific study of communication which is meant to be accessible to beginners and amateurs.

Although the author's fondness for science cannot be hidden, the approach is not meant to be contentious or argumentative, and the value and utility of alternative approaches is clearly

acknowledged. Even so, fuller explanations of the nature and advantages of alternative approaches is left to those closer to them. At the same time, it is important to point out that there is important disagreement among professionals as to the exact nature of science. Although this book makes a sincere effort to put forth a view of science that is consistent with the beliefs and activities of most professional scientists, inevitably it expresses a point of view with which some serious students may take issue.

The central thesis of the book is that modern science is not -- and has never been -- positivistic, although, of course, individual scientists or philosophers of science may hold different views. Science need not believe that observations are independent of the frame of reference of the observer, or that the world is simply there to be viewed by the careful observer.

Rather the view expressed here is that science has as its goal the construction of a shared, collective frame of reference within which observations may be compared. In fact, the book is largely an amplification of remarks by two contemporary scientists, Edward L. Fink, who said "Science is public," and George A. Barnett, who said "Science is difficult."

The book would not have been possible without the help of George Barnett and Christine Iacobucci, who read the manuscript and made valuable suggestions, Joan Ford, who gave it whatever intelligibility it might have, and Jan Harszlak, who edited every keystroke. Thank you.

jw
Amherst, NY
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Chapter I

A GENERAL THEORY OF COMMUNICATION

Although philosophers have always been concerned with people and society, the social sciences had their real start in the great period of urbanization and industrialization that we now call the Industrial Revolution. For centuries before this time, society had changed, but slowly. In the 17th Century, however, the population of the world began to increase explosively, and the old forms of social organization, consisting mainly of local small scale agriculture, began to crumble under the strain of the incredible increase in human population. Great numbers of people began to migrate from rural areas to cities, which in turn began to grow to unprecedented sizes. These large pools of unemployed city dwellers provided ready workers for newly developing urban industries, and societies which

had previously changed slowly began to change virtually overnight.

These vast changes in social organization led to great interest on the part of scholars and philosophers about society and the individual's place in it. Out of these early questions arose the modern social sciences: anthropology, geography, economics, political science, psychology and sociology. Although each of these disciplines has its own unique set of interests, all share at least one fundamental concern: how is society possible?

The English philosopher Thomas Hobbes stated the basic question in a very interesting way. He believed that people were, for the most part, pretty much equal in their mental ability (he thought this because people seemed satisfied with their own brainpower, no matter how inferior they may feel about their height or appearance or physical strength.) Because they were all roughly equal, each person could have an equal hope of

achieving his or her goals. But life is competitive, and often different people want the same thing (or the same person!). Among the most effective means of getting what one wants and needs, according to Hobbes, are force and fraud, so it follows that life ought to be a "war of all against all," a constant struggle of every person using every means at his or her disposal to cheat and rob his or her neighbor. Human life ought to be "nasty, brutish, and short."

But it isn't. Even though society is often spiced with violent conflict, for the most part, life goes on routinely, in a fairly systematic and orderly way in most places at most times. Why is this?

Different theorists developed a variety of theories to account for social order. Each of these theories was a hypothetical answer to Hobbes' question: Why is society more or less organized, and why isn't social life continuous, active warfare at all times? Some theories, like Hobbes' own, maintained that human

nature was fundamentally evil, but that the State, through a monopoly over force (through armies and police) maintained order by ruthlessly punishing disorder. Others, like Russeau and Freud, believed human nature was basically good, but that society in some ways corrupted people. Still others, like Adam Smith, believed that the forces of the free market economy automatically made it in everyone's advantage to cooperate, and so order was maintained by the "invisible hand" of free market forces.

All these theories, no matter how different, share one fundamental idea in common, and that idea is that individuals come *before* society. Most of the theories developed during the early days of the social sciences talked about a hypothetical "state of nature", which was the condition in which people lived before society began. Each of the theories had a different idea of what people were like in the "state of nature", some thought they were basically gentle and good, others that

they were bestial and evil. But all the theories believed, in some sense, that there were individual human beings with minds, attitudes, beliefs, needs, desires, and thoughts -- before there was society.

In the 20th Century, however, a different view began to emerge. Some theorists, like the philosopher George Herbert Mead, for example, began to question the idea that individual people existed before society. Instead, this new view insisted that society had to exist before there were individual human beings. Now, on the face of it, this seems absurd, since society is composed entirely of people, and obviously there couldn't be any society without people, but this is not what the new theory means at all. What it does mean is that, before there was a banding together of individual people into tribes and societies, individuals would not have "minds" in the sense they do now. Before societies developed, individual human beings would not have thoughts, ideas, desires, plans and concepts. The new theory (called

"symbolic interaction theory" or sometimes "interactionist theory") believes instead that *the human mind develops through communication with others, and not otherwise.* Human beings are considered *social* animals, whose mental development requires society.

While this theory was not developed by Communication theorists, it has been warmly embraced by them, and the idea that human consciousness emerges from communication with others now lies at the heart of modern Communication theory.

Each individual child is born into a society which is already there. As its senses begin to develop, many stimuli reach its brain, but the resulting images are incoherent and uninterpretable. While this is going on, however, the child is also experiencing an extensive flow of communication from people around it. These people already have functioning minds, and have already interpreted raw stimuli into objects and concepts. They designate recurring patterns of stimuli for the child and

name those patterns, again and again, so that the child learns to associate the patterns of stimuli with the symbols provided by the society. Even in the earliest stages of infancy, parents, friends and relatives help the new child symbolize experiences by saying the names of the most common objects in the child's environment over and over. Games like "Pat-a-cake","This Little Piggy" and "Got your nose!" help the infant distinguish important body parts from the general background environment.

This symbolizing of patterns of experience changes the undigested stimuli into "objects", which means "anything that can be designated or referred to." Once a pattern of stimuli can be *symbolized* it can be designated or referred to, and can form an object in consciousness. The child can be aware of it as something different from the background. The child does not invent these symbols, however; they have already been invented by the society and are passed on

to it through its communication with the members of society around it.

When this theory first originated, no one understood how the brain was able to learn to symbolize its experience, but recent research in neuroscience, computer science and cognitive science has led to a useful hypothesis. We know now that the brain consists largely of tiny electrochemical devices called *neurons*, which act a bit like switches. (Scientists believe there are about 10^{11} neurons in a typical human brain, which is a very large number.) These neurons are connected to other neurons by electrochemical pathways, although not every neuron is connected to every other neuron.

Some of the neurons are connected to receptors in the senses (that is, the eye, the nose, the ear, the mouth, and the skin). When we communicate with our environment, small amounts of energy activate the receptors in the senses, and electrochemical signals travel along the pathways to the neurons. When the

total amount of energy reaching a particular neuron climbs above a certain level or "threshold", the neuron turns on or "fires." When a neuron fires, it gives off electrochemical energy which travels along the connections between that neuron and all the others to which it is connected. Again, for this next level of neurons, if the total amount of energy reaches a certain threshold, they in turn are activated, and so on until the cascade of signals reaches the ends of the network of connections. If we experience one pattern of stimuli (that is, see, hear, touch, smell and/or taste some particular pattern) then a particular set or pattern of neurons will be turned on, and the others will remain off. If we experience something different, a different pattern of neurons will be activated. Thus what we are sensing "outside" our body is represented inside our body by patterns of activated neurons inside. Any particular experience represents a particular pattern of activated neurons.

When a baby sees a cat, a set of neurons which represents the (ever changing) shape and color of the cat are turned on; if the cat meows or purrs, the set of neurons which represent the sounds are also turned on. If the child's mother or father says "cat" while the child is looking at and listening to the cat, the set of neurons that represent the sound "cat" are also turned on.

Now a very important rule about how the brain works is this: the connections between neurons which are activated at the same time tends to be strengthened a little bit each time they are simultaneously activated. That means that, over time, the pattern of neurons which represents the appearance of the cat, the pattern of neurons which represents the sound of the cat, and the pattern of neurons which represents the sound of the parent saying "cat" will become connected. The result is that the set of neurons which represent the appearance features of a cat, its sound, the sound of parents saying "cat" and many other features associated

with the experience of a cat become interconnected into a *network*. This network of interconnected neurons represents the concept of "cat." Because its parts are tightly interconnected, when one part of the network is turned on (if, for example, the parent says "cat", the electrochemical signals emerging from this set of activated neurons can travel along the connections to the rest of the neurons in the concept and activate the entire concept. When a child sees a cat, or hears a cat, or hears someone say "cat", the concept of cat will be "called to mind."[1]

This "neural network" model is one possible explanation, and a very promising one, of how people can learn to *symbolize* their experiences. Whether the neural network model is correct or not, however, the development of symbols is of great importance in

[1] Connections between neurons can be negative as well as positive. We might imagine, for example, that negative connections form between the neurons that represent "cat" and "bark", for example, so that hearing barking "turns off" the concept "cat".

human thought, since it is symbols which makes thought possible. Once a set of stimuli have been designated and referred to by some symbol or set of symbols, we call the result an *object*. Thinking is the symbolic representation of objects. The major insight of modern interactionist theory is that most, if not all, of the symbols which represent human thought are not present at birth, nor are they developed by the individual during life, but rather have been developed by society over a long time and *communicated* to the individual by society.

Since each object is defined by a pattern of connections to other objects in the brain, we can see that objects have a meaning which consists only of their relationships to other objects. Learning what things are consists entirely in comparing them to other things (or in hearing our significant others tell us how they are related to other things, which is probably much more common

than learning by ourselves.) This means that no object has an inherent or intrinsic meaning by itself, but every object has meaning only in relation to the rest of our experience.

The most important "object" which the child is taught to symbolize and refer to is itself. The society, acting through the child's "significant others," (those who communicate with it most), teaches the child to identify, symbolize and refer to itself as an object of its own experience. To be sure, the self is a very special object, if only because it is the only object in one's experience that is *always* there. Once the child's self has been symbolized and thus made into an object of experience, it becomes possible for the child to observe, designate, and refer to itself. Once the self has been symbolized, the child can become *self-reflexive*, that is, aware of itself and its own actions.

As time passes, the child's significant others communicate to it not only that it is a "self", but begin

to communicate to it *what kind of self it is*. Depending on the child's actions and the significant others' reactions to those actions, the child is labelled a boy or girl, smart or not so smart, good or bad, fast, slow, ugly, attractive and much more. These symbols, which the child attaches to its own self, become the basis for its identity. In the earliest stages of life, these symbols are taken over from the attitudes of the others expressed toward the child. As the child grows older, it begins to play with other children. In the earliest forms of play, the child is able to recognize that there is a difference between other children and most other objects, like balls, stuffed animals and the like. Other children react like the child itself; they cry when toys are taken from them, smile when pleased, and so on. As a result, the child can begin to learn that there are other selves like itself, and can begin to identify with these other selves. The child can take the attitude of the other child, and by so doing learn something about its own self.

Still later, when the child is old enough, it can begin to take part in games. Games are different from simple play, because they are organized in systematic ways. To play a game like baseball, for example, requires different players playing different positions, with different tasks and responsibilities. The set of tasks each player must accomplish in his or her position is called a *role*.

The important aspect of games is that no one player can accomplish his or her role without understanding the roles of the other players and the relationships among those roles. It is impossible to play the role of batter, for example, without understanding the role of pitcher. A fielder can't fulfill his or her role without understanding that the batter will try to hit the ball, and that, should it come to the fielder's position, the fielder must attempt to catch or stop it and throw it to another player. Knowing where to throw the ball (or whether to throw it at all) requires understanding the

roles of all the other players.

When a child learns his or her role in a game, it is necessary to learn how that role relates to all the other roles. This ability to perceive relationships among the different roles played by different people is extremely important, and the essence of the modern theory as opposed to the older theories of social order. In the older theory, each individual had needs, desires, goals, plans and so on, which where inevitably in conflict with those of all the other persons in the world. But in the modern theory, each person's self concept consists of the set of roles he or she plays, and these roles are themselves interrelated to the roles of other members of society. The individual is not isolated and at odds with society, but is a mirror of it, whose own mind is organized in a way that reflects the organization of the society. Conflicts between individuals are the result of imperfect organization of the society, not inherent conflicts among egoistic individuals. Because any society

will always be imperfect, conflicts will always occur, but, for the most part, social life will be organized and relatively coherent.

This process by which the society communicates roles of organized activities into individual members continues throughout life as the child grows up and takes on different positions in the society. A position is often called a "status", from the Latin word for "place" or "location." The concept of "status" is a complicated one, but in general it refers to a position in an organization. Every person holds many statuses in many organizations during his or her life, as members of families, schools, cities and countries, business organizations, churches, political parties, voluntary groups and associations, the military forces, and many more. Associated with each of these status is a *role*, or set of organized behaviors which members of that status are expected to perform under different circumstances. Equally important, each status is connected to other

statuses through organized communication channels, and the way in which members of any given status are expected to communicate with other nearby status are part of the role associated with that status. The ways in which each status is linked to other statuses through communication is called a *communication network*, and this communication network behaves in a way that is similar to the *neural network* in the individual brain we discussed earlier. (Social communication networks are by no means identical to neural networks in human brains, but there are certain aspects of the way they work that are fundamentally similar.)

Once having taken on a given status -- such as a son or daughter, firefighter or teacher, or minister or student, persons in that status are exposed to systematic communications from the statuses near them about how the role is to be performed. Incumbents in the status learn what behaviors are expected from them, and what it is like to be a member of that particular status. The

role associated with that status becomes part of the self concept of the person. The total self concept of any person may be thought of as the complete set of roles, attitudes, and beliefs he or she has taken on as a result of communication with other members of the society. Everything people know and believe about themselves -- every aspect of their personal identity -- is derived from and based on the organization of the society in which they grew up. This self conception, in turn, determines the person's behavior throughout life.

The basis of human motivation in the interactionist theory is quite different from the basis of motivation in the older model. In the classical model, people act to satisfy their needs and desires. But in the interactionist theory, people act in ways they believe are *consistent with their self concept*. If we believe we are honest, we will behave honestly; if we believe we are criminals, we will behave criminally. The self concept is our sense of personal identity; it is our idea of who we

are and how we are related to the other objects in our environment. Among the other objects in our environment are actions and behaviors; those that are consistent with our sense of self; that is, those that are appropriate for people like ourselves, are the actions and behaviors we try to perform, *whether they fulfill our needs and desires or not*. This is fundamentally different from the classical motivational theory which says all human behavior is motivated by hope of reward or fear of punishment -- so different, in fact that one might wonder how different people could believe such widely different theories about the same thing. The fact is, however, that, although the theories are fundamentally different in their foundations, they can both make very similar predictions about what people will actually do under most circumstances -- so similar, in fact, that it can take great skill and ingenuity on the part of the scientist to devise tests which can tell which of the two theories works better. One important difference between

the two theories, however, is that the interactionist theory makes it much easier to understand why people are able to live together in relative order.

In this theory, it is not necessary to find a way to explain why individuals are not in a constant state of warfare with each other. In the older theory, each individual was considered a complete entity, with goals, needs, drives and ambitions that were independent of society and of other people. In his or her quest to fulfill these goals, each person would inevitably run into conflict with all the other people nearby, because they would also be seeking the same things, which are usually quite scarce. But in the modern interactionist theory, the goals, plans, ambitions and needs of each individual have their origin in the society, not in the individual, and so the actions of individuals "go together". The activities of individuals are interrelated, so that the successful achievement of ones goals assumes and requires that there are other persons seeking other goals that fit

together with our own.

In the interactionist model, each individual self conception is organized like the society in which the individual grew up, since individuals learn who they are and what they do and what it is like to be a person from the society. If the society in which they grew up is itself cohesive and well organized, then its individuals will be, for the most part, cohesive and well organized, and conflict will be minimal. Persons who grow up in societies that are themselves disorganized and out of control, on the other hand, will find themselves disorganized and out of control, and conflicts will be common.

We should not imagine that this theory predicts all members of any given status will be alike, or that people will behave in a mindless and predictable fashion. Each person occupies many statuses and plays many roles; there are so many possible combinations that one can say with certainty that no two people ever

occupied the same complete set of statuses and played the same roles, or ever will. What's more, each status, while fundamentally similar to others in the same organizational structure, is never identical to any other status. No two postmasters, for example, even in the same post office at different times, ever had identically the same responsibilities; no two mothers ever faced identical responsibilities or circumstances. While members of the same statuses play the same roles in basic ways, there is great room for differences even within the same status and the same role.

Moreover, each activity is played out in a specific set of circumstances, or *situation*. The word "situation" refers to the specific circumstances under which people act. Every action must take into account not only the status of the person and his or her appropriate roles, but also the specific situation in which it is to be carried out. Every action must be adapted to fit into its situation. Even the objects that one

encounters while acting can take on different meanings in different situations. In the United States, for example, a man might not be embarrassed to be naked in front of his brother, for example, or in front of his wife, but might find it embarrassing to be naked in the presence of both his wife and brother together. Roles, attitudes and beliefs, along with the meanings of the objects we experience, change from one situation to another, and so it is impossible for any two individuals to turn out identical; in fact, it is virtually impossible for even a single human being to remain the same over even a small interval of time, because all the aspects of his or her experience are constantly in flux in small ways, and, over longer periods, even in large ways.

The Origin of Ideas

Individuals can invent new ideas, concepts, objects, roles, songs, equations, poems, and the like, but

for the most part they don't. Some people, like Bach and Gauss, Shakespeare and Dali, are more inventive than others. But no individual invents as many ideas as he or she receives ready made from society. The overwhelming amount of information in any human mind originates elsewhere. But where do concepts come from?

Earlier, we described the brain as a network of neurons which may be interconnected. Those neurons which "go together" -- those that are activated when we see, hear, smell, taste or touch a carrot, for example, or hear or read the word "carrot," for that matter -- are connected by strong pathways along which electrochemical energy can flow. When any significant portion of these neurons are activated, the rest also turn on, which calls the concept "carrot" to mind. The memory of our concept of carrot is stored in the pattern of activation of a set of neurons, or what we may more generally call *nodes*.

There are real similarities between societies and neural networks (although there are important differences, too). In any network, there are a set of communication channels or pathways or connections. Places where these pathways intersect or cross are called *nodes*. In neural networks, the nodes are neurons. But in social networks, the nodes may be individual people, or they may themselves be organizations. In the first case, Mary may talk to John, which represents a network with two nodes, Mary and John. In the second case, the Smiths may talk to the Wilsons, which is another network with two nodes. In the second case, however, each node is an organization: the Smiths and the Wilsons. (Of course, on a lower level, both the Smiths and the Wilsons are networks, too, in which each node is an individual member of those families.)

Communication networks of this type can encode information (memories) in a way that is quite similar (but not identical) to neural networks. In a

neural network, when an individual person experiences an object, each of the different senses receives information about the object and transmits that information in the form of electrochemical signals to neurons connected to the sensory mechanisms. Information from different parts of the retina of the eye go to specific neurons in the brain, while information from the ear, nose, fingers, etc., all go to yet other neurons. These neurons in turn are connected to each other as a result of previous exposures to the object which have strengthened the connections among the separate neurons which represent the object. The "concept" which represents the object in the "mind" is not stored in a single place in the brain, but rather is represented by the pattern of activated neurons and the communication patterns among them. (It is called a "distributed" representation by computer scientists.) Those aspects of the object captured by the eye lie in one general region of the brain; those captured by the

ear lie in yet another, and so on. The entire concept can be called to mind only because the various representations, visual, auditory, olfactory, etc., are connected to each other through communication channels. Thus, the entire concept can be activated by any of its components: hearing it can "remind" us of what it looks like; smelling it can recall its sound to our minds, and the like.

Social networks work analogously to this. Some events and objects are private, and exist only for a specific individual. Only you, for example, can recall the taste of this morning's breakfast. But other events and objects are fundamentally public, and cannot be experienced by only one person. World War II, for example, is a public event. Although millions of people experienced aspects of World War II, both at the time it happened and through media and second hand accounts later, each person experienced only a small part of the overall war. Each individual mind and brain

contains only a part of the concept of World War II. The entire human understanding of the war, however, is stored in a distributed way in the brains of the entire population of the world. While each individual may have his or her individual concept of what World War II was, the complete concept belongs to all people collectively.

As in the neural network, recalling the complete concept is a communication process. While it is, of course, impossible to bring all the people in the world together to discuss the war, it is not uncommon for groups of veterans or survivors of the war to gather together to discuss their experiences. When they do so, the communication among them activates the recollections in each person in a way analogous to the communication among neurons in a neural network. Thus, the larger concept of the war that is remembered by the group can be called out similar to the way the individual concepts of the war can be recalled by each individual.

The idea of collective perception and memory is not mysterious or amazing. It means that, for very complicated or large scale events and objects, such as "The Great Depression", or *marriage*, individual people can only perceive and remember small parts of the whole, but many people, each observing and remembering small parts of it, together can see and recall much more completely. In order to recover what all the people saw and recall, it is necessary in some way for them to communicate and collect their individual experiences into a total of some sort. Some writers might call this set of collective information the *culture* of a society, but most writers would probably include more in the concept of culture, such as the society's architectural styles and other artifacts, books and written records, libraries, electronic media, and the like.

Sometimes collective experiences happen by chance, as when a group of passersby happen to witness

an accident. As we've seen, it's unlikely that any individual witness could see the complete event, particularly because one's individual perspective makes it possible to see some things and not others. (You can't see what's behind you, for example.) But the set of many witnesses can provide a "groups eye view" which is more complete than that from each single witness.

In other cases, collective experiences are more organized and deliberate, as is the case with public performances like mass media, shows, plays, concerts, sporting events and the like. In these cases, large audiences deliberately assemble to view common events. While each individual forms his or her own individual thoughts and concepts about the event, the audience as a whole also forms a more complete overall concept of the events witnessed. Particularly since these events are repeated again and again over the course of history, extremely large numbers of people all view common events, and, in the process, form collective concepts

about beauty in the arts, skill, honor, justice and other virtues in sports, language, interpersonal relationships and all aspects of social life. These collective concepts are formed collectively by the collection of people, not by individuals, and they are communicated to each individual through the social network, even to those people who did not attend to the events.

In still more formalized cases, special organizations are formed whose purpose is to carry out observations and form concepts. Critics at plays and concerts, and the press at sporting events, for example, are organizations of people whose role it is to devise ways of symbolizing the experiences of society. While each attendee at a concert or sporting event will form his or her own concepts of what happened at the event, critics and sportscasters will shortly afterwards communicate their concepts of what happened to thousands or even millions. Society supports many groups and organizations whose fundamental purpose is

to formulate basic concepts and ways to symbolize aspects of human experience. The press, entertainment media, colleges and universities, learned societies, scientific organizations, academic disciplines, religions, political organizations, and many more, are organizations whose primary purpose is to develop concepts and symbols which are *ways to represent and think about our experiences*. Many of these organizations are in competition with each other to inculcate their particular world view into members of the society, and, even within each such organization, different subgroups may oppose each other in a struggle to define the way people will think about the world of experience. Some of these struggles are prominent and public, such as the debate between those who define the origins of human life as divine, and those who say it is the result of evolutionary processes, or the dispute between those who would define human fetuses as living human beings and those who would not. Others are less publicly

prominent but perhaps no less important, such as the disputes between groups of scholars and scientists over whether human cognitive processes (such as thinking) are computable or not.

Each of these (and other) special groups are competing for the right to define the way society and its individual members will symbolize, and thus remember, think about, and understand their experiences. The process is fundamentally a process of communication. Members of a particular organization, such as a political interest group (like the Americans for Democratic Action or the Republican Party) share a common set of symbols and concepts which serve for them as a system for representing the objects of their experience. Other, competing organizations symbolize their experiences with different sets of symbols and concepts. When members communicate with other members of the same organization who use the same concepts and symbols, they find most often that they agree about their

experiences. On the other hand, when they communicate with members of opposing groups who use different symbols and concepts to encode their experiences, they find that their experiences do not agree. In fact, if the set of symbols and concepts used by members of two different groups are sufficiently different, members will find they cannot communicate at all, in the same way as an exclusive English speaker can make no sense whatever of a Chinese text, or vice versa.

Competition between groups who use different symbols and concepts to encode their experiences are most likely to take place when one or both is determined to grow larger. As a group grows larger, its symbols and definitions spread to more and more people. If eventually a large majority of people adopt one set of symbols and concepts, users of alternative sets of symbols and concepts will not be able to understand, nor be understood by the majority group, and will thus be effectively exiled from society. Members

of the losing group will either have to convert to the alternative system of symbols or become outcasts unable to live in the larger society.

In smaller groups where large scale growth is unlikely, such conflicts are not so probable. Vintage car fans and Opera fans have alternative ways to symbolize cars and music from the general population, but are not likely to grow large enough to threaten any other groups' positions in the society. If there were some chance, however, that opera lovers were to grow to dominate the record buying public, you can be sure that substantial opposition by other music fans would appear, just as substantial opposition to any major musical trend has always surfaced in the past.

As in neural networks, symbols and concepts are transmitted through communication channels in a social communication network. If a special group is completely isolated and does not communicate with other members of society, there is no chance that its

special symbols and concepts will move out into the larger society. An important principle of modern communication theory, in fact, is that nodes that communicate with each other tend to grow increasingly similar as they communicate. (This is often called the *Convergence Theory* of communication.) Groups that are closed off from the larger society but communicate frequently among themselves become at once very homogeneous (that is, similar in attitudes and beliefs) within the group, but increasingly different from the larger society. Within a group, members who communicate with each other most frequently tend to become most similar, while those who communicate least tend to become least similar in the way they think.

Motivation Theory: An Example

This chapter began by describing a simple theory of human behavior, which said that each

individual human being has needs, goals, ambitions, and plans which they try to fulfill, and that all human behavior is a response to some goal or desire in the individual. Because the early social scientists believed this theory, they needed to try to figure out how the goal-oriented activities of all those individuals could become organized away from all-out warfare and into a cooperative society. But how did they come to believe that theory? Where did that theory come from?

You might think that the theory is not a theory at all, but simply a description of the way human beings really are, which could be discovered simply by observing them. But a modern interactionist could not believe that, because he or she would think that our perceptions of everything we experience, including human behavior, would be influenced by concepts we had learned from society. Where then did these particular concepts come from?

In classical Greece, a fairly small but very

important group of philosophers considered these questions deeply from about 700 BC until about 300 BC. Their thinking may well have been spurred by a flow of ideas from the East, perhaps even as far away as China, which entered Greece through the port of Miletus in the seventh century, BC. Out of the interactions among these philosophers (what philosophers might sometimes call dialogue or dialectic) the concept of *goal* developed. This concept was applied by the Greeks to everything: apples fell to the ground because it was their goal to get to the center of the earth, which was their "proper place." Fire rose in the sky because it was "trying" to get to the periphery of the universe, which was its proper place. And the concept of goal was applied to human beings as well. They ate because their proper condition was to be nourished; they slept because being tired was an unnatural state and they tended toward their proper condition, which was to be well rested, and so on. Every human action was assumed to result from some internal

goal or need.

This theory was written down by philosophers and their students, perhaps the most famous of whom were Plato and Aristotle, and by their students and followers. Plato's writings in particular were studied very carefully by St. Augustine, and Aristotle's works by St. Thomas Aquinas. Both St. Augustine's and St. Thomas' works were very widely read by medieval Christian scholars, and formed the basis of official Christian philosophy in Europe. As a result, the theory of goals and motivation was widely, and in fact nearly universally, distributed throughout Europe and the entire Christian world through the Christian Church. The Church has for centuries been one of the largest social communication networks in the world. It was also a centralized network, with information sent from a single source that communicated essential Christian doctrine to every Christian in the world on a continuing basis. The result is that the overwhelming majority of Christians in the

world learned the motivational theory of the Greeks as the basis for all human action. Understanding what we now do about modern interactionist theory, this means that the motivational theory of Plato and Aristotle is a large part of the self concepts of most Westerners. Part of what people believe *about themselves* is that they are motivated by goals, and that all their actions can be explained by some goal or plan; everything we do we believe we do because, in some sense, we want to do it.

No one can say with certainty whether the motivational theory is true or not, or whether the modern interactionist theory is true. But this example can help us understand how a non-motivational theory like interactionism can explain why most people (at least most people in the Western world) believe that all human behavior is motivated by goals, even though interactionism is itself a non-motivational theory. Right or wrong, however, this example provides a very good demonstration of how a concept or theory is spread

through society by its social communication network.

Cognitive Processes

Both neural networks and social communication networks have several things in common that are crucial in understanding how people, groups, and societies work. First, they both consist of interconnected nodes, which can take on different *values*. (The simplest node can only be turned on or off, and can thus take on only two values; human nodes can be happy or sad, excited or sleepy, singing, writing a symphony, arguing, or a vast assortment of other values. Groups and organizations, which are composed of many individuals, can take on correspondingly more values yet. The state or condition that any node is in at a given moment is called its *activation value*.

Secondly, in both neural and social networks, some of the nodes are interconnected by *communication*

channels. Each node communicates its activation value along the communication channels to the other nodes to which it is connected, thus changing the activation values of the other nodes.

Third, in both neural and social networks, the combined activation values of all the nodes in the network at a given moment represents the *state* or *condition* of the system at that moment. In a neural network where, for example, the neurons that represent "happiness" are activated, the person will be happy. Similarly, in a social network, happiness tends to flow along communication channels in a network, so that a few very happy individuals in an organization tend to communicate their happiness to others near them in the system, so that it makes sense to think of a group, organization or even a society as happy or sad. This state of the system does not have to be an emotion, but could represent an idea or thought as well. Neurons in a brain or people in an organization can be, at a given

moment, representing a concept like "caution" or "conservatism" or "capitalism" or "baseball" just as easily.

Lastly, and very importantly, *the state of both neural networks and social networks at a given moment depends entirely on the patterns of connections among the nodes and the communication processes among those connections*. We will call the state of a network as represented by the activation pattern of its nodes at any instant a *cognition*, and the changes in those patterns as time goes by we will call *cognitive processes*. On the level of an individual person, the cognitive processes represented by the changing activation pattern of his or her neural network will consist of the thoughts and feelings that person is experiencing, while, at the collective level, the changing patterns of activation of the nodes of the social network will represent the issues and currents of opinion of the group, organization, or society.

What is Communication?

As we have seen, communication is not merely something that people do from time to time, but rather is the foundation of thought and action. When we are aware of anything at all, it is because we are communicating with our environment and because the neurons within our brains are communicating with each other. Society exists because the people within it communicate with their environment and each other. The individual human mind arises out of communication with society and the environment, and is so deeply entwined with thought that when communication stops, thought and feeling stop too. We are always communicating, and we cannot choose not to communicate. But just what is communication?

Communication can mean many things to many people, but there are two ways to think of communication that are useful for us in this book. The

first sense of communication is in the sense of the communication between neurons in a neural network. As we saw earlier, neurons can be connected to other neurons through communication channels, which are basically electrochemical pathways along which electrical charges may be distributed. When a connection between one neuron and another exists, and when one of the neurons is activated, an electrical charge passes from one to the other. It does not "choose" to go, but rather the communication takes place because there is a difference in electrochemical potential between the two nodes. Even though no goal is involved, information still travels from one node to the other. The result of this communication process is that *the state of the first node is transmitted or communicated to the second.* In this first sense, communication takes place between neurons for the same reason that water flows downhill -- it doesn't particularly "want" to be at the bottom of the hill, but flows naturally from a higher to a lower state of

potential energy.

As we've seen, however, there are two possible reasons to believe that human beings act differently from electrical charges and waterfalls. The first of these is that, according to classical theory, people might well be naturally goal oriented; that is, they do things not because causes make them do so, but because motives draw them to them (in other words, because they want to do them). And even if this is not true, as we've seen, even a non-motivational theory like interactionism predicts that people who *believe* they act for goals will, therefore, do so. Because this is so, we can identify a second kind of communication; communication which is deliberate and initiated in order to achieve some goal. This second kind of communication we might call goal oriented or deliberate communication.

Human beings can engage in both kinds of communication. Sometimes, individuals need the cooperation of other persons to fulfill a goal, and they

may deliberately communicate with another to gain their participation. In other cases, simply being present in the same place with another person makes it inevitable that the other will observe actions and characteristics of the first person. Non-verbal cues like tapping one's foot, shifting in one's seat, averting another's eyes, and so on, inadvertently provide information to the other, and are a form of communication.

What both forms of communication have in common, however, is the passage of information from one node to another. All processes in which information passes from one node to another may be considered communication. Some communication is deliberate and goal-oriented. However it may be defined, communication is the basic process of nature, and the foundation of all our experience.